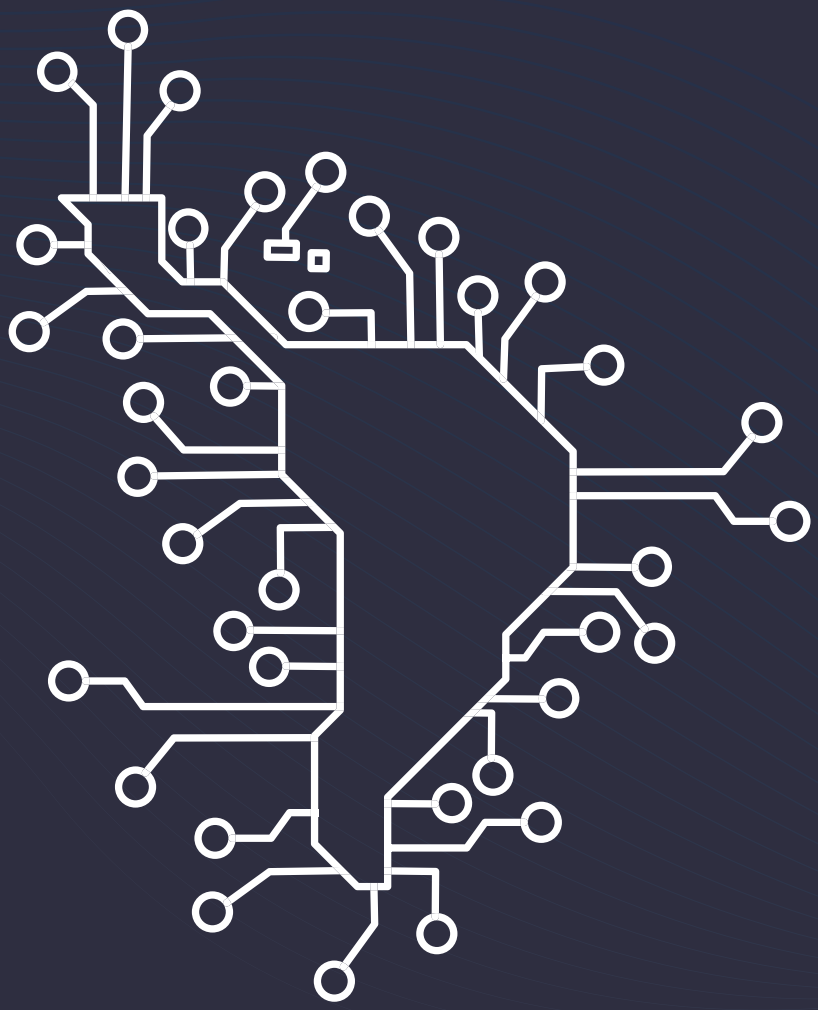

ARTIFICIAL INTELLIGENCE FOR SOCIAL GOOD IN LATIN AMERICA AND THE CARIBBEAN:

The Regional Landscape and 12 Country Snapshots

A fAIr LAC initiative report

ARTIFICIAL INTELLIGENCE FOR SOCIAL GOOD IN LATIN AMERICA AND THE CARIBBEAN:

The Regional Landscape and 12 Country Snapshots

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PRESENTATION

The Inter-American Development Bank (IDB) advocates for building a shared understanding of Artificial Intelligence (AI), its opportunities and applications, and its risks and the possible measures to mitigate them.

Towards this end, working in collaboration with C Minds and with input from a group of regional experts, the IDB designed the fAIr LAC initiative to promote the responsible adoption of AI in order to improve the delivery of social services and create development opportunities. The aim is to reduce gaps and attenuate growing social inequalities in Latin America and the Caribbean (LAC).

Working jointly with the private and public sectors, civil society, and academia, the fAIr LAC initiative leads the implementation of pilot projects for social good in response to identified public issues. Similarly, under its auspices, tools are created to guarantee minimum standards and strengthen the quality of data and models in order to mitigate potential risks associated with AI systems, while also fostering an informed public debate about its opportunities.

One of the first steps of this initiative is to document and disseminate a greater amount of information on the progress made in the field of AI for the common good and on relevant use cases in the region. This report contributes to these objectives.

In light of the latent need to speed up the response to the social and environmental challenges in LAC, this report seeks to contribute to the discussion and the generation of knowledge about the adoption of AI in an ethical and responsible manner so that it may be used as a supporting tool to achieve the United Nations Sustainable Development Goals.

PREFACE

Latin America and the Caribbean (LAC) needs innovative solutions to improve the quality of its social services. Technology can contribute towards this aim by making development in LAC more efficient and sustainable. Among the tools available, Artificial Intelligence (AI) can play a key role, provided certain requirements are met.

For example, AI can help physicians detect diseases. It can help teachers customize education for students. It can even help workers improve their qualifications and connect them with real job opportunities.

People can be much more productive when they are supported by technology. This is one of the basic principles for implementation of AI in our region: it should be designed to complement human beings and improve their capacity, but never to replace them entirely.

Regardless of the availability of multiple technologies, they can never replace the work of social sector professionals. In education, for example, even if AI facilitates customized curricula for each student, the end result will be insufficient without the guidance and pedagogy of a good teacher. Physicians and teachers, among many others, are the most important elements for the effective functioning of health and education services, respectively. Therefore, when problems occur related to the introduction of technology, the problem is not necessarily the technology itself, but rather the wrong design that is based on the false assumption that these professionals could be replaced.

Hence, we believe that the Inter-American Development Bank (IDB) has a key role to play in the implementation of AI in Latin America and the Caribbean. Our in-depth knowledge of the processes, opportunities, challenges, and risks associated with the public and social sectors, acquired throughout the IDB's 60 years of project experience with governments and ministries, places us in a privileged position to substantially contribute to the implementation of AI for to help deliver social services.

This report is part of broader ongoing effort in the field of AI field that follows its changing nature and accelerated pace of development. Our objective is to push for the adoption of ethical and responsible technology that generates better social services in our region. For this purpose, we have been collaborating and disseminating the most relevant use cases in Latin America and the Caribbean.

Marcelo Cabrol
Manager, Social Sector
Inter-American Development Bank

New digital technologies represent an unprecedented opportunity to significantly expand the impact of interventions by the Inter-American Development Bank (IDB). Within this framework, we should promote the use of these technologies without overlooking their potential risks and negative effects. Their careful implementation will ensure that these innovative tools effectively contribute to social inclusion.

Among new technologies, the potential of Artificial Intelligence (AI) stands out because it is central to the digital platforms and social networks that we use every day, and to the business model of many entrepreneurs and innovators in Latin America and the Caribbean (LAC). As shown in several studies, implementation of AI requires active and coordinated efforts to avoid biases and negative effects on disadvantaged groups. This is because challenges in the development and deployment of AI systems arise regarding consent, biases, explainability, and other factors that may cast doubt on the ethics and transparency of these systems and prevent them from having the legitimacy needed to expand their use, particularly during the training of algorithms. All these challenges highlight the important role that the IDB Group can play in the region by promoting ethical and responsible use of AI that generates a positive social impact.

In addition, it is essential to promote the responsible use of AI not only in large technological companies but also in emerging and innovative businesses in sectors such as health, education, and social services so that these firms design solutions oriented towards both the private and public sectors. This connection between innovative solutions and social problems represents a great opportunity for LAC, but it requires that the region's innovation ecosystem develop reliable AI-based standards and tools. This will only be possible by fostering the development of good practices, algorithm audits, and specific guidelines that promote responsible adoption of AI and allow for addressing the region's development challenges.

In the specific case of the IDB Lab, the innovation laboratory of the IDB Group, moving AI forward as a facilitator of innovation for inclusion requires assigning priority to connecting and training the different players in the region's innovation ecosystems (entrepreneurs, investors, business accelerators, among others). This joint effort between governments, businesses, and entrepreneurs will accelerate and consolidate the ethical and responsible use of AI as a tool that contributes to the fulfilment of the Sustainable Development Goals (SDGs) in LAC.

To carry out this agenda, the IDB Group is launching an initiative called fAIr LAC to promote the responsible use of AI for social impact. In particular, the IDB Lab and its network of partners seek to ensure that the region's entrepreneurs and innovators introduce tools into their work that guarantee digital security (data and systems availability, integrity and confidentiality), as well as algorithm transparency and accountability. This means that the AI models developed must include a vision of technical robustness and respect for citizen rights from their initial design onward. In this sense, we are driving activities that raise awareness, train talent, facilitate market and investment opportunities, and develop networks, methodologies, and tools to help entrepreneurs and small and medium-size enterprises integrate the concept of responsible AI into the development of their solutions.

We therefore invite entrepreneurs, innovators, and civil society organizations to join fAIr LAC and to work with us so that together we can fulfil the dream of putting technology at the service of people, inclusion, and equal opportunities in Latin America and the Caribbean.

Irene Arias
Manager, IDB LAB
Inter-American Development Bank

The C Minds team firmly believes that technology can be used as a tool for building social value. With this conviction, our mission is to collaborate with governments, academia, industry, multilateral organizations, and other actors of change to design strategies to strengthen the capacity of institutions in Latin America and the Caribbean (LAC). Our collaborative work seeks to create alliances using a holistic perspective that maximizes the benefits of new technologies. In particular, we want to understand how Artificial Intelligence (AI) can support deep structural changes that benefit the region, and at the same time design measures to anticipate and mitigate social and environmental risks that the fast-paced adoption and development of AI can produce.

Turning AI into a reality as a tool that fosters more inclusive and fairer economic and social development in LAC is not a luxury but rather a latent need. In this sense, we are proud partners of the IDB Group in this crucial task of strengthening the use of AI for social good in the region.

We hope that this report helps to clearly show the progress that LAC has made in this area and in turn contributes to promoting the discussions and actions needed for the ethical exploitation of this technology. Ultimately, this is what will define the role of AI in the process of making Latin America and the Caribbean a more prosperous, fair, and inclusive region. This will largely depend on our capability to collectively find answers to the deeper questions discussed here.

Constanza Gómez Mont
Founder and Director
C Minds

Inter-American Development Bank (IDB) – Social Sector

The Social Sector (SCL) is a multidisciplinary team whose work is based on the conviction that investing in people is the way to improve lives and overcome development challenges in Latin America and the Caribbean. Jointly with the countries in the region, the Social Sector formulates public policy solutions to reduce poverty and improve the delivery of education, employment, social protection, and health services. The objective is to advance a more productive region, with equal opportunities for men and women, and greater inclusion of the most vulnerable groups. www.iadb.org/en/about-us/departments/scl

Inter-American Development Bank (IDB) – IDB Lab

IDB Lab is the innovation laboratory of the IDB Group. We mobilize financing, knowledge, and connections to catalyze innovation for inclusion in Latin America and the Caribbean. We believe innovation is a powerful tool that can transform our region, providing unprecedented opportunities to populations that are vulnerable due to economic, social, or environmental factors. https://bidlab.org/

C Minds

C Minds is a women-lead Mexican organization directed towards fostering equal opportunities for a fuller life through the use of new technologies such as Artificial Intelligence (AI). The organization specializes in the design and implementation of social change strategies in emerging countries in response to the new paradigms triggered by widespread technological transformation. C Minds works with governments, multilateral organizations, and local institutions to implement projects to increase the resilience of communities, prepare different industries for the future, and promote the development of new technologies focused on human rights. www.cminds.co

This report is part of the fAIr LAC initiative:

fAIr LAC

fAIr LAC reflects the IDB's efforts to build a common understanding of Artificial Intelligence (AI), its opportunities and applications, and its risks and the possible actions to mitigate them. In cooperation with partners and strategic allies, this initiative promotes the responsible use of AI in order to improve the delivery of government services, mainly in the areas of education, health, social protection, labor markets, and issues related to gender and diversity. It also aims to create development opportunities in order to reduce gaps and attenuate growing social inequalities. Working jointly with the private and public sectors, civil society, and academia, the fAIr LAC initiative leads the implementation of AI systems experiments and pilot projects. Similarly, it creates models for ethical evaluation and other tools for governments, entrepreneurs, and civil society to deepen their knowledge of the subject, make guides and frameworks for the responsible use of AI available to them, and influence public policy as well as the entrepreneurship ecosystem. www.iadb.org/en/fairlac

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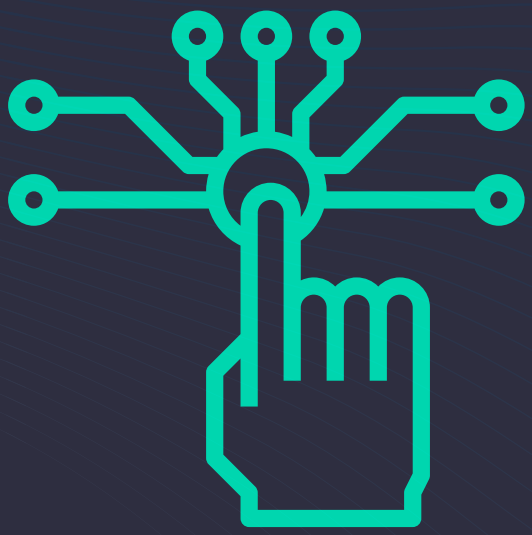


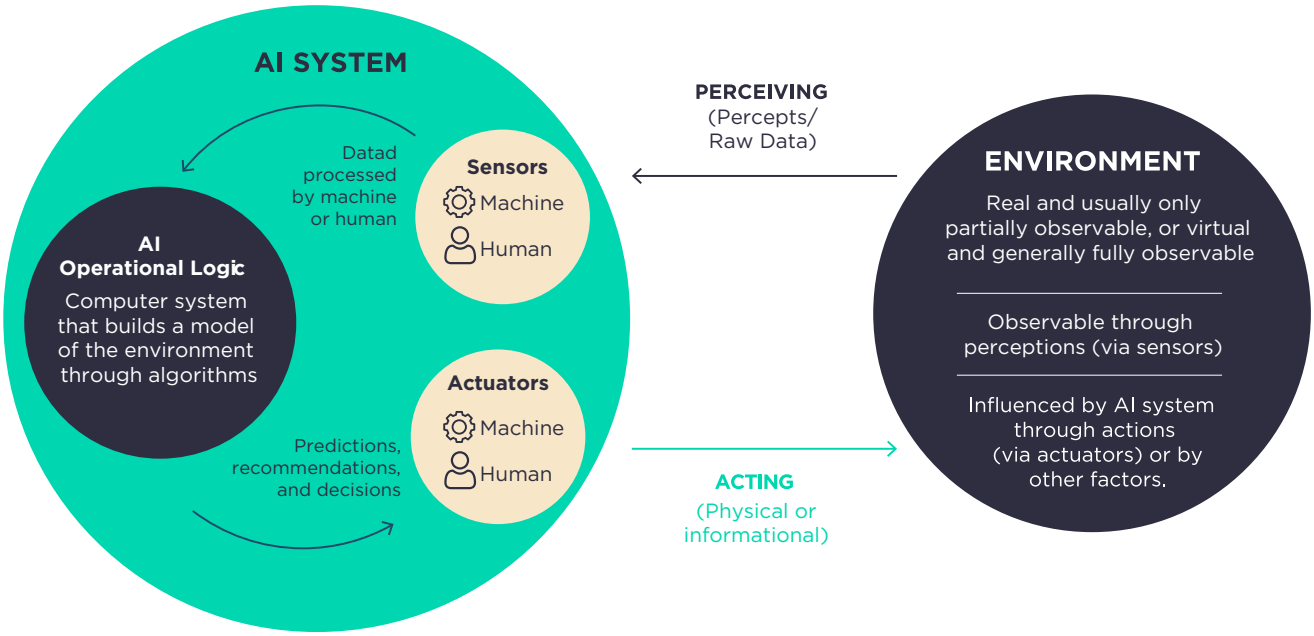
1. INTRODUCTION

1. INTRODUCTION

Among the numerous shared challenges faced by the countries of Latin America and the Caribbean (LAC) at a time of economic and political uncertainty, improving the delivery of government services is at the top of the list, particularly for education and health (IMF 2019). Developing regional strategies to successfully address these challenges is increasingly complex, due not only to political, cultural, and economic differences but also to growing social inequality. While this scenario may seem discouraging, many agents of change are seeking new alternatives based on technological tools to create a more prosperous and fairer region.

Among these tools is Artificial Intelligence (AI). In its dual role as a general-purpose technology and instrument for innovation, AI has gained prominence in debates in many areas by promising to change the way we live and our view of the world.[1] However, because AI is an ever-evolving concept, it is difficult to provide a definition that considers its multiple facets (Figure 1). It can be asserted that AI is a field of study centered on the development of computer system capacity to carry out tasks that were once considered exclusive to human intelligence, including reasoning, learning, and problem-solving, to mention just a few. The Organisation for Economic Co-operation and Development (OECD), as cited in Cabrol et al. (2020,10), defines AI as "a machine-based system that can, for a given set of human-defined objectives, make predictions, recommendations or decisions influencing real or virtual environments. AI systems are designed to operate with varying levels of autonomy."

Figure 1. High-Level Conceptual Vision of Artificial Intelligence



Source: OECD (2019)

1 A general-purpose technology is one that can be applied to several tasks rather than just a specific one. It displays technological dynamism (continuous updating) and has innovative complementarity (the capacity to induce other innovations) (Hurtado, Lugones, and Surtayeva 2014).

AI promises to enhance the design of digital services centered on the needs of people, the efficiency of important vital processes (such as the delivery of social services and the transparency of public decision-making),[2] and stimulating the economy by increasing productivity. It can also contribute to each and every one of the 17 United Nations Sustainable Development Goals (SDGs) through use cases that respond to specific goals, provided that challenges related to their scaling are overcome (Stanford University 2019). An example of the relevance of AI is the impact it can have on the economy of a developing country. It is estimated that AI could contribute an additional 14 percent of wealth to the emerging markets of Latin America (Estevadeordal et al. 2018).

The potential of AI is so broad that it is expected to be a core instrument for addressing current and future challenges. For its part, the concept of AI for social good aims to empower individuals: it is used to address the most important challenges of our time that have a direct impact on human beings and the environment in areas as diverse as health, education, labor, justice, resource availability, climate change, gender equality, and inequality.[3] Under the concept of AI for social good, different actors play a role, including those organizations or initiatives that address these challenges with the support of this technology.

The world is at the dawn of a new era when the impact of digitalization is expanding at an increasingly surprising pace. This is happening through technologies and techniques such as gene editing, cryptographic methods, and nanomaterials, among others (Davis 2016). Considering the promise of AI to improve quality of life, a great number of institutions in LAC have focused on learning about the new possibilities it offers and exploring and testing them, particularly in the domains of the economy, health, and education. It is hoped that in the next decade AI will benefit millions of people in the region (Anderson and Rainie 2018).

Considering this broad potential of AI, it is important to perform a general analysis of the progress achieved to date in developing and adopting it in LAC, as well as to document that progress in terms of leveraging models in the service of social good propelled by AI. This includes the mitigation of potential risks intrinsic to this technology that have been classified by the fAIr LAC initiative into eight categories:[4] (1) digital interoperability and transformation; (2) conceptualization and design; (3) governance and security; (4) data source; (5) model development; (6) use and decision-making; (7) accountability; and (8) systemic impact.

While efforts have been made in LAC to spur interest in driving innovation and technology development, specifically in AI, consolidated information is lacking on the use of AI as a tool to address social challenges from a country perspective or at the regional level. Considering that the region is at an early stage of AI adoption, it is an opportune time to review its potential different uses, and in particular the role that governments can play in its development and responsible adoption.

Hence, the Inter-American Development Bank (IDB) and C Minds have prepared this report within the framework of the fAIr LAC initiative to provide a preliminary diagnosis of the advances made in the use of AI at the service of social good by the countries of LAC. This effort brought together inputs from 65 experts from different sectors in the region and drew on information from relevant documents, which allowed for broadening the knowledge about the AI ecosystem in all of the countries studied.

This report is expected to contribute to the recognition and awareness of best practices in the field of AI in the region, report on these issues to decision-makers, promote dialogue and debate based on evidence, and foster the design of comprehensive strategies to advance the responsible use of AI to tackle social and environmental challenges in LAC. Similarly, the objective is to foster a critical space to reflect

2 In this document, social services are understood to include the group of services and actions oriented towards improving the social well-being of citizens through the delivery of information, care, and support, particularly for education, health, social protection, labor markets, social security, and issues associated with gender and diversity.

3 Social good refers to any action that is beneficial to the quality of life of people, and implies a positive impact on society in general.

4 For more information on these risk categories, see Cabrol et al. (2020).

on the meaning and implications of the accelerated development of AI in the region, and on the appropriate mechanisms to guarantee that this technology is used for the benefit of all people.

Readers are invited to learn about the progress that has been made in each country, convert the knowledge presented into an open dialogue about the course of this technology in the local context, and participate in the co-creation of a regional agenda that ensures that AI as a technological instrument safeguards human rights and contributes to inclusive development in LAC.

The AI ecosystem evolves in an accelerated manner, so periodic updating of this information is considered fundamental. The authors encourage anyone who wishes to recommend pertinent or new initiatives that have not been included in this report to send this information to the following emails: fairlac@iadb.org and info@cminds.co, or directly visiting the website of the fAIr LAC Observatory here.

2. METHODOLOGY

2. METHODOLOGY

Countries Selected

This report includes a diagnosis of the current situation of AI in 12 LAC countries: Argentina, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, Mexico, Paraguay, Peru, Trinidad and Tobago, and Uruguay (Map 1). This selection was based on a subregional assessment and 21 criteria (Annex A), including digital maturity, international rankings such as the Open Data Index, and progress achieved in AI.

Map 1. The 12 Latin American and the Caribbean Countries Selected for Study of Their Artificial Intelligence Landscape

Country Analysis

To provide a comprehensive and current scenario by country, researchers based their work on documentary analysis and information shared exclusively for this report by local and regional experts. A complete list of experts, who were selected on the basis of a mapping of the region and from recommendations, can be found at the beginning of this document under Acknowledgements.

For each country, the information collected is organized under the following subsections: (1) a summary of the country's profile as a general context; (2) documentation of the different efforts by government, academia, and the entrepreneurial sector and civil society to strengthen and develop an AI ecosystem in service of public good to fulfill the SDGs in the region;[5] and (3) a general conclusion. A detailed description of each subsection and the relevance of each player studied is provided in Annex B.

5 A list of use cases broken down by country, theme, and implementers can be found in Annex C.

AI Ethics

As per the warning in the report entitled *Automate with Caution: Data and Artificial Intelligence in Latin America*, the opportunities that AI offers LAC also entail potential risks that have still not fully materialized given its current state of development (Scrollini 2018). The topic of AI ethics is relatively new in the world and incipient in the region. While there are still no significant advances in the countries studied, within the framework of this report an open regional survey was conducted – the first of its kind – to learn about perceptions of the ethics of AI.[6] The survey included 225 participants from LAC, and the results are included in this publication. While the findings cannot be generalized for the entire region, since the participants do not constitute a representative sample, they provide a thermometer of the different perspectives that participants have on the issues addressed.[7]

Scope of the Report

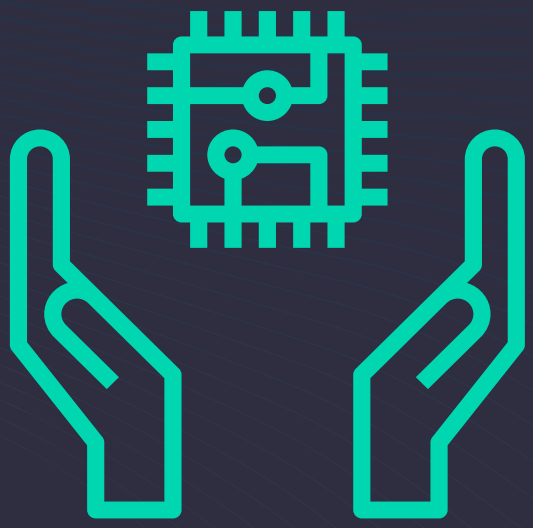
This report does not classify or rate the countries in the sample. Nor does it delve in detail into the initiatives that have incorporated the use of AI in each country or that are promoting its development. The aim is to provide a general overview of current AI building blocks and the progress achieved in each country in terms of the use of AI in the service of social good. In other words, the aim is to provide information about initiatives in this knowledge area to date carried out by four interest groups: government (with an emphasis on national initiatives), academia, the entrepreneurship ecosystem, and civil society organizations.

It is worth noting that while the efforts of industry in general and what is known as "Big Tech" constitute the backbone of AI development in the service of public good in countries, this publication does not closely examine those activities, avoiding the duplication of existing efforts such as those of Endeavor, a fAIr LAC partner. In sum, this report covers a sample of initiatives and ventures that harness AI in order to have a greater impact on issues related to social development and the environment in LAC.

Given that the AI ecosystem is rapidly evolving, it is recommended that readers stay current with the resources compiled in this report, which covers main efforts identified in the 12 countries up to the start of 2020.

6 The survey results are presented in Figure 6.

7 The following central themes on AI ethics and inclusive policies were considered: Inclusive growth, sustainable development and well-being; human-centered values and fairness; transparency and explainability; robustness, security and safety; and accountability.



3. MAIN FINDINGS

3. MAIN FINDINGS

While this section presents a summary of the findings of this report, it should be pointed out that the purpose is not to generalize these findings in terms of the rest of the region, since the 12 countries analyzed are among the most advanced in LAC when it comes to laying the groundwork for AI adoption as a tool for social good. The group of countries examined is referred to here as the LAC12. The main findings of the report are as follows:

- Most of the LAC12 have established solid foundations from a government perspective, since they are developing their AI systems in alignment with government efforts directed at increasing connectivity, infrastructure development, national digitalization strategies, open data, and national AI agendas.
- All of the countries studied have a digital strategy and, with the exception of Trinidad and Tobago, also have an open data agenda. Uruguay and Colombia have already formulated their national AI strategies, while Brazil and Chile are in the process of doing so. Mexico and Argentina have embarked on a significant effort by including the ecosystem in the development of a national strategy proposal that still needs to be consolidated.
- The lack of digital infrastructure in the region is a key challenge when it comes to the democratization of AI benefits. The Economic Commission for Latin America and the Caribbean (ECLAC 2019) notes that access to technology can be up to 10 times greater in urban areas compared with rural areas.
- Regardless of the differences recorded for rural and urban areas, a lack of connectivity is predominant in all of the 12 countries studied, as less than 70 percent of the LAC12 population on average has access to the Internet.
- The existence of 5G networks is a competitive element for the local AI ecosystem, as it accelerates and strengthens connectivity services. Developing such networks requires an AI system that analyzes data and learns more rapidly than those currently in place. In this sense, Argentina, Colombia, and Uruguay are conducting tests, while Mexico, Brazil, and Peru are already in the middle of spectrum auctions.
- Cybersecurity is key to making progress in the digital economy. This topic represents an important area of opportunity in the sample of selected countries because, according to the International Telecommunication Union's 2018 Global Cybersecurity Index, these 12 countries rank between positions 51 and 123 among the 175 countries ranked worldwide.
- In terms of gender, schooling, and English proficiency, one woman for every two men in the region participates in a science, technology, engineering, and mathematics (STEM) program. The average student is three years behind the OECD student average in reading, mathematics, and science. The average level in English – the language in which most AI programs and documents are written –is only 56 percent, which points to an area of opportunity and priority for which competencies will have to be developed.
- Close to 75 percent of LAC12 major universities have research and development of autonomous systems. For their part, public and private research centers generate 50 percent of this type of research.
- Over 96 percent of the main universities in the LAC12 offer degrees related to AI and 50 percent have their own specialized laboratory or center. These numbers are promising with respect to the development of local talent, one of the main challenges for AI entrepreneurship in the region. However, only half of these universities have branches outside of the country's capital city, which constitutes a major hurdle in terms of the dissemination of knowledge and the distribution of opportunities.

There is a gap when it comes to gender diversity in AI research, although this is not a challenge specific to LAC. A review in 2019 of 11,000 publications presented at 21 international conferences found that only 18 percent of principal authors were women. Another study that analyzed arXiv (the most important

open-access repository of publications) found that, on average, only 25.4 percent of publications on AI across 34 countries were coauthored by at least one woman. Among the LAC countries, only Argentina (34 percent), Mexico (27 percent), and Brazil (27 percent) are ranked among the countries where gender differences in publications on AI are less pronounced. Argentina ranked first among countries in the region in the share of AI publications for which a woman appears as sole author (15 percent) (Stathoulopoulos and Mateos-Garcia 2019).

- In terms of AI patents, LAC has the lowest level (less than 1 percent) when compared to other world regions.
- The 12 countries in the sample face systemic challenges such as inequality gaps. Their average Gini coefficient is 46 percent, positioning the region as one of the most unequal in the world, along with sub-Saharan Africa. This opens an opportunity to explore the way in which AI could become a powerful instrument to reduce this gap in equality.
- In 2018, venture capital doubled in LAC and reached a total of US$1.98 billion when including all subsectors. While still in its early stages, impact entrepreneurship and its promotion through venture capital is growing throughout the region. However, there are still marked differences between countries in terms of the level of AI evolution and adoption in this sector.
- Of the total number of risk investments in the region in 2017, 82 percent corresponded to the area of information communications technology (ICT). Even though the subsector that most uses AI in the region is enterprise software and services,8 with a share of 43 percent (Endeavor 2018), four other subsectors directly related to improving the quality of life stand out for their rate of growth in risk investments: health, EdTech, FinTech, and AgTech. While AI is not the only technology used by social and impact entrepreneurs, it plays a fundamental role in their innovation and growth strategies.
- The entrepreneurship ecosystem is driving numerous use cases of AI at the service of social good in the LAC12. Through these uses, the goal is to expand and distribute existing opportunities, for example by creating opportunities for farmers to access credit; promoting a customized and high-quality education through monitoring and support solutions for students; democratizing access to health services through remote automated diagnostic systems; enabling smoother communication with the deaf community; reducing malnutrition through the provision of sustainable and accessible plant-based food; and mitigating the effects of climate change in different sectors.
- The sample of 29 use cases shows that their biggest challenges in AI adoption include quality (58 percent), labeling (58 percent) and data availability (47 percent), followed by the availability of skilled talent (47 percent) and cultural resistance (42 percent).
- In the survey on AI conducted for this report, 37 percent of the 225 respondents perceived that very little importance is afforded to AI in the public agenda. Similarly, 58 percent perceive that civil society organizations and those dedicated to generating social impact are starting little by little to consider the use of AI to accelerate its impact.
- According to that same survey, the ethical issues of AI that raise concern in the region include personal data privacy and security (56 percent), system reliability and safety (37 percent), and transparency (33 percent). Furthermore, it is perceived that the private sector has greater influence on issues related to AI ethics (40 percent), followed by the academic sector (29 percent).
- Over 70 percent of survey respondents were not familiar with a use case implemented in the service of social good (Table 1).

8 This subsector is comprised of companies devoted to creating tools to satisfy business operational needs (e.g., cloud services such as Amazon Web Servicies, FutureFuel, and Squibler, among others).

Table 1. Overview of Progress in AI in 12 Selected Latin America and Caribbean Countries (percent)

	Government	Academia	Entrepreneurship Ecosystem	Civil Society
Argentina	77.5	52	52.4	75
Brazil	77.4	88	41.8	50
Chile	79.1	76	50.9	75
Colombia	89.1	68	47.3	25
Costa Rica	65.1	75	n/a	100
Dominican Republic	61.6	46.4	45.7	75
Ecuador	61.4	60	n/a	75
Mexico	76.4	64	52.1	25
Paraguay	61.8	46.4	n/a	50
Peru	62.6	46.4	45.4	50
Trinidad and Tobago	38.5	60.3	n/a	75
Uruguay	91.5	60	47.2	100

Source: Prepared by the authors.
Note: For "Government," the calculation was based on the average score of the World Bank's Digital Adoption Index, the World Economic Forum's Networked Readiness Index, and the Digital, Data, and AI Strategy Formulation Index (100 percent if the country has such strategies, 50 percent if they are in progress or on hold, and 0 percent if they do not have them). For "Academia," the figures were obtained by calculating the percentage of public non-centralized universities with degrees related to AI and with AI-related research, and an AI laboratory out of the total of universities studied (3, 4, or 5). For "Entrepreneurship Ecosystems," the Global Entrepreneurship Monitor's National Entrepreneurship Context Index (NECI) was used. The NECI measures how conducive the environment is for businesses. For "Civil Society," the CIVICUS Monitor tracking tool, which measures the state of civil society freedoms, was used.

4. REGIONAL OVERVIEW

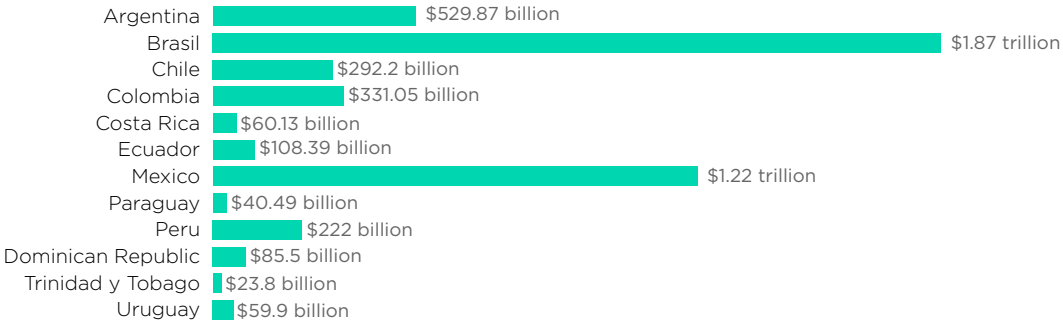
4. REGIONAL OVERVIEW

Selected Country Profiles

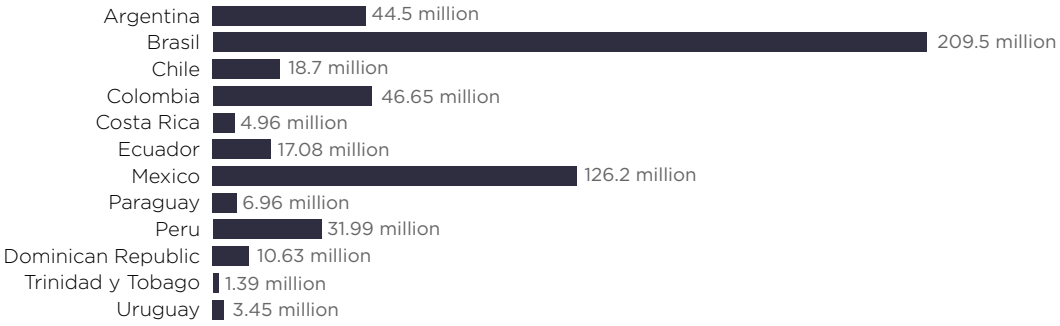
In order to provide a general context, Figure 2 presents a comparison of core indicators for the 12 countries selected for this report, including size of the economy, population, and human development and equality.

Table 2. Core Indicators for the 12 Selected Countries

Size of the Economy (in U.S dollars)



Population



Human Development Indicators

	Program for International Student Assessment	English Proficiency (percent)	Skilled Workforce (percent)	Human Development Index	Gini Coefficient
Argentina	N/A	58.38%	63.4%	0.825	41.2
Brasil	N/A	50.1%	62%	0.759	53.12
Chile	1st	52.89%	69.2%	0.843	46.6
Colombia	N/A	57.38%	58.2%	0.747	49.7
Costa Rica	N/A	48.75%	48.3%	0.794	48.3
Ecuador	N/A	46.75%	46.6%	0.752	44.7
Mexico	3rd	48.99%	40%	0.774	48.3
Paraguay	N/A	52.51%	43.8%	0.702	48.8
Peru	N/A	50.22%	83.6%	0.750	43.3
Dominican Republic	N/A	52.3%	50.2%	0.736	45.7
Trinidad and Tobago	N/A	N/A	71.8%	0.784	40.3
Uruguay	2nd	54.1%	25.5%	0.804	30.5

Sources: Panels a and b: World Bank (2019a); Panel c: (from left to right): OECD (2019);); Education First (2019); United Nations (2019); UNDP (2019); World Bank (2018).

Progress by Governments

Table 2 summarizes the progress made by the governments of the 12 selected countries in terms of establishing the foundations for driving AI in the service of social good.

Table 2. Progress in Strategy Formulation and Infrastructure and Connectivity

	Digital Strategy	Data Strategy	AI Strategy	Infrastructure and Connectivity
Argentina	Yes	Yes	Continuity to be explored	Very advanced
Brazil	Yes	Yes	In progress	Very advanced
Chile	Yes	Yes	In progress	Leader
Colombia	Yes	Yes	Yes	Very advanced
Costa Rica	Yes	Yes	No	Very advanced
Dominican Republic	Yes	Yes	No	Semi-advanced
Ecuador	Yes	Yes	No	Semi-advanced
Mexico	Yes	Yes	Continuity to be explored	Advanced
Paraguay	Yes	Yes	No	Semi-advanced
Peru	Yes	Yes	No	Advanced
Trinidad and Tobago	Yes	No	No	Advanced
Uruguay	Yes	Yes	Yes	Leader

Source: Prepared by the authors.

Note: For the connectivity and infrastructure sectors an average of scores was extracted from the World Bank's Digital Adoption Index and the World Economic Forum's Networked Readiness Index. For the far right column, a "leader" level corresponds to a score above 90 percent, "very advanced" between 80 and 89 percent, "advanced" between 70 and 79 percent, and "semi-advanced" between 60 and 69 percent.

In addition to the progress in each country, there are forums devoted to AI at the international level involving LAC countries, individually or as a bloc. This is where government actions seek to be aligned on AI issues in general. The forums include the following:

- **United Nations:** The Group of Friends on Digital Technologies,[9] aligned with the SDGs, seeks to maximize the positive impact of new technologies and mitigate potential negative risks. It is co-chaired by Mexico, Finland, and Singapore.
- **Digital 9:**[10] This is an international forum that groups nine countries that are pioneers in the development of digital practices that benefit their citizens. Mexico and Uruguay are the only Latin American countries that belong to this group. In 2019, Uruguay, which has an AI thematic group, assumed the D9 presidency.
- **The Pacific Alliance:** This initiative launched the Digital Agenda in 2017 along with a roadmap that charts how to improve the competitiveness of the four LAC countries in the alliance (Mexico, Peru, Colombia, and Chile) through ICT. The alliance seeks to take the lead in AI, among other issues, to send a signal of social commitment.
- **The GEALC Network:** In 2018, the Network of E-Government Leaders of Latin America and the Caribbean (GEALC) founded the Emerging Technologies Working Group led by Mexico.[11] This group prepared the first survey of the different initiatives in the region.

Progress by Academia

The CSRankings rates the top computer science institutions around the world.[12] This ranking is based on the number of institutions and researchers that have published papers on referenced subjects,[13] and that have appeared at the most selective events in their category. For the 2015–2020 period, 12 Latin American universities that stand out are listed below, followed by their relative ranking (which computes several components):

- *Universidade Federal do Rio Grande do Sul* (UFRGS), Brazil: 215
- *Universidade Federal de Mina Dos Gerais* (UFMG), Brazil: 221
- *Universidade Federal de Viçosa*, Brazil: 235
- *Pontifícia Universidade Católica do Rio Grande do Sul* (PUC-RS), Brazil: 253
- *Instituto de Ciências Matemáticas e de Computação* (USP-ICMC), Brazil: 253
- *Universidade de São Paulo* (USP), Brazil: 272
- *Universidad de Chile*, Chile: 297
- *Pontificia Universidad Católica de Río de Janeiro* (PUC-RIO), Brazil: 316
- *Universidade Federal de Pernambuco* (UFPE), Brazil: 351
- *Universidade Federal do Rio de Janeiro* (UFRJ), Brazil: 351
- *Universidad de Buenos Aires*, Argentina: 351
- *Universidad de los Andes*, Colombia: 386

According to Stanford University, reference made to AI in scientific journals is a sign of AI research and development impact. In 2019, only 2 percent of all publications on this subject were produced in LAC (Figure 3), making it one of the least prolific regions in the world in this area (Stanford University 2019).

9 For more information, see https://repositorio.cepal.org/bitstream/handle/11362/5014/1/S0700876_es.pdf

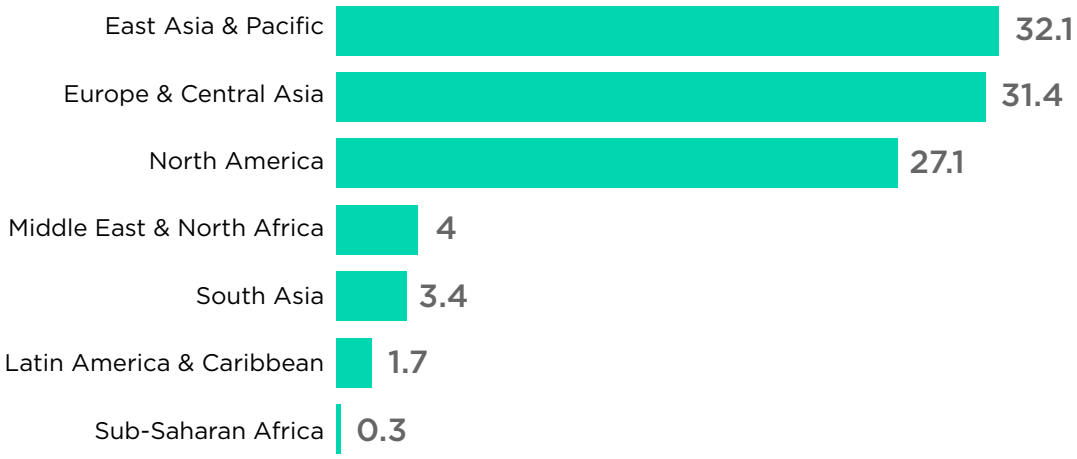
10 For more information, see https://leadingdigitalgovs.org/about/leading-digital-governments

11 For more information, see http://www2.redgealc.org/sobre-red-gealc/que-es-la-red-gealc/

12 CS in the title stands for computer science.

13 The referenced subjects include AI, computer vision, machine learning and data mining, and natural language processing.

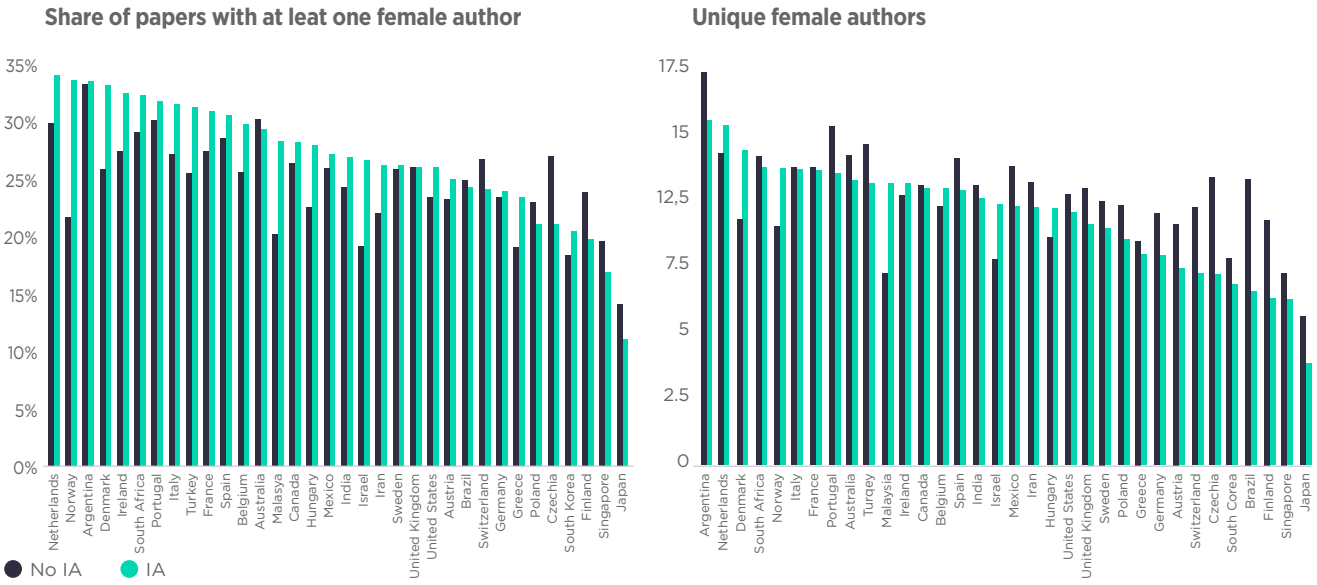
Figure 3. Share of AI Publications by Region



Source: Stanford University (2019).

It is worth noting that there is a gender diversity gap in AI research, even though this is not a challenge unique to LAC. A 2019 review of 11,000 publications presented at 21 international conferences found that only 18 percent of principal authors were women. Another study that analyzed arXiv (the most important open-access repository of publications) determined that, on average, only 25.4 percent of publications across 34 countries that addressed AI were coauthored by at least one woman (Figure 4). Among the 34 countries considered, only three LAC countries – Argentina (34 percent), Mexico (27 percent), and Brazil (27 percent) – are ranked among the countries where gender differences in publications about AI are less pronounced. Argentina occupies first place in the share of AI publications in which a woman appears as sole author (15 percent) (Stathoulopoulos and Mateos-Garcia 2019).

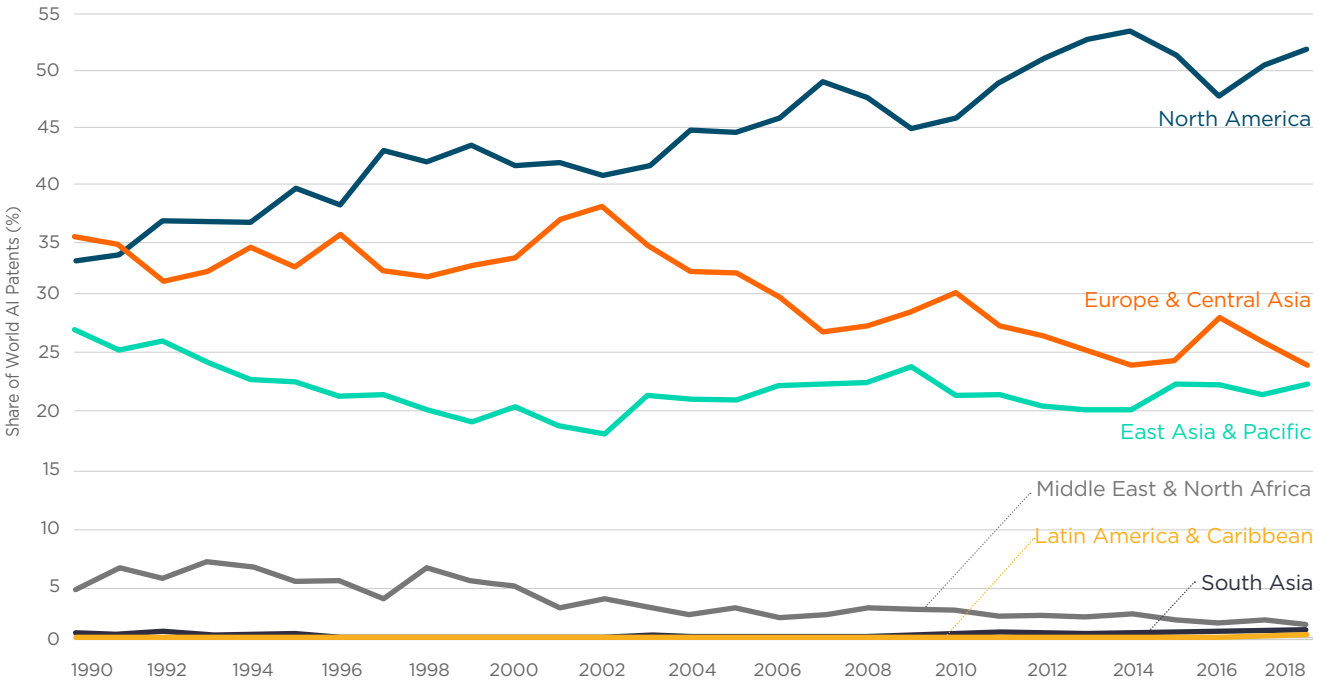
Figure 4. Share of Female Authors of AI Papers



Source: Stathoulopoulos and Mateos-Garcia (2019).

In terms of AI patents, the LAC region has among the lowest levels (less than 1 percent) when compared to its peers (Figure 5):

Figure 5. Share of World AI Patents by Region



Source: Stanford University (2019).

The data above show that LAC has a long way to go in terms of the development of academia on AI issues. Nonetheless, several valuable efforts have been undertaken by diverse institutions to consolidate and increase the availability of academic programs specializing in these issues, along with other research and development initiatives that are having a positive impact on the AI ecosystem in their respective countries.

Table 3 summarizes the information on undergraduate studies at top universities by country according to the QS World University Rankings (Annex B) and, in some cases, alternative local resources. The table also considers the existence of programs that specialize in or are related to AI,[14] as well as AI research and laboratories. Also consulted was the Times Higher Education Ranking,[15] another important university ranking at the international level whose analytical metrics are explained in Annex B. In those cases where there is not full or partial agreement between both rankings, the issue will be discussed in the section on Academia in each country's profile later in this report.

Table 3. Progress by Academia on Artificial Intelligence

	Public Universities	Non-Centralized	AI-related Degree	AI Research	AI Laboratory
Argentina	1/5	0/5	5/5	5/5	2/5
Brazil	4/5	3/5	5/5	5/5	5/5
Chile	2/5	3/5	5/5	5/5	4/5
Colombia	2/5	4/5	4/5	4/5	3/5
Costa Rica	3/4	2/4	4/4	3/4	3/4
Dominican Republic	1/3	1/3	3/3	1/3	1/3
Ecuador	1/3	1/3	3/3	2/3	2/3
Mexico	2/5	2/5	5/5	4/5	3/5
Paraguay	1/3	1/3	3/3	1/3	1/3
Peru	1/3	0/3	2/3	2/3	1/3
Trinidad and Tobago	2/3	2/3	3/3	2/3	0/3
Uruguay	1/4	2/4	4/4	4/4	1/4

Source: Prepared by the authors.

14 These include degrees in STEM such as data engineering, systems engineering, computer sciences, and data analytics, to mention a few.

15 For more information, see https://www.timeshighereducation.com/world-university-rankings

It is worth noting that additional academic efforts are being carried forth in each country to strengthen general AI research and development. These are documented throughout this publication.

Progress by the Entrepreneurship Ecosystem and Civil Society

New players in the entrepreneurship ecosystem and civil society have gradually started to use and benefit from AI tools to achieve efficiencies and strengthen the role of AI in improving the quality of life. A general overview of subsectors with higher growth that have a direct social impact, as well as the trend of AI applications being used and examples of multi-country initiatives, offers a general picture of regional achievements.

Sectors that Stand Out in the Use of AI in the Service of Social Good

The incorporation of autonomous systems in start-ups is increasingly more feasible. Large tech companies such as Amazon, Apple, Google, IBM, and Microsoft market their AI platforms and development tools. Some of them are free or low-cost and are among the growing list of open-source tools and codes. Their availability, along with other factors such as access to capital, are driving the growth of the entrepreneurship ecosystem that benefits from technology. According to Private Capital Investment in Latin America (LAVCA), risk capital in LAC nearly doubled in 2018, reaching US$1.98 billion compared with US$1.14 billion in 2017 (Azevedo 2019). This capital is split largely between Brazil (55.9 percent), Mexico (20.5 percent), Chile (10.6 percent), Argentina (4.1 percent), and Colombia (4.1 percent) (LAVCA 2019).

In turn, 82 percent of risk investments undertaken in 2017 were directed at ICT. In 2019, the SoftBank Group created a technology innovation fund of US$5 billion for the LAC region.[16]

Even though the largest subsector to use AI in LAC is enterprise software and services,[17] with a share of 43 percent (Endeavor 2018), there are four subsectors directly related to improvement in the quality of life that stand out for their rate of growth: health, EdTech, FinTech, and AgTech. While AI is not the only technology used by social and impact entrepreneurs, it plays a fundamental role in their innovation and growth strategies.

Health. After the enterprise software and services sector, health is among the sectors in LAC that most concentrate business activity with a high level of specialization in AI (17 percent) (Endeavor 2018).[18] It is estimated that health data double every three years (Densen 2011). The availability of this information makes this sector fertile ground for the use of AI, and there are impacts in terms of efficiency and medical attention and research and development, as well as on related fields such as health insurance, which is expected to have the fastest level of growth in the world at 30 percent a year through 2025.[19]

EdTech. One of the three major trends on an international level is adaptive learning. It is based on the use of AI, cognitive science, and predictive analytics, among other tools, to customize educational contents to the needs of each learner. In the case of LAC, Mexico is a country where companies that harness AI are being consolidated to offer customized educational services.

Out of 290 start-up companies in the EdTech sector identified by Endeavor, 57 percent are in LAC. Mexico has the most EdTech entrepreneurs in the region with 13, followed by Brazil with six and Colombia with five (Endeavor 2018).[20]

16 For more information, see group.softbank/en/corp/news/press/sb/2019/20190307_02/

17 See footnote 8.

18 The Endeavor study was based on an analysis of 70 businesses in Argentina, Brazil, Chile, Colombia, Mexico, and Peru that use AI in different sectors of the economy. For more information, see www.contenido.endeavor.org.mx/inteligenciartificial

19 For more information, see www.elhospital.com/eventos/FIME-2019+128796

20 For more information, see https://contenido.endeavor.org.mx/download-edtech-eng

The new education and virtual education formats on AI issues are fostering social mobility. Platzi, a Colombian company, is a digital platform of technology courses in the Spanish-speaking world and a worldwide leader. On average, the income of its students once they have completed a course increases by 54 percent, while the best students manage to increase their income by 260 percent, In 2018, the number of students registered on Platzi reached 700,000, according to the company.

AgTech. In recent years, the region has witnessed remarkable growth in AgTech technological innovation in the agriculture and food industries, a phenomenon that continues to expand across the region and in different productive sectors (IDB 2019).

As of 2018 there were 450 start-ups in LAC focused on technological innovation in AgTech, with more than half of these ventures created in the last four years (IDB 2019). There is a high concentration in Brazil, which accounts for 51 percent of all of the ventures identified, followed by Argentina with 23 percent, the Andean region with 18 percent, Uruguay and Paraguay with 5 percent, and Central America and the Caribbean with 0.03 percent (IDB 2019). Currently, 55 percent of those 450 entrepreneurships assessed by the IDB study offer technical innovation solutions to the agricultural and food industries that include the use of AI to achieve efficiencies.

FinTech. The Global FinTech Index City 2020 Rankings show that Brazil (19th out of 65 countries), Mexico (30th) and Chile (35th) are the three leading nations in the region with the largest number of consolidated FinTechs, that is, firms either maturing or ready to scale their operations.[21]

FinTech is the second subsector, followed by that of logistics and distribution, which receives the most risk investment in LAC (LAVCA 2019).

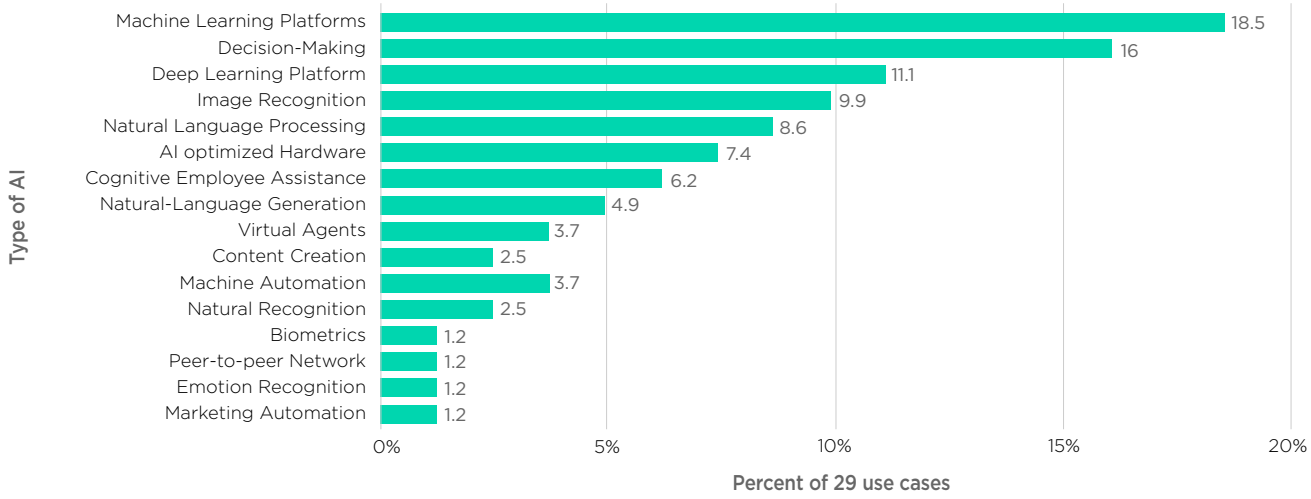
Among start-up companies in the FinTech sector, 41 percent believe that AI is the most cutting-edge tool to help boost business and establish a fluid customer service-benefit relationship. This is consistent with the significance being assigned to financial inclusion by banks (IA LATAM, 2019).

21 For more information, see https://findexable.com/gfi-download/

Use Cases of AI in the Service of Social Good

Figure 6 illustrates the types of AI applications for social good used in the sample of 29 use cases presented in this report.[22]

Figure 6. Types of AI Applications Used in the 29 Use Cases (percent)



Source: Applications completed by contacts for each use case. Indicators are based on Endeavor's regional survey (2018).

Relevant Multi-Country Initiatives in LAC

While the efforts and fora focusing on AI issues for social good are still incipient in the region, there are a few relevant multi-country initiatives which we summarize below.

Regional Initiatives and Other Efforts

fAIr LAC. Led by the IDB Group, this initiative fosters the generalized responsible use of AI in the service of social good on behalf of the private and public sectors in the region.[23] It has offices in Costa Rica, Mexico, and Uruguay.[24]

International Development Research Center. This Canadian institution has a development initiative called AI in the Global South that focuses on issues of public interest, such as infrastructure and skills for benefiting from this technology.[25]

Networks of professionals and communities of practice in the region. These include IA-Latam[26] and the Latam Circle of the AI Ethics Global Initiative of the Institute of Electrical and Electronics Engineers (IEEE)[27] chaired by C Minds.[28]

Innovators Under 35 (MIT).[29] This program recognizes outstanding innovators in LAC who are developing new technologies to address pressing problems. Among the winners are cases of innovators who have leveraged AI as part of a business model. Since 2017, 35 people across the entire region have been recognized.

22 See Annex C for a summary of the 29 use cases by country, topic, and implementers.

23 This report is a part of the initiative. For more information, see https://www.iadb.org/en/fairlac

24 For more information, see https://www.iadb.org/es/noticias/hojas-informativas/2004-01-08/grupo-bid%2C2572.html

25 For more information, see https://www.idrc.ca/en/research-in-action/artificial-intelligence-development

26 For more information, see www.ia-latam.com

27 For more information, see www.standards.ieee.org/industry-connections/ec/autonomous-systems.html

28 For more information, see www.cminds.co

29 For more information, see https://www.innovatorsunder35.com/regions/latin-america/

Newton Fund. Under the auspices of the British Embassy, this global fund supports AI and Internet projects on a broad array of issues, mainly in Brazil, Colombia, and Mexico. The fund was endowed with 375 million pounds for the first phase, which ends in 2020. In turn, the UK Export Credit Agency has signed an agreement with the Development Bank of Latin America (CAF) to finance up to $200 million to support GovTech and digital economy projects in the region.

BigTech. Some technology giants have programs focused on AI in the service of social good. For example, Google.org awarded 20 grants in 2019 under the latest edition of a program that focuses on AI for social good challenges, with two grants going to LAC (Colombia and Brazil).[30] Facebook has a program that supports entrepreneurs in Mexico and Colombia, and will be working on the development of experimental regulatory initiatives on issues related to algorithmic transparency. Microsoft AI for Earth, AI for Health, AI for Accessibility, and AI for Humanitarian Action finance projects that take advantage of AI in the organizations respective domains.[31] They currently support 21 initiatives in nine countries in the region (Argentina, Bolivia, Brazil, Chile, Colombia, Mexico, Nicaragua, Peru, Trinidad and Tobago) in areas that include agriculture (seven projects), biodiversity (six), climate change (six), and water (two).

Civil society initiatives. The digital rights effort of Brazil's Coding Rights seeks to mainstream the human rights and gender perspective into the development, regulation, and use of new technologies such as AI. It protects a series of projects and researchers in Mexico, Argentina, Brazil, Chile, and Colombia. Moreover, the AI for Climate Resiliency Global Initiative (of Mexican origin) seeks to accelerate the use of AI for conservation issues and to offset CO2 emissions produced by the AI industry.[32]

Talent training initiatives. Data Science for All (DS4A) is a 10-week data science and AI training program that started in March 2020. It is coordinated by SoftBank and Correlation One, with the collaboration of Harvard University, IDB Lab, and Microsoft.[33] The training in 2020 was held in Bogotá, Buenos Aires, Mexico City, and São Paulo.

The Mexican start-up company Dev.f is training talent in 10 LAC countries.[34] As of this writing, more than 3,500 students had graduated from the program. EdTech Platforms such as Coursera and Platzi (a Colombian company) offer specialized online courses in AI for the region. As of March 2020, 193 people had obtained certification from the AI Platzi course.

Laboratoria is a Peruvian start-up company devoted to the training and specialization of women in web development and UX design and the development of socioemotional skills.[35] More than 1,300 students have graduated from the program over six year in Mexico, Ecuador, Peru, Chile, and Brazil. Laboratoria contributes to reducing gender gaps in technology.

Saturdays.AI is a non-profit organization committed to democratizing access to knowledge about AI with the aim of applying it to projects or start-up companies that strive to solve social problems. The network extends across 20 cities in Ecuador, Colombia, Mexico, Peru, Chile, Bolivia, and Paraguay.

Events. The Latin America SumMIT (MIT 2020) included a thematic roundtable about drawing on AI to meet the SDGs. For its part, the World AI Summit for the Americas (Montreal 2019, 2020), whose participants come from Canada and the United States, opened its second edition (2020) to LAC participants. This event includes panels on climate change, inclusion, and ethics.

The Khipu Latin American Meeting on AI, an annual event whose 2019 edition took place in Uruguay, seeks to support AI talent and companies.

30 For more information, see https://ai.google/social-good/impact-challenge

31 For more information, see https://www.microsoft.com/en-us/ai/ai-for-good

32 For more information, see https://christophercordova.mx/al-for-climate/

33 For more information, see https://www.correlation-one.com/ds4a-latam

34 For more information, see https://www.devf.la/

35 For more information, see https://www.laboratoria.la/

Ethics of AI

Mitigating the ethical risks associated with AI has become one of the most relevant issues of international discussion. International organizations such as the Inter-American Development Bank (IDB), World Economic Forum (WEF), Institute of Electrical and Electronics Engineers (IEEE), Organisation for Economic Co-operation and Development (OECD), United Nations Educational, Scientific, and Cultural Organization (UNESCO), and European Union, together with academic institutions such as the Oxford University Institute for Ethics in AI, are working on developing guidelines, guides, and tools to help countries implement systems centered on human rights. By the end of 2019 over 90 documents on AI principles had been published by governments, companies, and other players towards this goal. The most commonly mentioned topics in these publications were justice, interpretability, and explainability (Stanford University 2019).

Among the proposals of ethical principles that have been most successful among governments are those presented in 2019 by the OECD[36] and by the High-Level Expert Group on Artificial Intelligence established by the European Commission. The OECD principles promote safe, fair, trustworthy, and robust autonomous systems: 42 countries formally adopted the principles, including seven from LAC (Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, and Peru). In addition, the European Union's Ethics Guidelines for Trustworthy AI were developed by a group of 52 independent experts representing academia, industry and civil society.[37] Even though these recommendations were designed for the institutions of the European Union, they have served as a benchmark for other interested countries and industries.

There are other pertinent international efforts aimed at developing AI ethics guidelines and protocols for the public and private sectors. These include a series of recommendations that will be published in 2020 by UNESCO's Expert Group on the Ethics of AI. This international expert group is composed of 24 members, four of whom are from LAC (two from Argentina, one from Brazil, and one from Mexico).[38] In turn, the IEEE has forged a global alliance for an ethically aligned design of autonomous and intelligent systems that develops, among other things, standards for the ethical use of AI in diverse fields of activity.[39] This initiative has a circle dedicated to Latin America that is led by C Minds. For its part, the IDB, through its fAIr LAC initiative, draws on a group of experts from the region dedicated to developing diverse tools for the responsible use of AI.

Within the framework of this report, the issues included under the definition of AI ethics deal with the responsible use of data so as to guarantee that the design of autonomous and intelligent systems is focused on respect for and protection of human rights. The main topics addressed include justice and non-discrimination, privacy, accountability, transparency, explainability, and security. This includes dealing with risks that are intrinsic to data and technical risks related to development and infrastructure, as well as having a public policy for digital transformation and skill development (Cabrol et al. 2020).

LAC is still in the early stages of development of guidelines, protocols, evaluations, regulatory frameworks, and social monitoring processes on ethical AI issues. Brazil, Argentina, Mexico, and Uruguay have made the greatest progress in public sector discussions. For its part, Uruguay has made the largest amount of formal progress in this area. As of this writing, Uruguay had completed its public consultation on AI strategies covering their ethical dimensions. The resulting publication will be a live document under constant review, both in terms of the observations received during the consultation and the results and lessons learned from the activities defined in the action plan. The previous government administration in Mexico (2012–2018) published principles and guidelines for the ethical use of AI by the Federal Public Administration, a pioneering effort at the international and regional levels. However, the current government (2018–2024) has not followed up on that effort. In early 2020, Argentina created the National Ethics Committee in Science and Technology under the Science, Technology, Knowledge and Innovation

36 For more information, see https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0449

37 For more information, see https://ec.europa.eu/digital-single-market/en/news/ethics-guidelines-trustworthy-ai

38 For more information, see https://unesdoc.unesco.org/ark:/48223/pf0000372991

39 For more information, see https://standards.ieee.org/industry-connections/ec/autonomous-systems.html

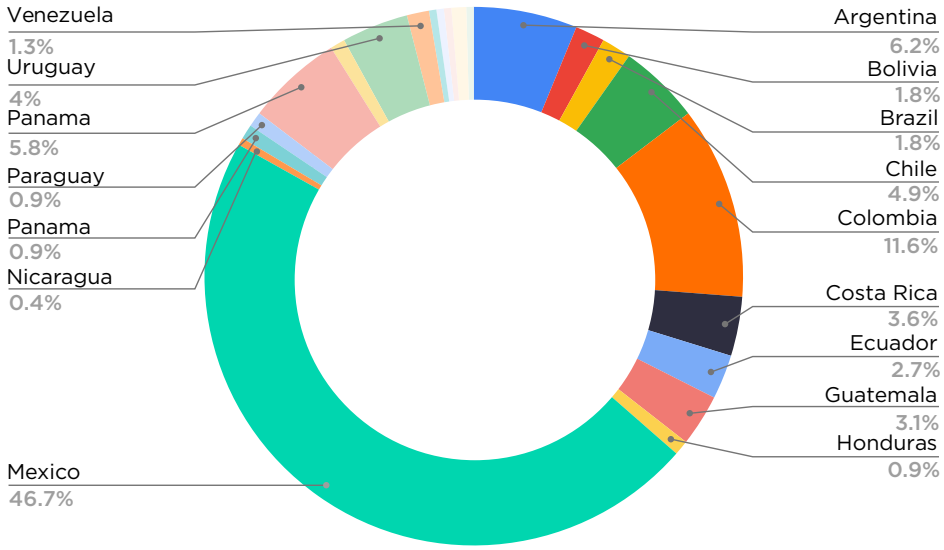
Ministry as part of its digital strategy. In 2019, Brazil included a cross-cutting axis for legislation, regulation, and ethical use of AI in the first draft of its national AI strategy, which has not been officially published.

The issue of AI ethics is at an early stage in the region and there is still not enough information available to comprehensively assess it. Given the need to advance understanding of the different perspectives on the topic, the IDB Group and C Minds, with the support of several partners, launched the first open regional survey on AI (Figure 7). This survey has allowed for discovering and documenting the perceptions of 225 participants. The main findings are as follows:

- **58 percent** of the sample perceives that civil society organizations and other entities dedicated to generating social impact are very little considering, or little considering, the use of AI to fulfill their goals.
- **62 percent** think that the topic of ethical AI is omitted in public discourse or is barely mentioned.
- **40 percent** perceive that the private sector is having a greater influence on issues relating to ethics in AI, followed by the academic sector (**29 percent**).
- The topics of ethics in AI that are most addressed include privacy and user security, with **56 percent**, followed by trustworthiness and system security, with **37 percent**.
- Over **70 percent** of participants de not know of an example of AI implemented for social good.

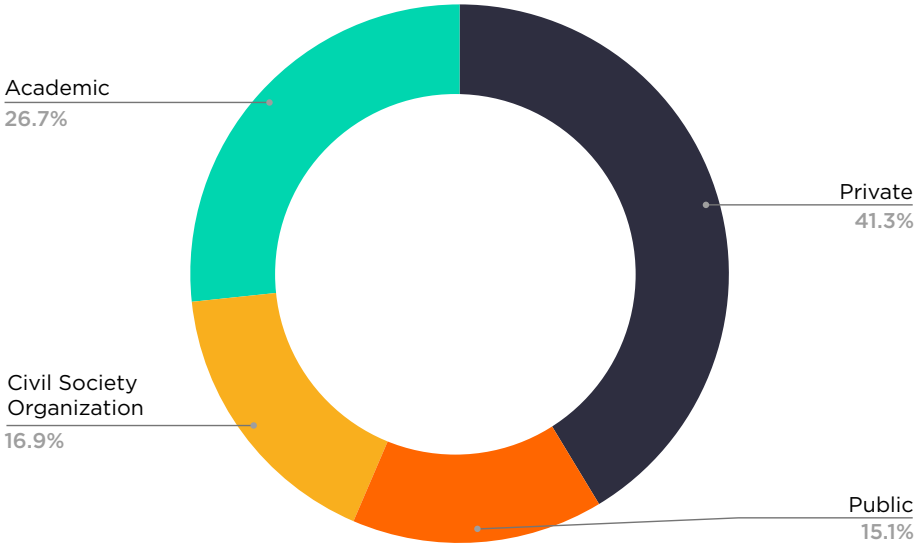
Figure 7. Survey on Perceptions of the Importance Given to the Ethics of Artificial Intelligence in Latin America and the Caribbean

The share of survey participants from the different countries

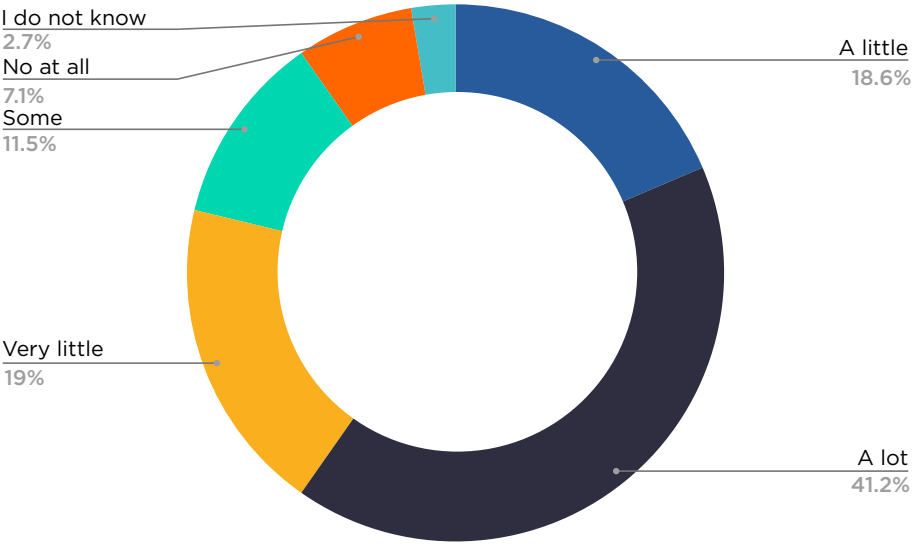


Barbados: 0.4% | Dominican Republic: 0.4% | Trinidad and Tobago: 0.9%

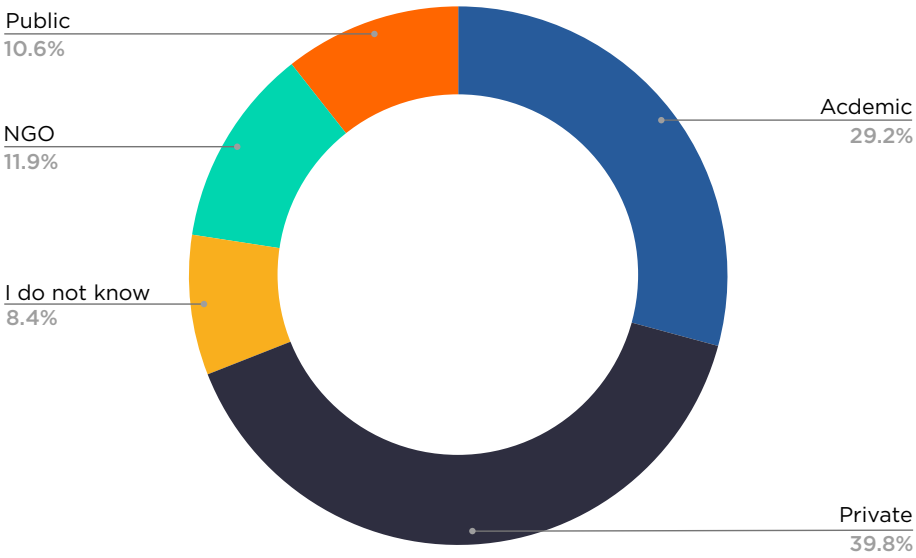
Representation by Sector



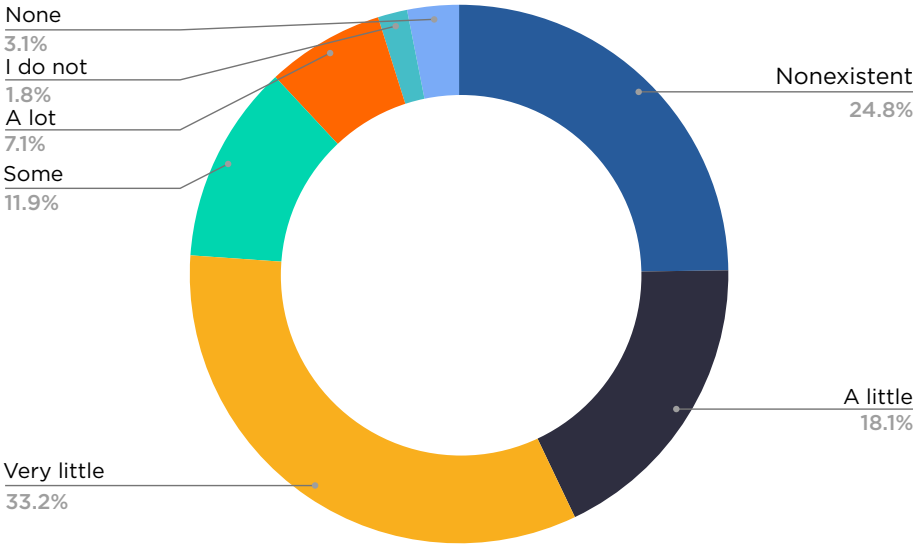
How much do you perceive that civil society organizations and others dedicated to generating social impact are considering the use of AI in order to accelerate their impact?



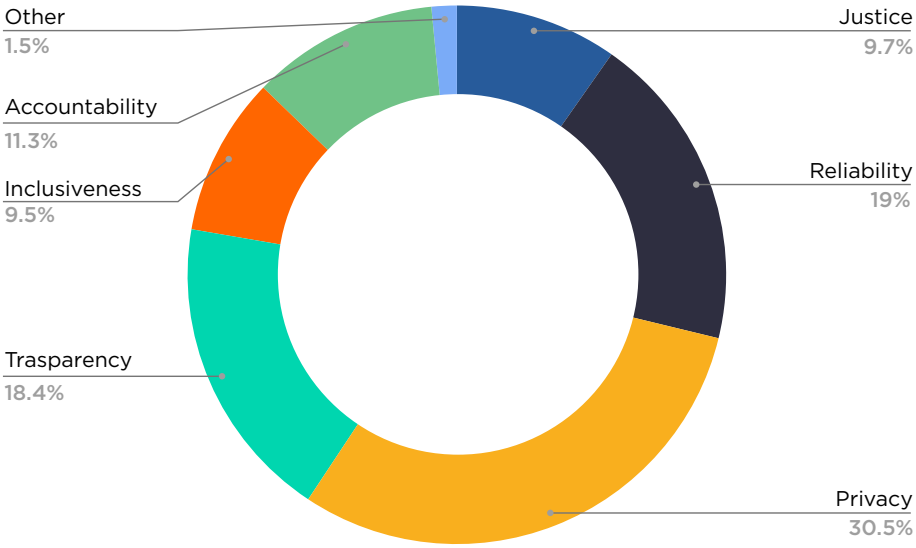
What sector do you consider has the most influence in AI ethics-related issues?



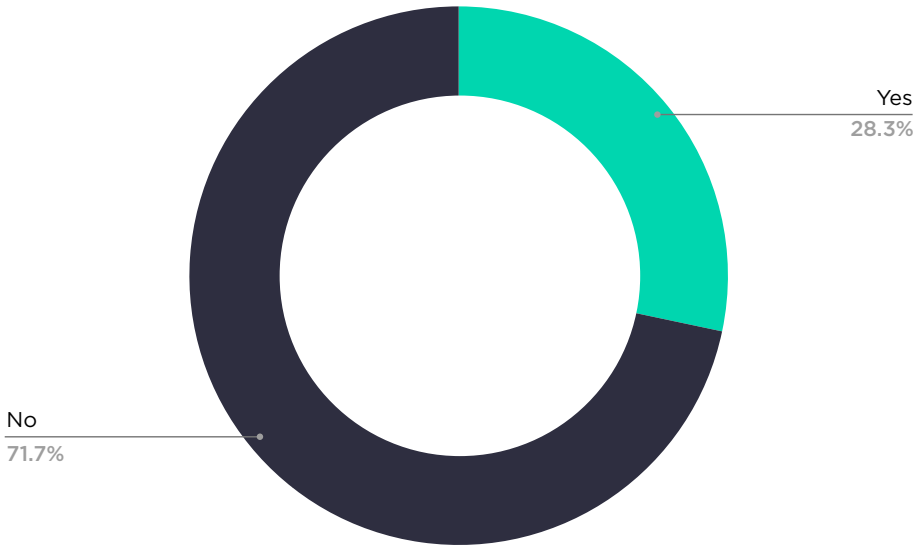
How much do you perceive that the AI ethical issue is inserted in public discourse, debates, articles, the news, and political or politicians' statements in your country?



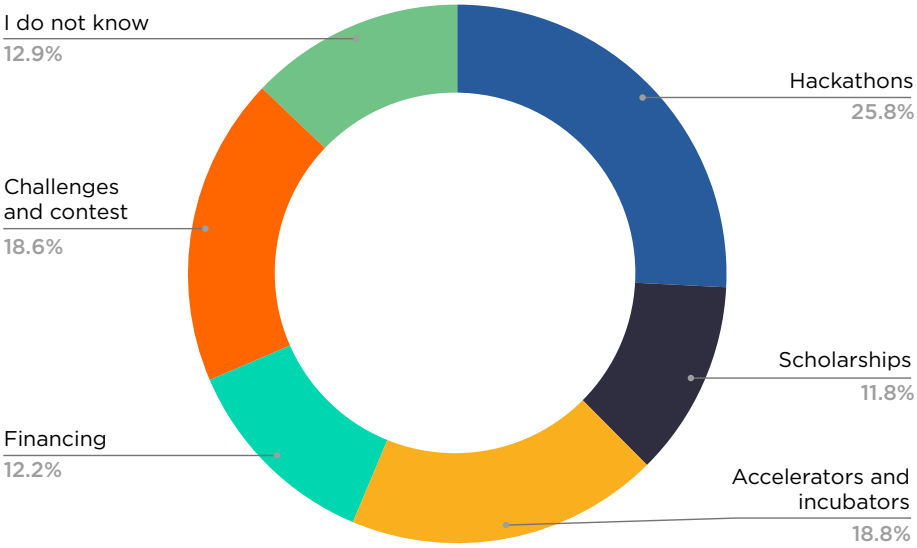
Which AI ethical issues do you think are being most addressed in your country?



Do you know of any use case that has been implemented that leveraged AI for social good?



In your country, what incentives are there for fostering impact entrepreneurships (social or environmental) to use AI?



Source: The survey on "Perceptions of the Importance Given to the Ethics of Artificial Intelligence in Latin America and the Caribbean" conducted in 2020 for this report.

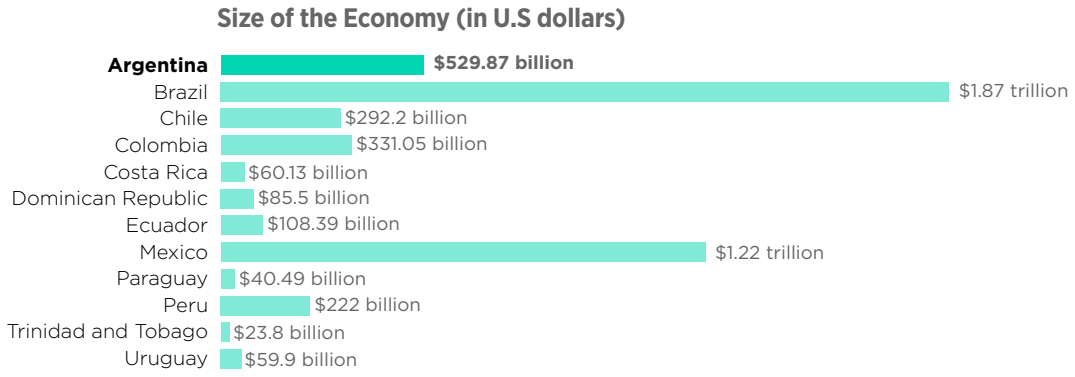
5. THE STATUS OF ARTIFICIAL INTELLIGENCE BY COUNTRY

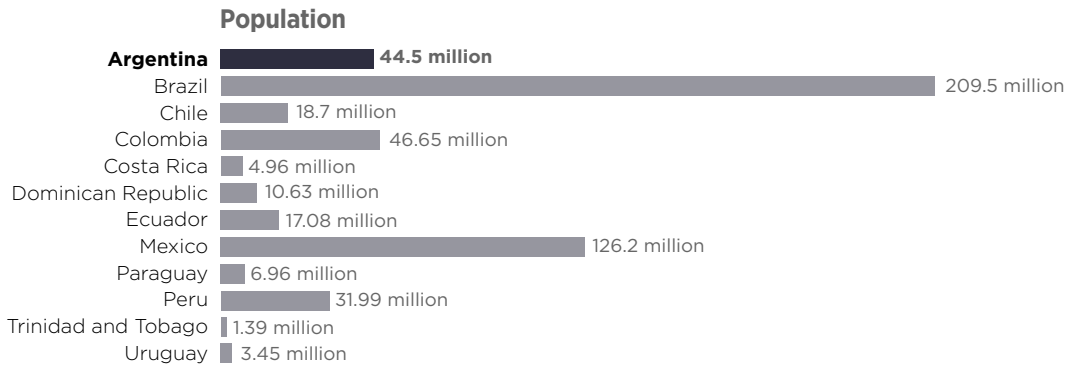
5. THE STATUS OF ARTIFICIAL INTELLIGENCE BY COUNTRY

ARGENTINA

To describe the current status of AI in Argentina within a broader context, Figure 7 presents a comparison of selected economic, demographic, education, human development, and equality indicators, while Table 5 presents other socioeconomic indicators.

Figure 7. Argentina Core Indicators: Comparison Chart





Human Development Indicators

	Program for International Student Assessment	English Proficiency (percent)	Skilled Workforce (percent)	Human Development Index	Gini Coefficient
Argentina	N/A	58.38%	63.4%	0.825	41.2
Brazil	N/A	50.1%	62%	0.759	53.12
Chile	1st	52.89%	69.2%	0.843	46.6
Colombia	N/A	57.38%	58.2%	0.747	49.7
Costa Rica	N/A	48.75%	48.3%	0.794	48.3
Dominican Republic	N/A	46.75%	46.6%	0.752	44.7
Ecuador	N/A	46.75%	46.6%	0.752	44.7
Mexico	3rd	48.99%	40%	0.774	48.3
Paraguay	N/A	52.51%	43.8%	0.702	48.8
Peru	N/A	50.22%	83.6%	0.750	43.3
Trinidad and Tobago	N/A	N/A	71.8%	0.784	40.3
Uruguay	2nd	54.1%	25.5%	0.804	30.5

Sources: Panels a and b: World Bank (2019a); Panel c: (from left to right): OECD (2019);); Education First (2019); United Nations (2019); UNDP (2019); World Bank (2018).

Table 4. Other Socioeconomic Indicators

Main Economic Sector (World Bank 2019a)	**Program for International Student Assessment** (OECD 2019)	**Science, Technology, Engineering, and Mathematics (STEM) Gender Index** (Arredondo et al. 2019)
Agricultural production	Below the average for the 12 countries	53 percent*
National Entrepreneurship Context Index – Global Entrepreneurship Monitor (Bosma and Kelley 2019)	**CIVICUS Monitor** (2020)	
5.2/10	Operating conditions of civil society organizations: narrowed (2/5)**	

Source: Prepared by the authors.

* Participation of female researchers in Argentina's STEM fields (in comparison to men).

**This indicator is explained in Annex B.

Table 5 summarizes the progress made by the various sectors in Argentina in terms of establishing the foundations for driving AI in the service of social good.

Table 5. Efforts to Establish the Foundations of AI in Argentina, by Sector

Government			
Digital strategy	Data strategy	AI strategy (being explored)	Infrastructure and connectivity
Academia (top 5)			
Public (1)	Non-centralized (0)	AI-related degree (5)	AI research (5)	AI laborator (2)
Entrepreneurship Ecosystem		**Civil Society**	
National Entrepreneurship Context Index (52 percent)		CIVICUS Monitor (2/5)	

Source: Prepared by the authors. The indicators are found in Annex B.

Government

Digital Strategy: Yes

Argentina's Digital Agenda, issued in November 2018, is the outcome of national and international efforts initiated over a decade ago. Defined by the *Consejo de Planificación y Seguimiento* (a diverse group led by the *Secretaría de Modernización* and comprised of different government agencies), the agenda focuses on economic and social development. According to the *Boletín Oficial de la República de Argentina*,[40] the agenda examines legal, infrastructure, and public policy projects to improve the coordination of government initiatives in their use of new technologies, digital inclusion, and the configuration of an efficient citizen-centered government. Furthermore, it seeks to boost Argentina's international relevance in the digital transformation process.

40 For more information, see https://www.boletinoficial.gob.ar/detalleAviso/primera/195154/20181105

The Ministry of Science, Technology and Productive Innovation created the National Committee of Ethics in Science and Technology as a central part of its digital strategy.[41] It is here that the ethical problems around the use of new technologies are analyzed and law and public policy proposals for new technology developments are supervised.[42]

It should also be noted that at the end of 2019 the Argentine Senate created the Committee for the Future comprised of lawmakers, rectors of the most important universities, and representatives of the National Academy of Sciences and other technology centers and institutions. During its first official meeting, the committee formulated a plan to cooperate on science-related matters and to design public policies on development, which include the subject of the future of work.

Data Strategy/Open Data Portal: Yes

According to the World Bank's 2019 Digital Adoption Index, Argentina's statistical capacity score for collecting, analyzing, and disseminating high-quality data about its population and economy is 78.88/100.[43] As part of Argentina's digital strategy, the Executive Branch developed the National Data Openness Plan, which made its Open Data Portal available to all citizens, among other actions.[44]

According to the plan, the portal had 941 data bases as of this writing with more than 30 public agencies covering government areas such as foreign affairs, economy, science, technology, agroindustry, energy, population, and education, among many others.

AI Strategy: Ongoing

On the last day of President Mauricio Macri's mandate (December 2015 – December 2019), the government released the AI National Plan, which falls under the *Plan Argentina Innovadora 2030* and *Agenda Digital 2030*.[45] The document was the end result of a drafting process that lasted more than a year and consultations with different actors in thematic panels and meetings, including the *2019 Desconferencia sobre inteligencia artificial*.[46] One of its main objectives is to build capacity so that Argentina assumes a leading role in technology in order to boost local development, instead of being a simple consumer of foreign technologies and advancements. Furthermore, the plan lays the foundation for the new government to pick up on the subject based on the documentation of identified strategic axes and action lines focused on the following dimensions: talent, data, supercomputer infrastructure, research, development, and innovation, implementation in the public and private sectors, impact on employment, ethics and regulation, international involvement, and innovation laboratories. In early 2020, the new government granted this plan the status of "reference document." According to local experts, it is possible that the initiative may not be affected by the transition of government and that it will focus on promoting small and medium-size enterprises. Since it is an inter-institutional and diverse project, numerous actors support it and could follow up on it.

Infrastructure and Connectivity

Argentina has the digital infrastructure that allows for innovation in the use and consumption of technologies. The World Bank's 2019 Digital Adoption Index reports that Argentina has attained 69 percent of

41 For more information, see http://www.cecte.gov.ar/

42 The most important activity of this committee is to promote dialogue and contacts between society and the scientific community through close links that generate trust about the transmission of fair and ethical results on the use of technologies.

43 This score is largely due to the enactment by the Argentine government of the State Modernization Plan in 2016 that proposed advancing towards a modern and efficient public administration for citizen services, with trained technical teams that provide solutions within a framework of ethics, transparency, accountability, and a gender perspective.

44 One of the portal´s outstanding qualities is that it secures standardization of information, making it easier to consult by integrating different systems and applications. As indicated in the portal itself, the objective is that citizens can build a community that make use of information and generates value with it. For more information, see https://datos.gob.ar/

45 For more information, see https://www.argentina.gob.ar/noticias/el-gobierno-presento-la-nueva-agenda-digital-2030

46 For more information, see https://www.argentina.gob.ar/ciencia/desconferencia-sobre-inteligencia-artificial

the total technology adoption level; over 74 percent of its population has access to the Internet; download speed is above the world average; and there are 1.3 subscriptions per inhabitant for mobile telephony. When it comes to 5G development, Argentina started technical trials in November 2017 (GSMA Intelligence 2018). However, the commercial use of this technology is not expected be put into practice until 2021 or 2022 due to the magnitude of legal and infrastructure adjustments.

Notwithstanding Argentina's strengths, in terms of its readiness to leverage the opportunities offered by ICT the country is only ranked ninth in the region and 89th among 139 countries worldwide on the World Economic Forum's 2017 Networked Readiness Index. Among those indicators that affect Argentina's ranking are the limited effectiveness of its legislative bodies, the high costs of mobile telephony, the government's moderate success in promoting ICT, and low governmental adoption of advanced technologies.

Income inequality is a barrier to digital inclusion in Argentina according to the 2016 GSMA Intelligence Consumer Survey. About 30 percent of people surveyed without an Internet connection said that the price of equipment and services represents a barrier to adoption. Furthermore, according to the IDB Broadband Accessibility Index – which measures the percentage of income that a basic broadband connection represents to 40 percent of the lower-income population – the citizens of LAC allocate 10 percent of their monthly income to a fixed or mobile broadband subscription, while in OECD countries the subscription percentages are 2 percent for mobile broadband and 3 percent for fixed broadband (IDB 2020).

Regarding cybersecurity, the International Telecommunications Union gives Argentina a score of 0.407 out of 1 on its 2018 Global Cybersecurity Index, which ranks the country at 11th out of 33 in the Americas and 94th out of 175 countries worldwide.

Academia

In Argentina, basic education curricula integrates specific objectives or basic subject knowledge about information technology or computer science (GSMA, 2016). This enables youth from an early age to acquire the minimum skills and comprehension of the potential of technology use.

Although AI is included in university programs, there is little enrollment outside of engineering schools. Business and economics schools are an area of opportunity for the study and use of AI.

According to the 2019 QS World University Rankings, the top five universities in Argentina are located in the capital and just one of them is a public institution (Table 6).[47] Although this represents an obstacle to the reach of training capabilities and accessibility to AI-related careers, there are also free high-quality institutions in the city and in other regions of the country that offer programs that are relevant for the ecosystem's development. Those universities have AI-related curricula as well as research for development capacity and training.

47 In addition to Argentine universities occupying the top five positions on the 2019 QS World University Ranking, those universities have technological and AI degree programs. At least another five training centers offering relevant undergraduate programs and, particularly, programs at the post-graduate level that are part of the 2020 Times of Higher Education ranking: the *Universidad Nacional del Sur* (public), the *Universidad Tecnológica Nacional* (public), the *Universidad de San Andrés* (private), the *Universidad Torcuato di Tella* (private) and the *Instituto Tecnológico de Buenos Aires* (private). Many of these universities have lines of research on AI as well as technological innovation labs. Although most of them are concentrated in the city of Buenos Aires, the U*niversidad Nacional del Sur* is located in *Bahía Blanca* and the *Universidad Tecnológica Nacion*al has 30 branches distributed across the country.

Table 6. The Top Five Universities in Argentina and Their Relationship with AI

	1. Universidad Nacional de Buenos Aires	2. Universidad Austral	3. Pontificia Universidad Católica Argentina	4. Universidad de Belgrano	5. Universidad de Palermo
Type of Institution	Public	Private	Private	Private	Private
Location	Buenos Aires	Buenos Aires	Buenos Aires	Buenos Aires	Buenos Aires
AI-related degrees	✓	✓	✓	✓	✓
AI-related postgraduate programs	✓	✓	✓	✗	✓
AI research	✓	✓	✓	✓	✓
AI laboratory	✓	✓	✗	✗	✗
Technological innovation laboratory	✓	✓	✓	✓	✗

Source: Prepared by the authors based on information obtained from the website of each institution.

Note: The Universidad Austral is also listed among the top five in the 2020 Times Higher Education ranking.

Other Relevant Institutions

There are also other relevant institutions in Argentina working in this field, including (1) the *Instituto Nacional de Tecnología Agropecuaria* (INTA),[48] an educational center with international coverage focusing on technological innovation in the agricultural sector; (2) the *Consejo Nacional de Investigaciones Científicas y Técnicas* (CONICET), the country's main authority committed to the promotion of science and technology, with researchers working in different areas of AI; and (3) the Agencia Nacional de Promoción de la Investigación, el Desarrollo Tecnológico y la Innovación, where researchers, projects, and funds committed to these issues are brought together. The last two government agencies are under the authority of the Ministry of Science, Technology, and Innovation.

In addition, the efforts of the Technology and Society Center (*Centro de Estudios en Tecnología y Sociedad* - CeTyS) of the *Universidad de San Andrés* also stand out. The CeTyS is facilitating production of a series of eight AI publications for the Spanish-speaking public within the framework of the GuIA Project. These documents allow for the consolidation of a baseline for reflection on and implementation of principles and tools for AI policies and digitalization.[49] The authors participating in this exercise are from Argentina, Colombia, Chile, Mexico, Uruguay, and Trinidad and Tobago.

Finally, the Artificial Intelligence, Philosophy and Technology Research Group (GIFT) brings together scholars from several disciplines whose inputs contribute to a better understanding of the ethical problems arising from exponential technologies such as AI.[50]

The Entrepreneurship Ecosystem and Civil Society

Argentina is among the countries in LAC with the most emerging companies in AI (Costa 2019). Since the creation of the Entrepreneurship Law, efforts have been centered on the use of AI technologies such as machine learning and deep learning.

48 For more information, see https://inta.gob.ar/documentos/argentina-national-institute-of-agricultural-technology-inta

49 The documents focus on the challenges and opportunities of the Latin American context from the ethical, legal, political, and socioeconomic point of view.

50 GIFT participated in the Humanistic Toolbox (*Caja de herramientas humanísticas*) research conducted within the framework of the GuIA Project of the CeTyS of the *Universidad de San Andrés*. The research presented a series of philosophical considerations to clarify the nature of AI and its relation with human intelligence, as well as a review of recent literature on the ethical risks associated with this technology.

Examples of impact ventures using AI include Bandit,[51] a human resources firm that has designed a tool to empower and enhance recruitment processes by determining the best skills of workers and the most pressing needs of companies. Bandit has spurred the emergence of other companies such as EmiLabs,[52] a recruitment platform that recently earned US$2 million (López 2019).

In terms of civil society, some initiatives have emerged that are laying the foundation for the promotion of an ecosystem that uses AI in the service of social good. These efforts include the following:

- ***Fundación Argentina de Inteligencia Artificial:***[53] This is a not-for-profit organization that promotes the development of a sustainable AI ecosystem in Argentina and the world. It encourages discussion on the topic, as well as the dissemination and promotion of AI projects and issues.
- ***Sociedad Argentina de Informática (SADIO):***[54] SADIO was founded in 1960 to identify, unify, and enhance the knowledge of science and information processing techniques, and to support the practice of objective and quantitative methods for decision-making. Moreover, it offers numerous courses and workshops on data analysis through machine learning, AI applications, and programming capabilities development, among other methods.
- ***Chequeado:***[55] Chequeado is considered to be a reliable organization in the area of data verification. Together with Africa Check, Full Fact, and the UK Open Data Institute, it has received funds from Google to use AI for the detection of misinformation campaigns and fake news.

Use Cases

Table 7 provides a synopsis of the main AI use cases in Argentina.

Table 7. Main AI Use Cases in Argentina

Name: Amanda Care		
For more information: www.amanda-care.com	Year it began to use AI: 2019	Sustainable Development Goal 3 (health and well-being)
Actors involved: Insurance companies, hospitals, and pharmaceutical corporations		Current status: Start-up company in initial phase
What it proposes: To optimize monitoring and follow-up between medical staff and patients.		
Brief description of project: Amanda Care is a virtual assistant designed to monitor a large number of patients so as to prevent health problems. Similar to the work of a personal assistant, Amanda ensures that patients are connected with doctors through messaging tools already in use by users such as WhatsApp and Facebook Messenger, among others. Amanda improves a patient's stay and compliance with protocols, while also reducing healthcare costs.		
AI applications	Creation of natural language, natural recognition, virtual agents, machine learning, AI-optimized hardware, decision-making, natural language processing.	
How AI is used	Amanda Care's software uses machine learning to hold a natural conversation with the user and identify the best contact strategy (Facebook, WhatsApp, among others), according to his/her preference. After reviewing these conversations, Amanda checks every entry in its context, identifies any deviations from the established protocol, and activates a warning for the service providers.	

Source: Information provided by the IDB for the preparation of this report.

51 For more information, see https://bandit.io/

52 For more information, see https://www.emilabs.ai/

53 For more information, see https://iaar.site/

54 For more information, see http://www.sadio.org.ar

55 For more information, see https://chequeado.com/acerca-de-chequeado/

Name: DYMAXION LABS		
For more information: www.dymaxionlabs.com	Year it began to use AI: 2018	Sustainable Development Goals 1 (end of poverty), 2 (zero hunger), 11 (sustainable cities and communities), 13 (climate action), 16 (peace, justice, and solid institutions), 17 (objective-driven alliances)
Actors involved: Dymaxion Labs		Current status: Start-up company in consolidation phase.
What it proposes: Optimize the distribution of resources through evidence-based decision-making.		
Brief description of project: Prepares, collects, and analyzes satellite geographical data to support decision-making about the use of resources by effectively installing Internet of Things sensors; shortens project development time to incorporate irregular human settlements into urban planning; and allows for the experimentation and validation of hypothesis in an expeditious and cost-effective manner.		
AI applications	Machine learning platforms, AI-optimized hardware, decision-making, image recognition	
How AI is used	Dymaxion uses AI and computer vision to analyze geospatial data in satellite images. Depending on the image, images are stored in different databases in order to understand how climate change evolves or which variables are relevant to the subject.	

Source: Information provided by Dymaxion Labs for the preparation of this report.

Name: Kilimo		
For more information: https://www.kilimo.com.ar/	Year it began to use AI: 2015	Sustainable Development Goals 2 (zero hunger), 6 (clean water and sanitation), 12 (responsible production and consumption), 13 (climate action)
Actors involved: Kilimo		Current status: Escalation phase
What it proposes: Kilimo seeks to optimize freshwater use in agriculture to avoid water waste, since the sector consumes 70 percent of water available in the world.		
Brief description of project: Kilimo helps agricultural producers optimize water usage through customized irrigation programs, which in turn reduces costs. The company reduces water usage in crops by 40 percent. In 2019 alone, Kilimo helped save up to 15 billion liters of water on 50,000 thousand hectares. At present, Kilimo has operations in Argentina, Brazil, Chile, Paraguay, Peru, and the United States. Kilimo is a private company established in the United States with two subsidiary companies, one in Argentina and another in Chile.		
AI applications	Machine learning platforms, data science, satellite image identification.	
How AI is used	The machine learning model allows for estimating water consumption for a seven-day cultivation based on field data, satellite images, and large databases with historical data, and offers periodic advice on the amount of irrigation needed.	

Source: Information provided by Kilimo for the preparation of this report.

Name: Laura		
For more information: n.a.	Year it began to use AI: 2019	Sustainable Development Goal16 (peace, justice, and solid institutions)
Actors involved: Ministry of Finance of the Province of Cordoba		Current status: Government project in initial phase
What it proposes: To close the gap between citizens and government by creating faster and more efficient processes that foster good democratic practices.		
Brief description of project: Laura is a software that allows for the automation of tasks in bureaucratic procedures, administering them in a more agile and efficient manner. One of those tasks is the verification of retirement contributions in the Social Security Federal Administration (*Administración Nacional de la Seguridad Social* - ANSES), a procedure that an employee must perform to start the provincial retirement process.		
AI applications	Automation of processes	
How AI is used	The software connects a potential beneficiary with the ANSES database to verify his/her pension situation, including key information about salaries and social security contributions over the years. In this manner, Laura determines if a national or provincial benefit applies and determines the retirement amount. It also allows for quicker detection of possible incompatibilities.	

Source: Information provided by the Ministry of Finance of the Province of Cordoba for the preparation of this report.

Name: Prometea		
For more information: https://ialab.com.ar/	Year it began to use AI: 2017	Sustainable Development Goals 8 (employment and economic growth), 9 (industry, innovation, and infrastructure), 11 (sustainable cities and communities), 16 (peace, justice, and solid institutions)
Actors involved: School of Law of the National University of Buenos Aires, and the Public Prosecutor's Office of the Autonomous City of Buenos Aires		Current status: Government project in initial phase
What it proposes: Strengthen citizenship rights, particularly those dealing with gender-based violence.		
Brief description of project: Prometea is part of the AI Lab of the government of Argentina. It facilitates faster and more efficient processing of gender-based violence complaints by automating certain steps of the administrative procedure through an online platform.		
AI applications	Natural language generation, natural recognition, virtual agents, automation of robotic processes, natural language processing, image recognition.	
How AI is used	Prometea uses machine learning techniques. It operates as an expert system to automate the creation of documents, perform intelligent searches, and assist in data control. It also has an intuitive and friendly interface that allows one to "speak" or chat with the system.	

Conclusions

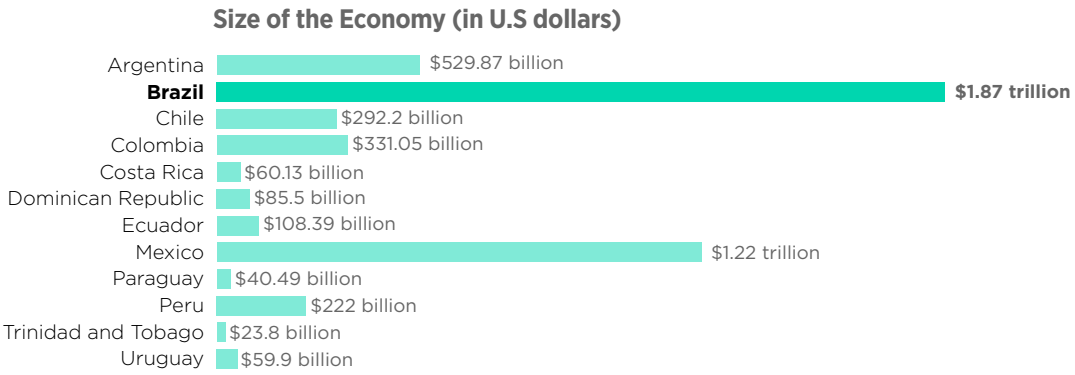
Argentina is a pioneering country in LAC when it comes to the adoption of AI. Its AI strategy, though yet to be consolidated, will be a tool that helps strengthen the country's AI ecosystem. Furthermore, the Committee for the Future is promoting the continuity of tools and the digital strategy.

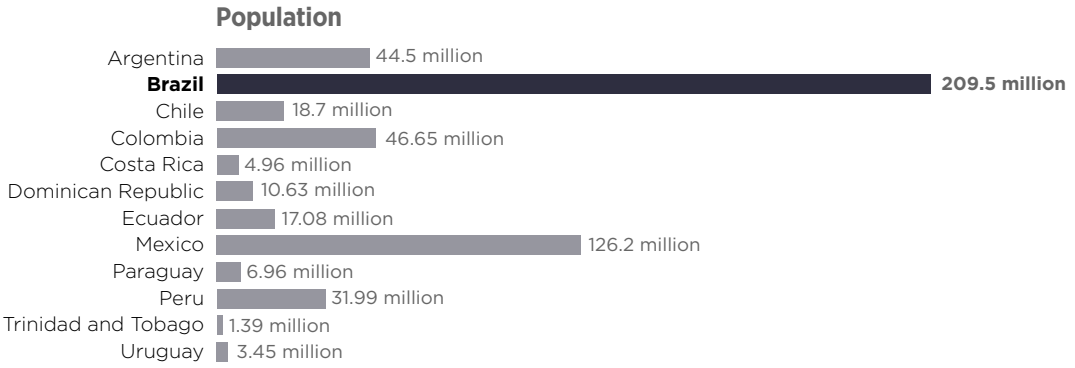
Argentina has an excellent record in AI research led by both its main universities and external research centers. The latter have gained considerable recognition, and at least three (INTA, CONICET, and the National Research Promotion Agency) are committed to driving AI development and implementation. The participation of these institutions differentiates Argentina from other countries in the region. Within the private sector, the entrepreneurship ecosystem has the largest number of emerging companies dedicated to AI, thanks to legal support and the participation of angel investors and capital funds. For its part, civil society has made some specialized efforts on AI promotion and there are AI use cases for social good that have reached different levels of maturity.

BRAZIL

To describe the current status of AI in Brazil within a broader context, Figure 8 presents a comparison of selected economic, demographic, education, human development, and equality indicators, while Table 9 presents other socioeconomic indicators.

Figure 8. Brazil Core Indicators: Comparison Chart





Human Development Indicators

	Program for International Student Assessment	English Proficiency (percent)	Skilled Workforce (percent)	Human Development Index	Gini Coefficient
Argentina	N/A	58.38%	63.4%	0.825	41.2
Brazil	**N/A**	**50.1%**	**62%**	**0.759**	**53.12**
Chile	1st	52.89%	69.2%	0.843	46.6
Colombia	N/A	57.38%	58.2%	0.747	49.7
Costa Rica	N/A	48.75%	48.3%	0.794	48.3
Dominican Republic	N/A	46.75%	46.6%	0.752	44.7
Ecuador	N/A	46.75%	46.6%	0.752	44.7
Mexico	3rd	48.99%	40%	0.774	48.3
Paraguay	N/A	52.51%	43.8%	0.702	48.8
Peru	N/A	50.22%	83.6%	0.750	43.3
Trinidad and Tobago	N/A	N/A	71.8%	0.784	40.3
Uruguay	2nd	54.1%	25.5%	0.804	30.5

Sources: Panels a and b: World Bank (2019a); Panel c: (from left to right): OECD (2019);); Education First (2019); United Nations (2019); UNDP (2019); World Bank (2018).

Table 8. Other Socioeconomic Indicators

Main Economic Sector (World Bank 2019a)	**Program for International Student Assessment** (OECD 2019)	**Science, Technology, Engineering, and Mathematics (STEM) Gender Index** (Arrendondo et al. 2019)
Services	Above the average for the 12 countries	29 percent*
National Entrepreneurship Context Index – Global Entrepreneurship Monitor (Bosma and Kelley 2019)	**CIVICUS Monitor** (2020)	
4.2/10	Operating conditions of civil society organizations: obstructed (3/5)**	

Source: Prepared by the authors.

* Participation of female researchers in the STEM field (in comparison to men).

** This indicator is explained in Annex B.

Table 9 summarizes the progress made by various sectors in Brazil in terms of establishing the foundations for driving AI in service of social good.

Table 9. Efforts to Establish the Foundations of AI in Brazil, by Sector

Government			
Digital strategy	Estrategia de datos	AI strategy (being explored)	Infrastructure and connectivity
Academia (top 5)			
Public (4)	Non-centralized (3)	AI-related degree (5)	AI research (5)	AI laborator (5)
Entrepreneurship Ecosystem		**Civil Society**	
National Entrepreneurship Context Index (42 percent)		CIVICUS Monitor (3/5)	

Source: Prepared by the authors. The indicators are found in Annex B.

Government

Digital Strategy: Yes

Brazil's Digital Transformation Strategy (2018–2021) is the result of the efforts made by the Inter-Ministerial Working Group (GTI, Portuguese acronym), a team of over 130 experts and an online public consultation that received responses from over 700 participants from across all sectors, including the government, the productive sector, the scientific community, academia, and civil society.

The strategy is composed of five digital-transformation-enabling thematic axes: (1) infrastructure and access to ICT; (2) research, development, and innovation; (3) building trust in the digital environment; (4) education and professional skills; and (5) international dimension.

There are also digital transformation thematic lines that address subjects such as industry, agriculture, digitalization in services, and new business models, among other issues. Moreover, the strategy also recognizes the responsibility of the Brazilian government to provide a comprehensive framework that considers the Sustainable Development Goals.[56]

Data Strategy/Open Data Portal: Yes

The Brazilian Open Data Portal[57] was envisioned as part of the actions contemplated by the Public Information Access Law of 2011.[58] It enables anyone to view information about the different government agencies.

The portal establishes a publication calendar or Open Data Plan that commits each agency to sharing data during given periods of the year. Likewise, it is equipped with a reporting mechanism to reveal the lack of timely publication of information by one of these agencies. As of this writing, the portal had information on 157 government agencies and 7,098 data sets.[59]

AI Strategy: Ongoing

In May 2019, the federal government, together with the Brazilian Competitiveness Movement, organized the AI Seminar on Digital Transformation (*Seminário Inteligência Artificial na Transformação Digital*) with the participation of relevant authorities, scholars, and systems developers. The objective was to call the government's attention to the importance of formulating a specific AI strategy instead of having a strategy that simply complemented the 2018–2021 Digital Transformation Strategy, and to show the opportunities such a strategy offers as well as the challenges and dilemmas it poses.[60]

Furthermore, the Brazilian Ministry of Communications (*Ministério da Ciência, Tecnologia, Inovações e Comunicações* - MCTIC), with the help of the Brazilian Internet Steering Committee (*Comité Gestor da Internet no Brasil* - CGI), aims to create up to eight Centers for Applied Research in Artificial Intelligence (*Centros de Pesquisa Aplicada em Inteligência Artificial* - CPA). Four of those CPAs will be launched in 2020, laying the foundation of an AI ecosystem driven by the government. Many activities will be conducted in the CPAs, including scientific, technological and innovation research that will be oriented towards and applied to solving social and environmental problems using AI as a principal tool.

The MCTIC also launched a public consultation on the draft of an AI National Strategy that remained open until the end of January 2020.[61] The strategy has two types of axes: vertical (research, development, innovation, and entrepreneurship; implementation in the public sector; implementation in the productive sectors; and public security); and cross-cutting (legislation, regulation and ethical aspects; use; and international and AI governance). Finally, it worth mentioning the government's initiative to create up to eight CPAs focusing on areas of health, agriculture, industry, and intelligent cities.[62]

56 Four indicators were defined to monitor compliance with the objectives of this strategy: (1) for infrastructure, the Information and Communication Technology Development Index of the International Telecommunications Union (ITU); (2) for cybersecurity, the ITU´s Global Cybersecurity Index; (3) for electronic commerce, the Business-to-Consumer E-commerce Index of the United Nations Conference on Trade and Development; and (4) for electronic government, the United Nations E-Government Development Index.

57 For more information, see www.dados.gov.br/

58 The law emerged from a collaborative process with open software resources and the participation of interested experts and citizens. It won the award at the federal government's 2015 Best Practices Contest.

59 The portal makes free educational resources available to users to teach them how to use the platform, data, and best practices for handling large data bases.

60 The seminar emphasize the importance of supporting universities and research centers to drive the progress of this technology. Discussions were also encouraged about the ethical consequences of AI, including transparency and privacy, among other issues.

61 For more information, see http://www.mctic.gov.br/mctic/opencms/salaImprensa/noticias/arquivos/2019/12/MCTIC_lanca_consulta_publica_para_a_Estrategia_Brasileira_de_Inteligencia_Artificial.html

62 For more information, see https://www.mctic.gov.br/mctic/opencms/textogeral/Os-Centros-de-Pesquisa-Aplicada-CPA-em-Inteligencia-Artificial-IA.html

Infrastructure and Connectivity

The World Bank's 2019 Digital Adoption Index ranked Brazil fourth among the 12 countries studied in this report and 43rd out of 180 countries worldwide. However, in terms of its of its willingness to leverage the opportunities offered by ICT, Brazil ranks sixth among the LAC12 and 72nd out of 129 countries worldwide on the World Economic Forum's Networked Readiness Index. Even though adoption and use costs of these technologies at the individual and business levels are considered to be accessible, the agenda to promote ICT has not been robust enough in Brazil.

In 2017, the population with access to the Internet in Brazil reached 69 percent, placing the country near the LAC average (UNESCO 2019). One of the factors that has facilitated the increase of Internet access in the last few years is the concentration of 68 percent of the population in urban areas, according to the 2018 Brazilian Digital Transformation Strategy (Departamento de Política de Transformación Digital 2018), based on data from the National Telecommunications Agency (ANATEL).

Strengthening ICT infrastructure and access is the first thematic axis that is included in the Brazilian Digital Transformation Strategy. This is a relevant issue for the country given its vast territory and the need to expand the Internet network. One of the main obstacles to achieving affordability is consumer taxes paid for mobile telephone services, which represent more than 30 percent of their total cost.

Another determining factor for continuing Brazil's digital transformation is access to broadband. During the most recent Mobile World Congress in 2019, Brazil announced a 5G spectrum public tender for March 2020 (Jaimovich 2019).

Regarding cybersecurity, the International Telecommunications Union's 2018 Global Cybersecurity Index gives Brazil a score of 0.577 out of 1, positioning the country sixth out of 33 countries in the Americas and 70th out of 175 countries worldwide.

Academia

Brazil has recognized regional educational and research centers that have bolstered the development and innovation of AI-related issues.

In terms of accessibility, the Brazilian landscape for training talent at the undergraduate level is promising: the top five universities per the 2019 QS World University Rankings are public and have branches in various parts of the country (Table 10). Furthermore, all of them offer relevant undergraduate and postgraduate degrees, conduct subject-related research, and have AI centers.

The country has other universities that offer AI programs, such as the Federal University of Minas Gerais (UFMG). This university has been an important ally for AI development at the national level and has contributed to relevant projects.[63] For its part, the Federal University of Catarina (UFSC) has a highly regarded AI research laboratory.[64]

63 Among these projects is Kunumi, an AI solutions company that supports the emergence of an AI ecosystem in Brazil by training professionals, encouraging an entrepreneurial spirit, and promoting interaction between academia and businesses. Another successful case is XQuad, developed by a group of UFMG electrical engineering postgraduate students who were finalists in the AlphaPilot international competition that involved a race between autonomous drones that had to overcome obstacles in the shortest possible time.

64 For more information, see https://en.ufsc.br/

Table 10. The Top Five Universities in Brazil and Their Relationship with AI

	#1 Universidade de São Paulo	#2 Universidade Estadual de Campinas	#3 Universidade Federal do Rio de Janeiro	#4 Universidade Federal de São Paulo	#5 Universidade Estadual Paulista
Type of Institution	Public	Private	Public	Public	Public
Location	Eight branches in the State of São Paulo*	Three branches in São Paulo	Four branches in the State of Rio de Janeiro	Six branches, all in the State of São Paulo	A total of 22 branches distributed in different locations in the country
AI-related degrees	✓	✓	✓	✓	✓
AI-related postgraduate programs	✓	✓	✓	✓	✓
AI research	✓	✓	✓	✓	✓
AI laboratory	✓	✓	✓	✓	✓
Technological innovation laboratory	✓	✓	✓	✓	✓

Source: Prepared by the authors based on information obtained from the website of each institution.

Note: The Universidade de São Paulo, Universidade Estadual de Campinas and Universidade Federal de São Paulo are also listed in the 2020 Times Higher Education ranking.

* Bauru, Lorena, Piracicaba, Pirassununga, Ribeirão Preto, São Carlos, Santos, and São Paulo.

Other Relevant Institutions

Academia in Brazil has also forged alliances with different sectors to establish specialized centers such as the Advanced Institute for Artificial Intelligence (AI2), which mainly focuses on resolving social problems. Other academic initiatives dedicated to AI for social good include the Federal University of Río de Janeiro's LabBCI and LabAssistiva, which conduct research and develop technologies for people with disabilities.

Other research centers in the country include the *Instituto de Pesquisas Tecnológicas do Estado de São Paulo* (IPT),[65] a non-university academic institution that has the support of the *Secretaria de Economia e Planejamento do Estado de São Paulo*. The IPT provides innovation services, research and development, and methodological support, and offers courses and classes.

The relevance and capacity of Brazil's AI sector has been recognized by key players such as IBM, which will open its first AI research center in Latin America at the University of São Paulo (USP) as part of its AI Horizons Network initiative.[66] This research center will be the largest in Brazil and will be funded on tripartite basis by IBM, USP, and the state government through its *Fundação de Amparo à Pesquisa do Estado de São Paulo* (FAPESP). It will mainly focus on agroindustry, health, and financial services.

Finally, it is worth highlighting educational initiatives such as *Mundo Senai*,[67] a platform with online courses for 3 million students in more than 23 study centers across Brazilian cities that includes subjects such as AI and data sciences in its curricular program. These courses are delivered with the collaboration of Microsoft.

65 For more information, see https://www.ipt.br/en/institutional

66 For more information, see https://www.research.ibm.com/artificial-intelligence/horizons-network/#partnerships

67 For more information, see https://www.mundosenai.com.br/

The Entrepreneurship Ecosystem and Civil Society

Considering its nominal gross domestic product as measured by the International Monetary Fund (IMF) in 2014, Brazil is the country with the most wealth in Latin America,[68] in addition to being the regional leader in innovation capacity (Lugones, Gutti. and Le Clech 2007). Businesses are mainly driven by the large size of the domestic market, but a lack of coordination between public policy and the private sector hampers further growth (Schwab 2019).

There is a start-up ecosystem of businesses in Brazil that use AI in diverse forms to comply with the various Sustainable Development Goals. Among them, Nubank, the largest online bank outside of Asia, stands out.[69] Nubank focuses on financial inclusion and to date has over 10 million clients. Examples of another type include Guiabolso,[70] a mobile application that uses AI to organize users' personal finances to help them save money and make better financial decisions.[71]

The use of new technologies in the agribusiness sector is also very important in Brazil. For example, Solinftec is a company devoted to maximizing agricultural processes through data inputs collected by computers installed in machines and meteorological stations, among other locations.[72] The aim is to make recommendations to improve the quality of the solutions for small and medium-size agricultural enterprises.

For its part, civil society has made progress regarding discussions about respect for human rights in digital environments. In the same direction, there are organizations such as Coding Rights[73] and Olabi[74] that are working on AI ethics and inclusion. Coding Rights is dedicated to the defense of human rights in the development, regulation, and use of new technologies through research, lobbying, development of technological tools, and capacity-building in digital security and techno-politics. Olabi is working for a socially fairer world through the use of technology. Its projects include the *Levantamento do PretaLab* initiative that focuses on Afro-Brazilian women and seeks to raise awareness about algorithmic biases and their potential to reinforce discrimination.

The work of the Brazilian Artificial Intelligence Association (*Associação Brasileira de Inteligência Artificial* - ABRIA) has also had a positive impact on the country.[75] ABRIA emerged in 2017 when 16 AI companies came together to accelerate and adopt AI platforms with the potential to improve the productivity of the Brazilian economy. The objective is to increase the information exchange between national and international players, enhance the social benefits of an economy that takes advantage of AI, promote a healthy environment for the development of emerging companies, serve as an interlocutor between the public and private sectors, promote innovation, and train a skilled workforce.

Other efforts include the work of the not-for-profit organization ITS Río,[76] which is committed to promoting spaces for dialogue about AI ethics. In 2018, ITS Rio carried out the Global Symposium on AI and Inclusion in Rio de Janeiro as part of events of the Global Network of Internet and Society Research Centers.[77]

68 Nominal gross domestic product is the gross domestic product evaluated at current market prices.

69 For more information, see https://nubank.com.br/en

70 For more information, see https://www.guiabolso.com.br/

71 This application not only provides an account of purchases and sales, but also allows for including loans, mortgages, and the percentage of variable rates so that users can have greater control over their monetary resources.

72 For more information, see https://solinftec.com/

73 For more information, see https://www.codingrights.org/

74 For more information, see https://www.olabi.org.br/

75 For more information, see http://abria.com.br/

76 For more information, see https://itsrio.org/en/en-home/

77 For more information, see https://itsrio.org/en/search-en/?title=artificial+intelligence

Use Cases

Table 11 provides a synopsis of the main AI use cases in Brazil.

Table 11. Main AI Use Cases in Brazil

Name: LAURA		
For more information: https://www.laura-br.com/	Year it began to use AI: 2016	Sustainable Development Goal 3 (health and well-being)
Actors involved: LAURA partners		Current status: Not-for-profit organization in scaling stage
What it proposes: To reduce preventable sepsis-related death, which is now the leading cause of death in Intensive Care Units and one of the main causes of late hospital mortality. It is estimated that this disease kills about 230.000 Brazilians annually.		
Brief description of project: To reduce unnecessary deaths via early intervention through a health monitoring platform used by 200,000 patients every month. The platform identifies patients with clinical deterioration, notifies the healthcare team in real time, and analyzes electronic healthcare records. LAURA has already benefited 2.5 million patients and reduced overall mortality by 25 percent, saving 12 lives per day.		
AI applications	Machine learning, decision-making, deep learning, natural language processing.	
How AI is used	LAURA analyzes a patient's electronic medical care records and, based on historical data, identifies patients with the highest sepsis risk.	

Source: Information provided by LAURA for the preparation of this report.

Name: Livox		
For more information: https://www.livox.com.br	Year it began to use AI: 2019	Sustainable Development Goals 10 (reduced inequalities), 4 (quality education)
Actors involved: Worcester Polythenic Institute, *Universidade Federal Rural de Pernambuco*, Livox International LLC		Current status: Start-up in initial phase
What it proposes: The inclusion of people with disabilities.		
Brief description of project: Livox is an alternative communication application that enables individuals with nonverbal disabilities and learning problems to communicate and express their feelings and wishes 20 times faster than with normal augmentative and alternative communication devices.		
AI applications	Natural language generation, virtual agents, machine learning, natural language processing.	
How AI is used	Livox facilitates communication by individuals with cognitive disabilities by enabling them to select and point to pictures. Livox provides a wide variety of food and activities icons for use at different times during the day. It employs machine learning and neural networks to predict how probable certain interactions might be used. It can also simply "talk" to the person with the disability. Livox recognizes the conversation and uses natural language processing to generate possible interactions.	

Source: Information provided by Livox for the preparation of this report.

Name: Portal Telemedicina		
For more information: https://portaltelemedicina.com.br/en/telediagnostic-platform	Year it began to use AI: 2016	Sustainable Development Goals 3 (good health and well-being), 4 (quality education), 9 (industry, innovation, and infrastructure), 10 (reduced inequalities), 11 (sustainable cities and communities), 16 (peace, justice, and strong institutions), 17 (partnerships for the goals)
Actors involved: Google (California and Brazil), *Secretaria de Estado da Saúde de São Paulo*, *Fundação de Amparo à Pesquisa do Estado de São Paulo*		Current status: Start-up in scaling stage
What it proposes: To facilitate the quick and affordable access to quality health services.		
Brief description of project: *Telemedicina* is a platform that allows health clinics to expand their diagnoses in a rapid and low-cost manner. Clinics upload the necessary data to the platform to receive the diagnostics made by medical teams at large-scale health institutions. For this purpose, the Tele-Diagnosis platform is directly integrated with medical devises, national electronic health records systems, radiology, and laboratories in order to capture and transfer data automatically via the cloud, enabling doctors to make a diagnosis with a web-secured application.		
AI applications	Machine learning, AI-optimized hardware, deep learning, natural language processing, cybersecurity, regulatory compliance, image recognition, marketing automatization and non-supervised machine learning techniques for detecting frauds and irregularities.	
How AI is used	Machine learning algorithms predict medical diagnoses needed to prioritize medical attention in an emergency. The doctor's interface has pre-defined diagnostic labels that function as decision trees. This allows doctors to issue 10 times more diagnoses per hour based on the tests.	

Source: Information provided by Portal Telemedicina for the preparation of this report.

Name: R1T1		
For more information: www.projectcompany.org	Year it began to use AI: 2013	Sustainable Development Goals 2 (no hunger), 3 (health and well-being), 10 (reduced inequalities), 17 (partnerships for the goals)
Actors involved: Roche Ltd; Microsoft; Intel; MI; University of Victoria; *Universidade Estadual de Maringá*; Harvard University; University of California- Berkeley; Stanford University; *Unicamp, SOBRATI Terapia Intensiva and Hospital Universitário Regional de Maringá*, R1T1		Current status: Company in consolidation phase
What it proposes: To unify all the areas of a hospital through a single robot in order to reduce administrative processing costs and increase efficiency.		
Brief description of project: R1T1 is a robot for a wide range of health sector applications that connects all the areas in a hospital. It is capable of identifying the state of health and mood of a person without touching him or her. It also assists doctors and hospital auxiliary staff. It can be controlled locally or remotely with just an Internet connection.		

AI applications	AI-optimized hardware, decision-making, natural language generation, virtual agents, biometric techniques, robotics automation processes, natural language processing, image recognition, cognitive worker assistance, content development.
How AI is used	AI is achieved through business inputs, data engineering, data science, packaging, improvements in pipeline systems, improvement of the mathematical model, and monitoring. The machine learning pipelines (AI pipelines) allow for the optimal connection of patients' needs with available resources and personnel.

Source: Information provided by R1T1 for the preparation of this report.

Name: Traive

For more information: www.traivefinance.com	Year it began to use AI: 2017	Sustainable Development Goals 1 (no poverty), 2 (zero hunger), 3 (good health and well-being), 4 (quality education), 7 (affordable and clean energy), 8 (decent work and economic growth), 9 (industry, innovation, and infrastructure), 10 (reduced inequalities), 11 (sustainable cities and communities), 12 (responsible production and consumption), 15 (life on land), 17 (partnerships for the goals)

Actors involved: Traive	Current status: Start-up company in initial phase

What it proposes: To remedy the lack of loans and mortgages for micro, small, and medium-sized companies in the agricultural sector, particularly farms. There are approximately 500 million small and medium-sized farms in the world, and their agricultural production represents 75 percent of the total global food supply, even though they only receive 25 percent of all agricultural loans.

Brief description of project: Traive solves the agribusiness loan problem through an alternative credit system based on a data mix from different sources that estimates a client's mortgage loan performance in real time. At the same time, this allows farmers to improve their strategy during the growing season. The mobile application allows farmers to submit loan requests quickly and easily, based on expert recommendations. It is estimated that Traive will have supported 2,500 small and medium-sized agribusiness operations by the end of 2020.

AI applications	Machine learning platforms, AI-optimized hardware, decision-making, natural language processing, peer networking.
How AI is used	Traive's machine learning model uses agronomic, satellite-generated, and climatic data variables, together with historical data. With this, it optimally measures the risk of any farm, regardless of its size.

Source: Information provided by Traive for the preparation of this report.

Conclusions

Brazil is currently developing its AI strategy and stands out for its work on digitalization topics. The government has incorporated cybersecurity strategies, ICT infrastructure, digital content regulations, and E-commerce security tools into its operation. All of this has opened a large market for new technologies, including AI. For more than five years, Brazil has been working on consolidating good practices for data cleansing, quality, and openness, which are all vital for AI development and adoption. These efforts have led to the establishment of the foundation for the future of AI in Brazil's public domain.

Regarding AI in academia, it is worth mentioning that Brazil's top five universities are public, and that all of them have AI and technological innovation laboratories. There are also independent technology centers that support the country's AI research ecosystem.

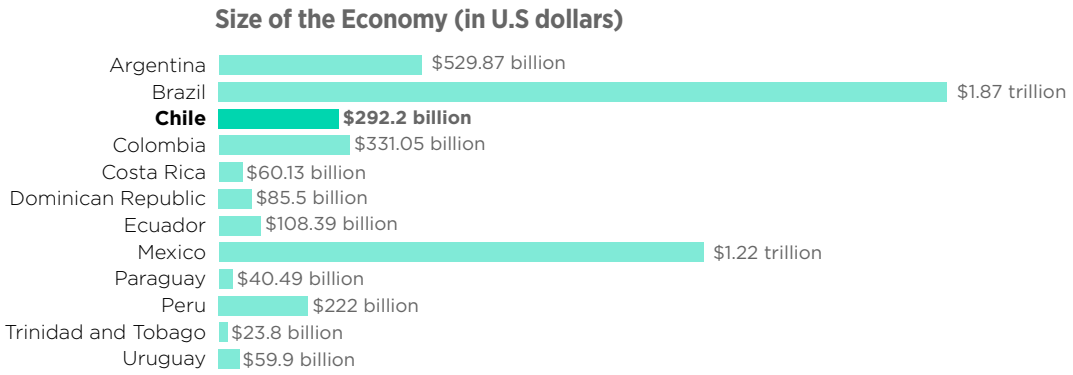
To motivate the sector, the national government offers incentives in the form of competitions and awards, while access to risk capital continues to increase. In this scenario, AI-driven start-up companies have come into existence, especially in the FinTech and AgroTech sectors, that are becoming increasingly relevant in the international market.

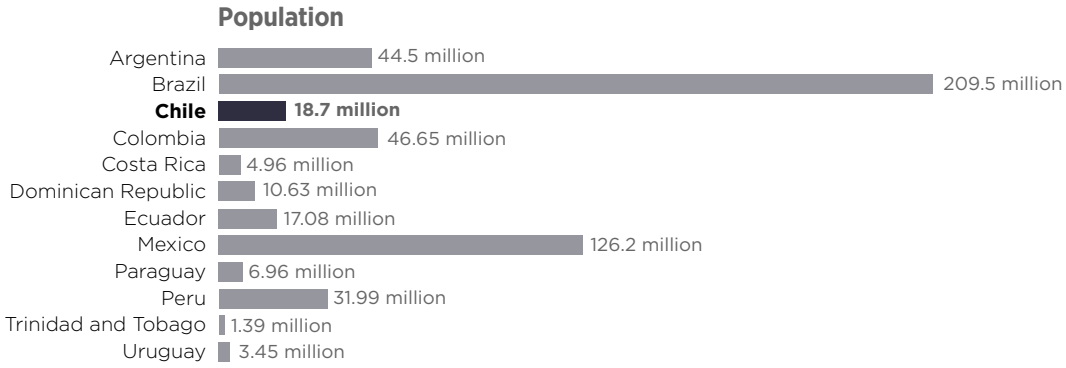
Finally, even though experts have determined that civil society in Brazil is not robust, a few organizations are indeed devoted to issues related to AI for social good. These include entities such as Coding Rights and Olabi, as well as trade associations such as ABRIA, that promote industry collaboration on these issues.

CHILE

To describe the current status of AI in Chile within a broader context, Figure 9 presents a comparison of selected economic, demographic, education, human development, and equality indicators, while Table 13 presents other socioeconomic indicators.

Figure 9. Chile Core Indicators: Comparison Chart





Human Development Indicators

	Program for International Student Assessment	English Proficiency (percent)	Skilled Workforce (percent)	Human Development Index	Gini Coefficient
Argentina	N/A	58.38%	63.4%	0.825	41.2
Brazil	N/A	50.1%	62%	0.759	53.12
Chile	**1st**	**52.89%**	**69.2%**	**0.843**	**46.6**
Colombia	N/A	57.38%	58.2%	0.747	49.7
Costa Rica	N/A	48.75%	48.3%	0.794	48.3
Dominican Republic	N/A	46.75%	46.6%	0.752	44.7
Ecuador	N/A	46.75%	46.6%	0.752	44.7
Mexico	3rd	48.99%	40%	0.774	48.3
Paraguay	N/A	52.51%	43.8%	0.702	48.8
Peru	N/A	50.22%	83.6%	0.750	43.3
Trinidad and Tobago	N/A	N/A	71.8%	0.784	40.3
Uruguay	2nd	54.1%	25.5%	0.804	30.5

Sources: Panels a and b: World Bank (2019a); Panel c: (from left to right): OECD (2019);); Education First (2019); United Nations (2019); UNDP (2019); World Bank (2018).

Table 12. Other Socioeconomic Indicators

Main Economic Sector (World Bank 2019a)	**Program for International Student Assessment** (OECD 2019)	**Science, Technology, Engineering, and Mathematics (STEM) Gender Index** (Arredondo et al. 2019)
Industrial sector	The highest among the 12 countries	32 percent*
National Entrepreneurship Context Index – Global Entrepreneurship Monitor (Bosma and Kelley 2019)	**CIVICUS Monitor** (2020)	
5.1/10	Operating conditions of civil society organizations: narrowed (2/5)**	

Source: Prepared by the authors.
* Participation of female researchers in STEM fields in the public sector (in comparison to men).
**This indicator is explained in Annex B.

Table 13 summarizes the progress made by various sectors in Chile in terms of establishing the foundations for driving AI in service of social good.

Table 13. Efforts to Establish the Foundations of AI in Chile

Government				
Digital strategy	Data strategy	AI strategy (being explored)	Infrastructure and connectivity	
Academia (top 5)				
Public (2)	Non-centralized (3)	AI-related degree (5)	AI research (5)	AI laborator (4)
Entrepreneurship Ecosystem		**Civil Society**		
National Entrepreneurship Context Index (51 percent)		CIVICUS Monitor (2/5)		

Source: Prepared by the authors. The indicators are found in Annex B.

Government

Digital Strategy: Yes

Representatives of the public and private sectors, academia, and civil society worked together in a participatory exercise to define the 2020 Digital Agenda,[78] a roadmap of 60 measures to make progress towards inclusive and sustainable digital development through the use of ICT. The Digital Agenda is structured around five pillars that establish its strategic directions: human rights in digital development, digital connectivity, digital government, digital economy, and digital competencies.

One of the features of the agenda is that it is flexible, that is, it allows for adaptations and for adding new measures or strategic challenges that have a high impact. As a result, by the end of 2019 the number of agenda goals had increased to 63 from the 60 original ones.

78 For more information, see http://www.agendadigital.gob.cl/files/Agenda%20Digital%20Gobierno%20de%20Chile%20-%20Noviembre%202015.pdf

The Digital Transformation Strategy launched in April 2019 has as its main action lines digital identity, reducing bureaucracy through digitalization, state cybersecurity, the use of emerging technologies, and a data-driven state.[79] These last two points explicitly include the formulation of a data and AI strategy, the automation of public policies through the use of data, and the use of public data to generate a Govtech data ecosystem.[80]

In September 2019, the Chilean Congress enacted the Law of Digital Transformation of the State, which seeks to eliminate the use of paper-based documentation in government offices over a span of five years, make intensive use of data, and create open and efficient interoperability mechanisms.

As of this writing, the following improvements were recorded for the pillars of the Digital Agenda: 74 percent for human rights in digital development, 92 percent for digital connectivity, 82 percent for digital government, 85 percent for digital economy, and 69 percent for digital competencies.

Data Strategy/Open Data Portal: Yes

One of the main outcomes of the 2020 Digital Agenda is the Open Data Portal,[81] a platform that to date has 3,761 data sets and includes 520 state agencies. Its purpose is to encourage transparency and accountability so as to strengthen democracy.[82] One of the challenges this portal faces is the homologation of information with the aim of facilitating access for citizens.[83]

A joint project developed between the Chilean government and Datawheel called DataChile aims to add value through the intelligent use of public data.[84] This platform integrates, visualizes, and distributes public data to improve the efficiency and effectiveness of public decision-making. This is achieved through integrated data that help reveal gaps in public services, identify opportunities for industrial diversification, and promote a better-informed public debate. The platform is currently administered by the Digital Government Division.

AI Strategy: Ongoing

During the first half of 2019, a group of ministries, led by the Ministry of Science, Technology, Knowledge and Innovation (*Ministerio de Ciencia, Tecnología, Conocimiento e Innovación* - MCTCI, conducted an analysis of the global context of AI strategies, the results of which were presented to the president of the country in August. The president, in turn, instructed the MCTCI to execute an AI work plan to develop a national policy and action plan. The purpose of the work plan is to empower citizens in the use and development of AI tools, promoting discussion about its legal, ethical, social, and economic consequences. The policy, along with its action plan, will be launched in 2020.

The MCTCI established a committee of 10 Chilean experts on issues such as AI, data, the economy, and social and ethical aspects to implement this action plan. Two scholars who joined the committee led efforts to draft a document entitled "Towards an AI R+D+i+S strategy for Chile."[85]

79 For more information, see https://digital.gob.cl/doc/estrategia_transformacion_digital_2019_v1.pdf

80 According to the IDB, the Govtech concept covers all emerging companies whose technology can be applied to the improvement of public services (health, education, mobility), administrative management (records, decision-making, streamlined processes), and public infrastructure (public Wifi, drones or sensors for street connectivity), as well as citizen political participation (electoral processes, public policy decision-making, communication with institutions, social organization, etc.).

81 For more information, see https://datos.gob.cl/

82 Any person may view the information on this portal, whether to conduct independent research, develop applications using the public administration´s databases, or determine what information was used by the administration for decision-making in different areas.

83 The portal contributes to the mission of the 2020 Digital Agenda to encourage citizen participation and improve the experience of citizens when they interact with public services.

84 For more information, see https://es.datachile.io/

85 The document was delivered to the president and to the MCTCI minister. For more information, see https://drive.google.com/file/d/1_IFAH3WsUhaXgNCHQ8UGHpyNIzb25JBC/view

This work plan is led by *Unidad Futuro del MCTCI*, and by representatives of the Ministries of Economy, Development and Tourism, Social Development and Family, Labor and Social Security, Transportation and Telecommunications, and Foreign Affairs. The initiative also includes the participation of the General Secretariat of the Presidency, the National Research and Development Agency (*Agencia Nacional de Investigación y Desarrollo* - ANID), the Production Development Corporation (*Agencia Nacional de Investigación y Desarrollo* - CORFO), and the National Training and Employment Service (*Servicio Nacional de Capacitación y Empleo* - SENCE).

Chile's national AI policy contemplates the development of three pillars:

i. Enabling factors: Data, including their sources, standards, and protection; human capital, which covers school education all the way to training and labor reconversion, including technical, higher, and postgraduate education; and computing infrastructure, which includes fiber optic networks, the deployment of sensors, data centers, and 5G networks.

ii. AI use and development: Elements of basic and applied AI research and development and the demand for solutions.[86]

iii. Ethics, regulatory aspects and social and economic impacts: Ethical, regulatory, economic, and social challenges that stem from the development and implementation of AI, along with the opportunities arising from the proper use of this technology.[87]

Following a diagnostic of the AI ecosystem in Chile, the drafting of an AI policy base document is foreseen. The drafting process will include the participation of civil society and academia through documents and self-organized working groups assembled by individuals or organizations; seminars with working roundtables in all of the country's regions coordinated by the MCTCI and the ANID; and a public consultation prior to the publishing of the final version of the policy.

Infrastructure and Connectivity

In Chile, over 82 percent of the population has Internet access, making it one of the countries with the greatest connectivity in the region (UNESCO 2019). Furthermore, it is estimated that for every 1,000 inhabitants, there are 1,134 cellular phone subscriptions, which indicates that some individuals have two to three mobile telephone subscriptions.

With a score of 75.62/100 on the World Bank's 2019 Digital Adoption Index and a solid infrastructure, Chile is considered to be highly prepared for the digital revolution. The country's score on the World Economic Forum's Networked Readiness Index is 57 percent. In addition, Chile will most probably become the leader in LAC after it implements the 5G public network, as was suggested in the Mobile World Congress 2019 (Agenda Pais 2019).

As regards cybersecurity, with a score of 0.470 out of 1 Chile ranks 9th out of 33 in the Americas and 83rd out of 175 countries worldwide on the International Telecommunications Union's 2018 Global Cybersecurity Index.

86 Supply and demand of all of the ecosystem´s actors are considered: universities, research centers, nongovernmental organizations, industry, and the government.

87 Issues to be considered include the effects on the privacy of individuals and the Sustainable Development Goals, in particular those concerning the environment, work, gender gaps, justice and democracy, among others.

Academia

According to the 2019 QS World University Rankings, Chile's top five universities offer undergraduate degrees and postgraduate degrees on issues related to AI, conduct research on the topic, and have laboratories and/or technology innovation centers. Four of the universities also have a specialized laboratory specializing on AI topics (Table 14).

Moreover, the academic capacity of Chile is reinforced through multiple collaborations with government institutions such as CORFO and the National Fund for Scientific and Technological Development (*Fondo Nacional de Desarrollo Científico y Tecnológico* - FONDECYT), which are research and funding partners.

Table 14. The Top Five Universities in Chile and Their Relationship with AI

	1. Pontificia Universidad Católica de Chile	2. Universidad de Chile	3. Universidad de Santiago de Chile	4. Universidad de Concepción	5. Universidad Adolfo Ibáñez (UAI)
Type of Institution	Private	Public	Public	Private	Private
Location	Three headquarters, all in Santiago	Two headquarters, both in the vicinity of Santiago	Three headquarters, all in Santiago	Concepción	Three headquarters: Viña del Mar, Santiago, and Miami (United States)
AI-related degrees	✓	✓	✓	✓	✓
AI-related postgraduate programs	✓	✓	✓	✓	✓
AI research	✓	✓	✓	✓	✓
AI laboratory	✓	✓	✓	✗	✓
Technological innovation laboratory	✓	✓	✓	✓	✓

Source: Prepared by the authors based on information obtained from the website of each institution.
Note: Two of these universities (Pontificia Universidad Católica de Chile and Universidad de Chile) are also listed on the 2020 Times of Higher Education ranking.

Other Relevant Institutions and Initiatives

In addition to the aforementioned universities, Chile has two institutes that work toward enhancing the country's AI capacity: the Millennium Institute for Foundational Research on Data (*Instituto Milenio Fundamentos de los Datos* - IMFD) and the International Institute for Enterprise Innovation (3IE) of the Universidad Técnica Federico Santa María. The IMFD —a reference point for Latin America— is a multidisciplinary research center that deals with the computational aspect of data and its use as a social impact tool. The mission of 3IE is to support the development and internationalization of innovative projects. The institute incubates projects, coordinates sessions for network creation, and organizes tournaments such as the Torneo de Emprendimiento Startup Academy IA 2019 to identify innovative projects that incorporate AI for social good.[88]

88 First place at the tournament was awarded to ALICIA (Intelligent Legal Assistant), a legal assistant for collections and arrears in trial cases that provides free legal advice to users who would otherwise have to pay for a lawyer when they are already in a default trial. ALICIA aims to help the 2 million Chileans (20 percent of the total population) who face trials for indebtedness annually. This winning project was developed by former engineering students from the Commercial Engineering degree program of the *Pontificia Universidad Católica de Valparaíso*. The project has been in the incubation stage since the end of 2019.

Other efforts include the GobLab of the Universidad Adolfo Ibáñez, a laboratory for public innovation attached to the School of Government that seeks to improve the quality of life through the use of innovative technologies such as massive data analysis or Big Data.[89] One of its projects is to develop a predictive model that contributes to the community public safety strategy of the Municipality of Lo Bernechea in Chile.

The Entrepreneurship Ecosystem and Civil Society

According to the World Economic Forum's 2018 Global Competitiveness Index, Chile is the second most competitive country in Latin America after Colombia. Worldwide, Chile ranks 33rd among 140 countries evaluated. Chile's competitiveness is due to its stable macroeconomic conditions and the development of its infrastructure, among other factors. Chile has not only increased the percentage of established businesses, it has also raised expectations with regard to the creation of jobs through ventures such as Start-Up Chile,[90] a start-up accelerator created by the Chilean government to achieve higher levels of innovation-based entrepreneurship.

Chile has an AI start-up company ecosystem that is on the rise (Costa 2019). Examples of entrepreneurships that use AI for social good include U-Planner,[91] which works with universities from 16 countries to optimize their processes, and Kimche,[92] a start-up that helps parents and teachers improve the quality of education of Chilean students through customized curricular plans adapted to their needs. Organizations such as IA Chile,[93] a learning community made up of a group of AI experts, assist the community of professionals with companies that use emerging technologies.

An example of a public-private endeavor is Data Observatory,[94] a non-profit organization created in 2020 to leverage the benefit obtained from data on the environment and other unique public data that are generated within the country and have global value.[95] The Data Observatory coordinates academia, the public sector, industry, and civil society in global partnerships so as to generate useful solutions and capabilities in data science and related technologies that yield returns to the different sectors of the economy. Specifically, the observatory centers on four lines of work: (1) collect datasets of global value and make them available to the public in an open manner; (2) design and implement solutions to acquire, analyze, explore, visualize, and offer access to these datasets and maximize their full exploitation; (3) contribute to the development of talent related to the implementation of these actions, and provide hands-on learning based on materials and courses; and, (4) invest in creating networks that facilitate technology transfer and associativity among people who work in different fields but who share functional similarities in terms of their work with data. One of the observatory's most noteworthy projects aims to harness AI to explore solutions for phenomena related to climate change such as the extreme events produced by desertification and sea level changes, among others.

There are also organizations such as the Fundación Ciudadanía Inteligente,[96] which develops digital tools to strengthen democracies. Its projects include A+ Alliance, a global alliance that promotes inclusive algorithms to tackle the biases replicated by AI.

89 The GonLab was created to help close gaps in technology development and increase the role of Chile in the Fourth Industrial Revolution. For more information, see https://gobierno.uai.cl/centros/goblab/proyecto-modelo-predictivo-prevencion-del-delito/

90 For more information, see https://www.startupchile.org/es/sobre-nosotros/

91 For more information see www.u-planner.com

92 For more information see https://database.contxto.com/company/kimche

93 For more information see https://inteligencia.ai/

94 For more information see http://www.dataobservatory.net

95 Stakeholders involved in the Data Observatory include the government of Chile (through the Ministry of Science, Technology, Knowledge and Innovation and the Ministry of Economy, Development and Tourism), together with Amazon Web Services and the *Universidad Adolfo Ibáñez* The aim is to further open this initiative to new partners.

96 For more information, see https://ciudadaniai.org/

Derechos Digitales is a civil society organization committed to promoting and protecting human rights in the digital and technological environment. Its main lines of action are freedom of expression, privacy and personal data, and copyrights and access to knowledge rights. In 2018, *Derechos Digitales* published the report entitled "Algorithms and Inequality," which suggests areas of responsibility to companies, government and civil society regarding ways to avoid automated decisions that affect the rights of individuals.97

Use Cases

Table 15 provides a synopsis of the main AI use cases in Chile.

Table 15. Main AI Use Cases in Chile

Name: ALeRCE		
For more information: http://alerce.science/	Year it began to use AI: 2019	Sustainable Development Goals 4 (quality education), 9 (industry, innovation, and infrastructure), 17 (partnerships for the goals)
Actors involved: **Funders:** *Instituto Milenio de Astrofísica, Centro de Modelamiento Matemático* **Chilean partners:** REUNA (company), *Universidad Adolfo Ibáñez, Universidad Andrés Bello*, *Universidad Austral, Universidad Católica de Chile*, *Universidad de Chile*, *Universidad de Concepción* **International partners:** Caltech, Harvard University, University of Washington		Current status: Academic project in consolidation phase
What it proposes: Manage large volumes of astronomical data from large telescopes and astronomy cameras through automated systems. This scientific community generates thousands of data sets. Currently, these telescopes can produce up to a million events per night, and in the upcoming years it is expected that 10 million events will be reached during nightly observations. The events must be distributed among the community of astronomers though the transmission of continuous data streams so that they can be captured, annotated, and classified by astronomy brokers. The volume of data generated by the new telescopes requires automated systems to organize and classify new events.		
Brief description of project: ALeRCE is one of the first astronomical brokers in the world and the first to publicly provide the classification of astronomical alerts generated by the Zwicky Transient Facility (ZTF), located in California. ALeRCE offers multiple services to the astronomical community, including the intake of ZTF data streams to classify events based on first alerts associated with them (early classifier) as well as another service based on the temporal evolution of all alerts associated with an event (late classifier), using machine learning techniques in both cases.		
AI applications	Platforms for machine learning and deep learning, robotic process automation, cognitive work assistant, image recognition.	
How AI us used	ALeRCE allows for automatic communication between its databases and survey telescopes through an application programming interface (API), and it also offers different public web interfaces for searching for new supernova candidates (snhunter.alerce.online), or for exploring all of the time series and their classifications (alerce.online), among other services.	

Source: Information provided by Universidad Andrés Bello for the preparation of this report.

97 For more information, see https://www.derechosdigitales.org/wp-content/uploads/algoritmo_desigualdad_cast.pdf

Name: DART		
For more information: https://teledx.org/DART	Year it began to use AI: 2015	Sustainable Development Goal 3 (good health and well-being)
Actors involved: Universidad de Chile and private investors		Current status: Government, university, and start-up company project in initial phase
What it proposes: Diabetes being one of the most common causes of sight loss for the working-age population, yearly exams are essential for its prevention. However, there is a considerable gap between available ophthalmological capacity and the number of diabetes patients who require the exam, which total more than 460 million people worldwide. This project aims to expand access to these exams.		
Brief description of project: DART improves access to preventive exams to detect signs of disease in its initial stages by enabling medical centers to send pictures of the retina of their patients to the DART platform. The platform analyzes the images, discards negative cases, and refers potential positive cases to ophthalmologists for their recommendations to patients on the steps they should follow, thus maximizing a doctor's time. The service is used by 1 million people every month. To date, over 250,000 patient exams have been analyzed.		
AI applications	Platforms for machine learning and deep learning, decision-making, cognitive work assistant, image recognition.	
How AI is used	The DART machine learning model was developed with a representative sample obtained from several centers and observers to detect signs of diabetic retinopathy.	

Source: Information provided by TeleDx for the preparation of this report.

Name: Not Company (NotCo)		
For more information: www.notco.com	Year it began to use AI: 2015	Sustainable Development Goals 2 (zero hunger), 3 (good health and well-being), 12 (responsible consumption and production), 13 (climate action), 15 (life on land)
Actors involved: NotCo		Current status: Start-up company in consolidation phase
What it proposes: Reduce the environmental impact of mass consumer animal-based products by offering plant-based food alternatives.		
Brief description of project: NotCo is committed to finding formulas that produce the same tastes and nutrients as traditional animal-based foods, but made with vegetable ingredients. In just eight months, its first product captured an 8 percent market share.		
AI applications	Natural language generation, platforms for machine learning and deep learning, decision-making, natural language processing, cognitive work assistant, image recognition.	
How AI is used	AI expedites the research process and the development of new prototypes.	

Source: Information provided by NotCo for the preparation of this report.

Name: Predicción de lugar de delitos		
For more information: rmanasevich@gmail.com	Year it began to use AI: 2019	Sustainable Development Goals 9 (industry, innovation, and infrastructure), 11 (sustainable cities and communities), 16 (peace, justice, and strong institutions)
Actors involved: Government of Chile and the Undersecretariat of Crime Prevention Developers: The Physical and Mathematical Sciences School of the *Universidad de Chile*		Current status: Government project in consolidation phase
What it proposes: Contribute to crime prevention through time and resource optimization.		
Brief description of project: This system is used across all of the country's communes to predict where crimes are most likely to happen, generating three daily predictions upon which law enforcement shifts are updated.		
AI applications	Deep learning and machine learning.	
How AI is used	The predictor delivers crime risk maps on a daily basis based on data on crime complaints.	

Source: Information provided by the Physics and Mathematical Science School of the Universidad de Chile for the preparation of this report.

Name: U-Planner		
For more information: www.u-planner.com	Year it began to use AI: 2012	Sustainable Development Goals 4 (quality education),10 (reduced inequalities)
Actors involved: U-Planner		Current status: Company in consolidation phase
What it proposes: To generate a real impact on higher education by giving access to millions of students who currently do not have that opportunity whether due to performance, leaving school, or lack of coverage.		
Brief description of project: U-planner allows for advanced analysis and provides AI solutions for the management and operation of universities in several countries. It offers products in three main areas: (1) Intelligent Campus: Improve the organization of institutional facilities, optimizing their infrastructure. (2) Academic: Implement intelligent measurement methodologies, including skill-based models to strengthen quality indexes for accreditation; and (3) Student Success: Centralize, integrate, and guarantee the availability of higher education institution services so as to increase their use and improve the quality of the experience provided to students and other stakeholders. Currently U-Planner has an impact on over 2 million students.		
AI applications	Deep learning and machine learning.	
How AI is used	Drawing from the data sets of different universities, U-Planner creates models that allow for the recognition of behavioral patterns and therefore identify standardized ways to address the different issues faced by higher education institutions.	

Source: Information provided by U-Planner for the preparation of this report.

Conclusions

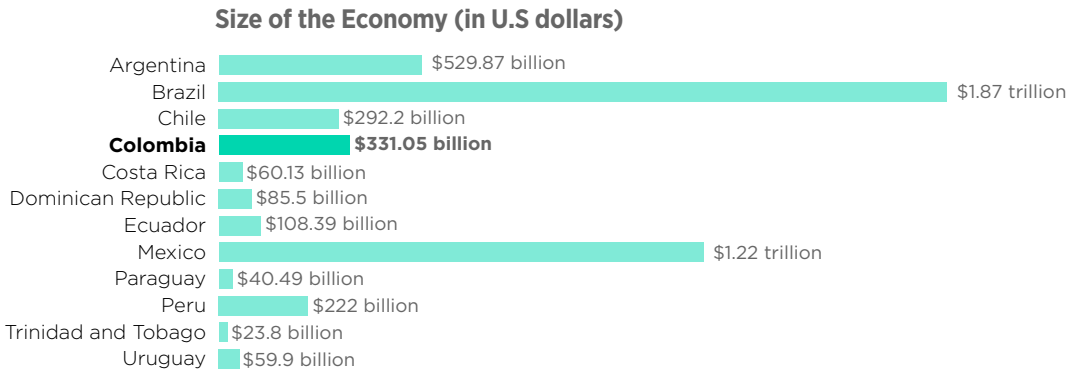
Progress has clearly been made in AI by Chile's public sector, academia, and industry. Chile is expected to have an AI Strategy in 2020 that will strengthen the foundation to accelerate the use of AI for social good across the country. The fact that Chile is seeking to open institutional arenas on ethical AI issues is a good indicator of its interest in strengthening the mechanisms for the responsible use of this technology.

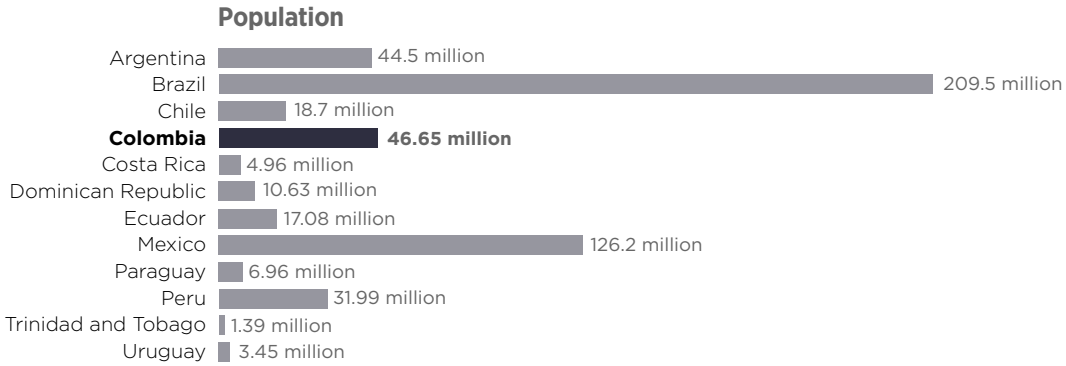
As demonstrated by Chile's PISA exam results – the country is first in the region – education is a priority. Chile's universities – both public and private – conduct AI research and offer related degrees. Finally, although the participation of civil society is classified as narrow, Chile has consolidated organizations that promote AI adoption and the ethical discussions which it generates.

COLOMBIA

To describe the current status of AI in Colombia within a broader context, Figure 10 presents a comparison of selected economic, demographic, education, human development, and equality indicators, while Table 16 presents other socioeconomic indicators.

Figure 10. Colombia Core Indicators: Comparison Chart





Human Development Indicators

	Program for International Student Assessment	English Proficiency (percent)	Skilled Workforce (percent)	Human Development Index	Gini Coefficient
Argentina	N/A	58.38%	63.4%	0.825	41.2
Brazil	N/A	50.1%	62%	0.759	53.12
Chile	1st	52.89%	69.2%	0.843	46.6
Colombia	**N/A**	**57.38%**	**58.2%**	**0.747**	**49.7**
Costa Rica	N/A	48.75%	48.3%	0.794	48.3
Dominican Republic	N/A	46.75%	46.6%	0.752	44.7
Ecuador	N/A	46.75%	46.6%	0.752	44.7
Mexico	3rd	48.99%	40%	0.774	48.3
Paraguay	N/A	52.51%	43.8%	0.702	48.8
Peru	N/A	50.22%	83.6%	0.750	43.3
Trinidad and Tobago	N/A	N/A	71.8%	0.784	40.3
Uruguay	2nd	54.1%	25.5%	0.804	30.5

Sources: Panels a and b: World Bank (2019a); Panel c: (from left to right): OECD (2019);); Education First (2019); United Nations (2019); UNDP (2019); World Bank (2018).

Table 16. Other Socioeconomic Indicators

Main Economic Sector (World Bank 2019a)	**Program for International Student Assessment** (OECD 2019)	**Science, Technology, Engineering and Mathematics (STEM) Gender Index** (Arredondo et al. 2019)
Production and export of primary commodities	Above the average for the 12 countries	38 percent*
National Entrepreneurship Context Index – Global Entrepreneurship Monitor (Bosma and Kelley 2019)	**CIVICUS Monitor** (2020)	
4.8/10	Operating conditions of civil society organizations: repressed 4/5**	

Source: Prepared by the authors.

* Participation of female researchers in STEM fields in the public sector (in comparison to men).

** This indicator is explained in Annex B.

Table 17 summarizes the progress made by various sectors in Colombia in terms of establishing the foundations for driving AI in service of social good.

Table 17. Efforts to Establish the Foundations of AI in Colombia, by Sector

Government			
Digital strategy	Data strategy	AI strategy	Infrastructure and connectivity
Academia (top 5)			
Public (2)	Non-centralized (4)	AI-related degree (4)	AI research (4)	AI laborator (3)
Entrepreneurship Ecosystem		**Civil Society**	
National Entrepreneurship Context Index (48 percent)		CIVICUS Monitor (4/5)	

Source: Prepared by the authors. The indicators are found in Annex B.

Government

Digital Strategy: Yes

The 2018–2022 National Development Plan (Plan Nacional de Desarrollo – PND)[98] contains the Colombian Digital Transformation Pact (Pacto por la transformación digital de Colombia - TDC).[99] The pact has three main objectives: (1) widely expand Internet connectivity for both natural and legal persons; (2) develop digital work competencies and environments that foster creativity in the service of digital innovation; and (3) create an institution that ensures implementation of the pact and regulates new technologies. This may

98 For more information, see https://colaboracion.dnp.gov.co/CDT/Prensa/Resumen-PND2018-2022-final.pdf

99 For more information, see https://www.dnp.gov.co/DNPN/Plan-Nacional-de-Desarrollo/Paginas/Pactos-Transversales/Pacto-transformacion-digital-de-Colombia/Transformacion-digital.aspx

have an impact on the productive sector as well as on public administration that seeks the use of data intelligence tools to fight corruption.

For its part, the Ministry of Information Technologies and Communications of Colombia (*Ministerio de Tecnologías de la Información y las Comunicaciones* - MinTIC) coordinates the programs arising from the pact, mainly involving intelligent manufacturing. This effort, carried out by iNNpulsa, which is a program of the National Learning Service (*Servicio Nacional de Aprendizaje* - SENA), will strengthen the relationship between companies and academia.

While the TDC proposes a reform with nationwide coverage, the National Development Plan has a manual for digitalization in the realm of local governments. In addition, this pact is an mechanism aimed at strengthening seven of the Sustainable Development Goals: 4 (education), 8 (decent work and economic growth), 9 (industry, innovation, and infrastructure), 10 (reduced inequalities), 11 (sustainable cities and communities), 16 (peace, justice, and strong institutions), and 17 (partnerships for the goals).

In 2018, the World Economic Forum chose the city of Medellin as the Spanish-speaking headquarters for the Centre for the Fourth Industrial Revolution. The center was inaugurated in April 2019 and hosts the work of experts in digital, physical, and biological systems aimed at transforming the country's social and economic environment through the use of technology. Its digital laboratory will play an important role in the planning of smart cities, as well as in the development of the Internet of Things. This action has been endorsed by the signing of AI development agreements with the Organisation for Economic Co-operation and Development (OECD 2019).

Data Strategy/Open Data Portal: Yes

The Colombian Open Data Portal allows access to 10,231 data sets from different government entities.[100] Additionally, it offers different teaching tools for these entities to use and benefit from, and its report section presents the tracking of information quality by department, furthering the commitment of each subnational entity to ensure that the information published meets established guidelines.

The purpose of the portal is help journalists, students, entrepreneurs, civil society organizations, and government build a data ecosystem that facilitates improved and transparent access to the country's information. To drive the opening up and use of these data, the MinTIC published the open government guide entitled "Guía para el uso y aprovechamiento de datos abiertos en Colombia."[101]

AI Strategy: Yes

At the end of 2019, the Colombian government passed a National Policy for Digital Transformation and AI.[102] According to MinTIC, the policy aims to promote the strategic use of digital technologies in the public and private sectors. This is expected to bolster productivity and promote the welfare of citizens.

This policy seeks to create international alliances for the innovation, design, and implementation of initiatives that foster entrepreneurship and digital transformation. Its priorities are to create an AI market in the country and attract global talent.

As part of one of the strategies of the 2018–2022 National Development Plan, the government of Colombia, through MinTIC, granted full scholarships to 25,000 public employees in the Coursera and Platzi platforms so that they can strengthen their technology skills by attending five courses on AI and digital transformation.

100 For more information, see https://colaboracion.dnp.gov.co/CDT/Prensa/Resumen-PND2018-2022-final.pdf

101 For more information, see https://estrategia.gobiernoenlinea.gov.co/623/articles-9407_brief_guia_datos.pdf

102 For more information, see https://colaboracion.dnp.gov.co/CDT/Conpes/Económicos/3975.pdf

Infrastructure and Connectivity

In Colombia, a little more than half of the population (62 percent) has access to the Internet. The country has accomplished 64 percent of the progress needed in its transition to digitalization, according to the World Bank's 2019 Digital Adoption Index. On the World Economic Forum's Networked Readiness Index, Colombia scores 49 percent.

On the International Telecommunication Union's 2018 Global Cybersecurity Index, Colombia obtained a score of 0.565/1, which places it 7th among 33 countries in Latin America and 73rd among 145 countries worldwide.

Academia

According to the 2019 QS World University Ranking, most of the top five universities in Colombia offer technological undergraduate and postgraduate degrees that develop capacity in AI technology development (Table 18). Similar to the Chilean case, three out of five of the country's most important universities are private, which poses a challenge for the access of the general population to higher education. These academic centers are concentrated in the northwestern part of the country, which could constitute a limitation in this same sense, as seen in the 2019 QS World University Rankings.

Table 18. The Top Five Universities in Colombia and Their Relationship with AI

	1. Universidad de los Andes	2. Universidad Nacional de Colombia	3. Universidad Externado de Colombia	4. Pontificia Universidad Javeriana	5. Universidad de Antioquia
Type of Institution	Private	Public	Private	Private	Public
Location	Bogotá and Cartagena	Eight branches*	Bogotá	Bogotá, Cali	Medellín
AI-related degrees	✓	✓	✗	✓	✓
AI-related postgraduate programs	✓	✓	✗	✓	✓
AI research	✓	✓	✗	✓	✓
AI laboratory	✗	✓	✗	✓	✓
Technological innovation laboratory	✓	✓	✗	✓	✓

Source: Prepared by the authors based on information obtained from the website of each institution.
Note: The Universidad de los Andes and the Universidad de Antioquia are also among the top five universities in the 2020 Times Higher Education ranking.
*Bogotá, Medellín, Manizales, Palmira, Amazonas, Caribe, Tumaco, and Orinoquía.

In Colombia, cross-sectoral partnerships are commonplace. Some of the AI centers listed above receive support through, for example, the MinCiencias (previously known as Colciencias or the Administrative Department of Science, Technology and Innovation). This agency, along with the MinTic, develops and implements AI projects in which universities and private actors such as *Grupo Bancolombia* participate.

Other Relevant Institutions

Colombia has numerous research institutions that aim to gain more knowledge in AI. Among them is the *Universidad Internacional de la Rioja-Colombia*, which offers a master's degree in AI, and the Universidad de

Medellín, which leads a line of research in AI for several programs through the Research Group in Systems Engineering and Telecommunications Engineering (*Grupo de Investigación de Ingeniería de Sistemas e Ingeniería de Telecomunicaciones*).

The Centro de Innovación Tecnológico Industrial de Colombia of the Ibero-American University Foundation (*Fundación Uniberitaria Iberoamericana* - FUNIBER), which has the support of the *Caja Colombiana de Subsidio Familiar*, aims to exponentially broaden innovation in Colombian companies from a technological perspective in terms of both their products and processes.

The Entrepreneurship Ecosystem and Civil Society

Colombia is the most competitive country in LAC included in this report, with a ranking of 28th out of 140 on the World Economic Forum's 2018 Global Competitiveness Index. Furthermore, it is among the LAC countries that have made the greatest progress in start-ups that harness AI. One of the most outstanding examples is Rappi, the first Colombian unicorn technology. Rappi is a delivery service of products operating in nine LAC countries. Among various ways it harnesses AI, Rappi has developed and implemented its own digital banking system, which uses FinTech to tackle the lack of access to finance that prevails in Colombia. Another innovative example is NUXTU,[103] which uses AI to simulate and improve the range of the human senses such as taste and smell through electronic noses and taste buds.

According to local experts, the main proponents of entrepreneurship in Colombia are the national government and subnational administrations, which have promoted the creation of companies through a more flexible legal framework and tax incentives. Some examples of entrepreneurship are discussed below.

Colombia.AI: This community of volunteer experts, trainees, and enthusiasts of machine learning works to disseminate knowledge about data science and AI. Through free monthly discussions and workshops, Colombia.AI shares knowledge, teachings, and experiences about technologies that exploit the power of data. Its purpose is to unite industry and academia to support the growth and development of AI in Colombia. This community currently has over 5,700 members in two cities, Bogotá and Barranquilla.

World Economic Forum Center for the Fourth Industrial Revolution: This center, located in Medellin, is the WEF's first center in Latin America and fifth in the world, along with those in San Francisco, Tokyo, Beijing, and Mumbai. The center strengthens Colombia's agenda for the development of AI policy frameworks, blockchains, and the Internet of Things. Additionally, it seeks to disseminate the benefits and mitigate the risks of emerging technology.[104]

Ruta N: This company emerged in Medellín in 2009 as a center of innovation and business. Its goal is to contribute to improving the quality of life of the inhabitants of Medellin, Colombia's second largest city, through science, technology, and innovation. Its vision is directed toward transforming Medellín into a city where innovation is the main catalyst of the economy. To achieve this, it seeks out talent, capital, and global companies to come to the city, strengthens the innovative and entrepreneurial business fabric, and generates science, technology and innovation (STI) solutions for the challenges Medellin faces. Ruta N is also home to the WEF's Center for the Fourth Industrial Revolution.

When it comes to the efforts of civil society organizations, some center on the issue of digital rights. For example, *Fundación Karisma* works to promote human rights in the digital environment. Another foundation, *Derechos Digitales de Latinoamérica*, has among its goals to incorporate the use of AI in public discourse in Colombia. This nongovernmental organization strives to democratize new technologies and drive the use of an Internet that is more open, safe, and respectful of human rights.

103 For more information, see https://www.nuxtu.co/

104 To achieve this, the center brings together governments, leading companies, civil society organizations, and experts from around the world to co-design and test innovative approaches to policy and technology for governance, and to develop pilot projects.

Use Cases

Table 19 provides a synopsis of the main AI use cases in Colombia.

Table 19. Main AI Use Cases in Colombia

Name: 1DOC3		
For more information: www.1doc3.com	Year it began to use AI: 2015	Sustainable Development Goals 3 (good health and well-being), 4 (quality education), 10 (reduced inequalities)
Actors involved: 1DOC3		Current status: Start-up in scaling stage
What it proposes: Since LAC only has 1.9 doctors per every 1,000 inhabitants, and only 5 percent of the population can afford private health insurance, 1DOC3 offers the first level of access to healthcare through technology.		
Brief description of project: 1DOC3 is a digital platform that offers virtual medical orientation so that anyone can seek advice online, ask questions or chat with a doctor at an affordable price, or access reliable information that is free of cost. 1DOC3 is available throughout the Spanish-speaking world and offers this service to 1 million people every month.		
AI applications	Natural language generation, decision-making, natural language processing	
How AI is used	The1DOC3 model uses data from medical encyclopedias, external medicine libraries, and physician labels formulated by more than 400 doctors, as well as the questions and answers that circulate on the platform.	

Source: Information provided by 1DOC3 for the preparation of this report.

Name: Acuerdos de Paz		
For more information: http://www.acuerdosdepaz.co/	Year it began to use AI: 2008	Sustainable Development Goal 16 (peace, justice, and strong institutions)
Actors involved: Quantil		Current status: Government project and start-up in scaling stage
What it proposes: Facilitate citizen understanding of the legal documents stemming from the Colombian Peace Process so as to democratize understanding of compliance with them.		
Brief description of project: The government of Colombia and the Revolutionary Armed Forces of Colombia (FARC) signed the "General Agreement for the Termination of the Conflict and the Construction of a Stable and Lasting Peace." It is a lengthy document that is difficult to read, which is why Quantil created an algorithm that analyzes the text and can answer specific questions of citizens with graphs and concise replies.		
AI applications	Natural language processing	
How AI is used	Quantil built mathematical models to develop a series of algorithms and services available online that facilitate an efficient and intuitive study of the agreement. The algorithms analyze text and generate images, text, and graphs to answer questions such as the following: Q: Does the agreement address jail terms? A: Yes, under Point 5	

Source: Information provided by Quantil for the preparation of this report.

Name: System to Identify Eligibility for Social Programs (Sistema de Selección de Beneficiarios para Programas Sociales - SISBEN)		
For more information: https://www.sisben.gov.co/	Year it began to use AI: 2019	Sustainable Development Goal 1 (no poverty)
Actors involved: National Planning Department, governorships, municipalities		Current status: Government project in scaling stage
What it proposes: Improve the distribution of resources to social assistance programs.		
Brief description of project: SISBEN is a national survey that Colombia uses to obtain reliable and up-to-date socioeconomic information about the most disadvantaged groups throughout the country. It allows for classifying the population according to socioeconomic levels so as to optimize the distribution of resources for social programs.		
AI applications	Support for decision-making	
How AI is used	Throughout the survey, a machine learning model (Quentile Gradient Boosting) is applied to identify potential beneficiaries of social assistance programs. The SISBEN IV methodology allows for identifying both income poverty and multidimensional poverty in the population.	

Source: Information provided by the Departamento Nacional de Planeación for the preparation of this report.

Conclusions

In the years to come and in line with its National Development Plan, Colombia proposes to make significant changes based on the use of technology. One of its major goals is to democratize the Internet and achieve full network coverage across the country. With the Open Data Portal and the 5G antenna and prototype infrastructure, the aim is for AI adoption that is carried out in a more comprehensive manner. Moreover, the country is a pioneer in government implementation of an AI strategy. Unlike other nations in the region, Colombia is already executing its AI development and adoption plan at the national level.

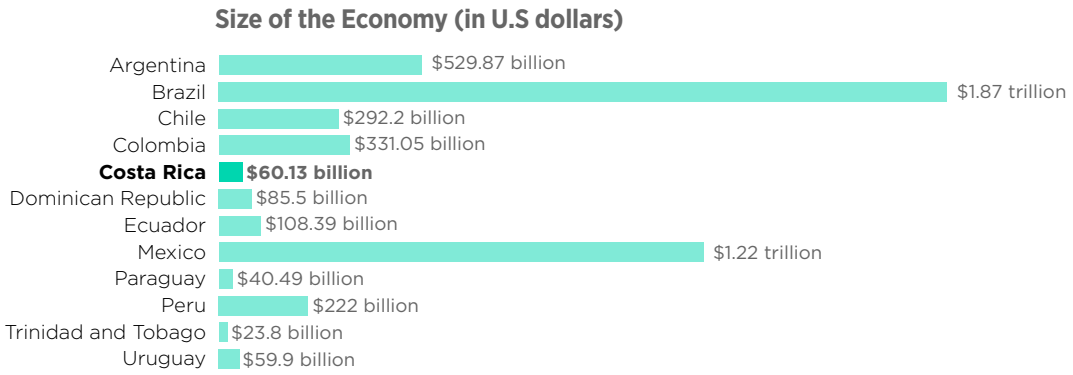
In the academic field, universities and research centers have prepared diverse studies on AI and its applications. At the same time, these centers work together with the business and government sectors, as is demonstrated by use cases such as Ruta N and the WEF's Center for the Fourth Industrial Revolution, both instigated by the government through financing and support policies.

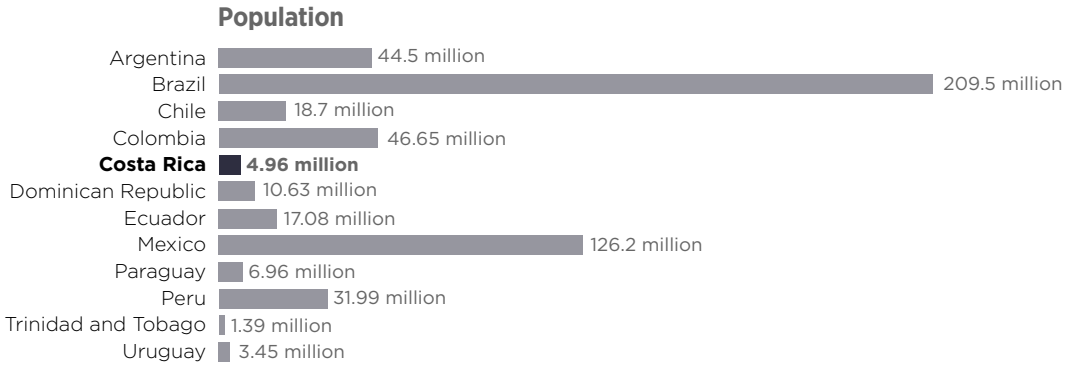
It is worth noting that the private sector is not the only one with an interest in contributing to AI implementation. Civil society organizations have launched initiatives that foster AI use, while also addressing the ethical and legal conditions of adopting this new technology.

COSTA RICA

To describe the current status of AI in Costa Rica within a broader context, Figure 11 presents a comparison of selected economic, demographic, education, human development, and equality indicators, while Table 20 presents other socioeconomic indicators.

Figure 11. Costa Rica Core Indicators: Comparison Chart





Human Development Indicators

	Program for International Student Assessment	English Proficiency (percent)	Skilled Workforce (percent)	Human Development Index	Gini Coefficient
Argentina	N/A	58.38%	63.4%	0.825	41.2
Brazil	N/A	50.1%	62%	0.759	53.12
Chile	1st	52.89%	69.2%	0.843	46.6
Colombia	N/A	57.38%	58.2%	0.747	49.7
Costa Rica	**N/A**	**48.75%**	**48.3%**	**0.794**	**48.3**
Dominican Republic	N/A	46.75%	46.6%	0.752	44.7
Ecuador	N/A	46.75%	46.6%	0.752	44.7
Mexico	3rd	48.99%	40%	0.774	48.3
Paraguay	N/A	52.51%	43.8%	0.702	48.8
Peru	N/A	50.22%	83.6%	0.750	43.3
Trinidad and Tobago	N/A	N/A	71.8%	0.784	40.3
Uruguay	2nd	54.1%	25.5%	0.804	30.5

Sources: Panels a and b: World Bank (2019a); Panel c: (from left to right): OECD (2019);); Education First (2019); United Nations (2019); UNDP (2019); World Bank (2018).

Table 20. Other Socioeconomic Indicators

Main Economic Sector (World Bank 2019a)	**Program for International Student Assessment** (OECD 2019)	**Science, Technology, Engineering and Mathematics (STEM) Gender Index** (Arredondo et al. 2019)
Agricultural	Above the average for the 12 countries	40 percent*
National Entrepreneurship Context Index – Global Entrepreneurship Monitor (Bosma and Kelley 2019)	**CIVICUS Monitor** (2019)	
n.a.	Operating conditions of civil society organizations: open (1/5)**	

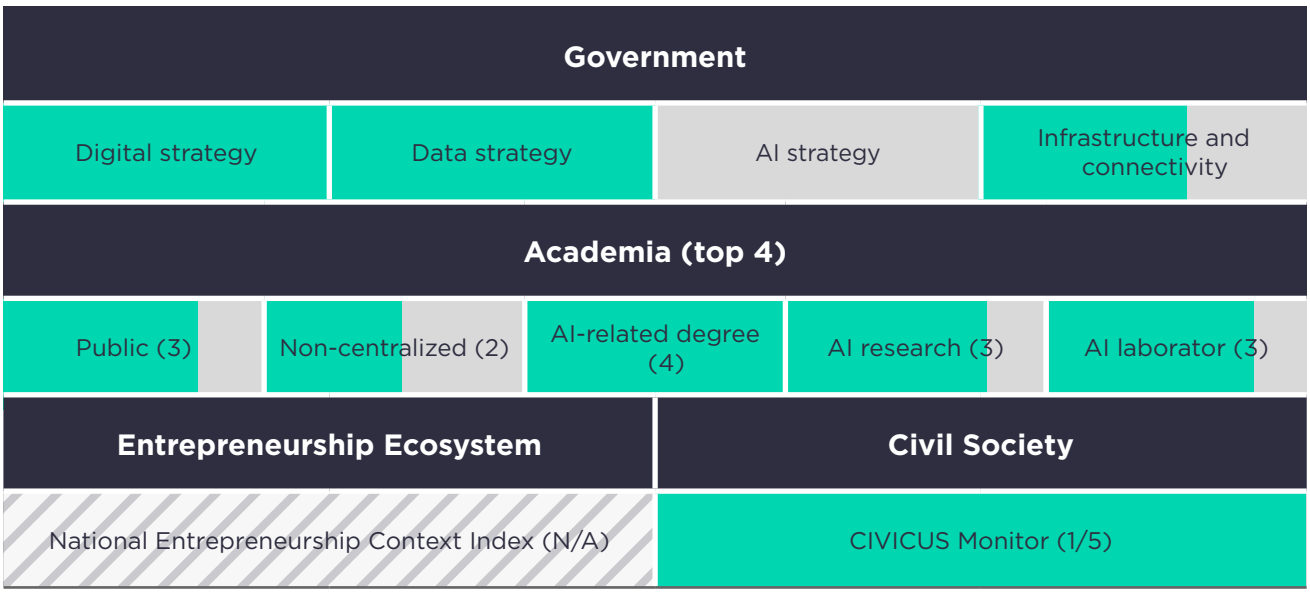
Source: Prepared by the authors.

* Participation of female researchers in STEM fields in the public sector (in comparison to men).

** This indicator is explained in Annex B.

Table 21 summarizes the progress made by various sectors in Costa Rica in terms of establishing the foundations for driving AI in service of social good.

Table 21. Efforts to Establish the Foundations of AI in Costa Rica, by Sector



Source: Prepared by the authors. The indicators are found in Annex B.

Government

Digital Strategy: Yes

Costa Rica's 2018–2022 Digital Transformation Strategy is the product of a consultation and co-creation exercise among diverse actors to outline the country's digitalization vision for the short, medium, and long terms.[105] It sets out the strategic axes and lines of action for the upcoming years for Costa Rica to become digitally inclusive, technologically best connected, and productively more innovative. The final goal of these transformations is to improve the quality of life of the country's citizens, ensure the business conversion for

105 For more information, see https://micit.go.cr/images/imagenes_noticias/17-10-2018_Estrategia_de_Transformaci%C3%B3n_Digital_hacia_la_Costa_Rica_del_Bicentenario/estrategia_de_transformacion_digital_de_costa_rica.pdf

Industry 4.0, and improve the citizen-government relationship. The axes include digital government, business transformation, innovative society, good governance, and *Costa Rica Conectada*.

in the strategy document, Costa Rica recognizes the strategic use of technologies to achieve the comprehensive transformation of people, guided by the basic principles of the 2030 Sustainable Development Agenda. Similarly, the country adheres to the commitments of the Digital Agenda for Latin America and the Caribbean (ECLAC 2019), which include the development of digital infrastructure; promotion of digital transformation and the digital economy, regional digital market, digital government, culture, inclusion, and digital skills; and the use of emerging technologies for sustainable development.[106]

Costa Rica has led bilateral efforts with the United Arab Emirates (UAE) to accelerate its technological development. This included the signing of a letter of intent between the Costa Rican government (through the Ministry of Science, Technology and Telecommunications) and the UAE government to carry out mutually beneficial cooperation activities. Both nations have committed to conduct training activities on issues relating to data mining and intelligence.

Costa Rica has a high ranking on Statista's E-government Development Index (0.70 out of 1) and Penplusbytes' Public Service Delivery Index (0.67 out of 1), which places it among the top 10 countries on digital government issues in Latin America, according to a United Nations ranking.

Data Strategy/Open Data Portal: Yes

Every two years since 2013, government, academia, the private sector, and civil society have jointly developed Open Government Action Plans that outline the roadmap of a series of commitments to promote transparency, accountability, and inclusion.[107] To date, Costa Rica has developed three bi-annual action plans (2013–2014, 2015–2017, and 2017–2019) that include 58 commitments.

In addition to these plans, in the context of its open government initiative, Costa Rica has an Open Data Portal that allows citizens to access information about the different ministries and other official entities on topics such as industry, economics, and trade.[108]

AI Strategy: No

In Costa Rica, no efforts have been made and none are under way to define a national AI strategy. However, certain issues related to this technology – including Industry 4.0. technologies, intelligent digital government, and inclusive integrated services, among others – are addressed in the 2018–2022 Digital Transformation Strategy mentioned above.

According to a study commissioned by Microsoft and conducted by the Center for the Implementation of Public Policies for Equity and Growth (CIPPEC), Costa Rica has significant potential for AI development. The study suggests that if the adoption rate of AI-related technologies increases, economic growth could increase by 1 additional percentage point of GDP per year in the next decade, reaching 5.7 percent. To overcome the challenges and seize this opportunity, the role of the government is key to promoting and facilitating the technology adoption process (Albrieu et al. 2019).

Infrastructure and Connectivity

Compared to the regional mean, Costa Rica has high levels of digital connectivity and infrastructure. It ranks

106 As a result of these efforts, in recent years important achievements have been made on digital government. As an illustration, Costa Rica recognizes electronic signatures and digital legal documents thanks to the Single Digital Health Record (*Expediente Digital Único en Salud* - EDUS).

107 For more information, see http://gobiernoabierto.go.cr/planes-de-accion/

108 For more information, see http://datosabiertos.presidencia.go.cr/home

3rd on the World Economic Forum's 2016 Networked Readiness Index, which reflects digital adoption by 66 percent of its population. Costa Rica´s scores 63 percent on the World Bank's Digital Adoption Index.

According to a report by GSMA Intelligence (2018), Costa Rica is an example of successful coordination between different public entities on infrastructure to promote digital inclusion. In 2015, the government launched the National Development Telecommunications Plan to reduce the digital gap, promote the efficient use of the spectrum, and provide universal and affordable access to broadband, all of this taking into account that a large number of users access the Internet from their mobile phones. This plan was jointly developed by the Ministry of Science, Technology and Telecommunications (the main regulator (Sutel), the Costa Rica Department of Social Security, and the Ministries of Health and Education.

Currently, according to data from the GSMA, mobile Internet reaches a little over 60 percent of the Costa Rican population, which places the country fourth in LAC in terms of highest mobile Internet penetration after Chile, Uruguay, and Argentina (GSMA Intelligence 2018).

In cybersecurity, the International Telecommunications Union gives Costa Rica a score of 0.221 out of 1 on its 2018 Global Cybersecurity Index, which is 18th out of 33 countries in the Americas and 115th out of 145 countries worldwide.

Academia

According to UNESCO data, Costa Rica has 572 researchers per million inhabitants (UNESCO 2019). In addition to the work carried out in the field of AI by the National Center for High Technology (*Centro Nacional de Alta Tecnología* - CeNAT), the four Costa Rican universities that are best ranked for their undergraduate programs in the 2019 QS World University Rankings conduct AI research and offer degrees in the subject matter. Three of them are public, which facilitates access for preparing and training talent. They are mostly located in the center of the country, although since Costa Rica is a small country it has an adequate public transport system and therefore there are few difficulties for those individuals wanting to access this type of education.

Under the selection criteria detailed at the beginning of this document, Costa Rica has four universities in the 2019 QS World University Ranking (Table 22).

Table 22. The Top Four Universities in Costa Rica and Their Relationship with AI

	1. Universidad de Costa Rica	2. Universidad Nacional Costa Rica	3. Tecnológico de Costa Rica	4. Universidad Latinoamericana de Ciencia y Tecnología
Type of Institution	Public	Public	Public	Private
Location	San José	Heredia	Cartago	San José
AI-related degrees	✓	✓	✓	✓
AI-related postgraduate programs	✓	✗	✓	✓
AI research	✓	✗	✓	✓
AI laboratory	✓	✓	✓	✓
Technological innovation laboratory	✓	✓	✗	✓

Source: Prepared by the authors based on information obtained from the website of each institution.

Note: The Universidad de Costa Rica is ranked the best university of the country in the 2020 Times Higher Education ranking.

Other Relevant Institutions

In addition to the universities listed in Table 22, it is worth mentioning that the *Colegio Técnico Profesional de Escazú* inaugurated a neuroscience and AI classroom, the first of its kind in Latin America. The goal of the local government of Escazú is to become an intelligent city, and the establishment of this classroom is a direct contribution towards this aim.

One of the particular strengths of Costa Rica is its robust partnerships across sectors. For example, in an effort to expand AI education in Costa Rica, the Ministry of Science, Technology and Telecommunication (*Ministerio de Ciencia, Tecnología y Telecomunicaciones* - MICITT) partnered with Texas Tech University to offer an introductory program on AI to professionals from branches of systems engineering, ICT, and related areas. All candidates were given full scholarships. This initiative was part of efforts by the MICITT's Innovation and Human Capital for Competitiveness Program (PINN), which is financed by the IDB.

For its part, the Costa Rica Institute of Technology (*Instituto Tecnológico de Costa Rica* - TEC) has hosted AI international events such as the International Work Conference on Bioinspired Intelligence. The conference was organized with four Costa Rican universities: *Universidad de Costa Rica*, *Universidad Nacional*, *Universidad Estatal a Distancia*, and *Universidad Técnica Nacional*.

Another relevant institution is the above-mentioned CeNAT, where universities cooperate with areas of government and the private sector. Founded by the National Council of University Presidents (*Consejo Nacional de Rectores* - CONARE), CeNAT focuses on research and development and postgraduate degrees in the areas of technology, including AI. The National Artificial Intelligence Laboratory (LaNIA, Spanish acronym), among other entities, also corresponds to CONARE.[109]

ONARE has four laboratories: (1) the PRIAS Laboratory, which performs analysis in the areas of photogrammetry, remote sensing, geographic information systems, spatial data infrastructure, geodesy, and computer science; (2) the National Nanotechnology Laboratory (*Laboratorio Nacional de Nanotecnología* - LANOTEC); (3) the CENIBiot Laboratory, which works on biotechnological scaling in the region; and (4) the National Advanced Computing Collaboratory (*Colaborario de Computación Avancada* -CNCA), which provides an interactive forum for researchers and developers of advanced computing to apply their skills to the natural sciences, humanities, engineering, social sciences, and the arts.[110]

In 2018 alone, CeNAT registered 202 projects developed within the framework of a tripartite collaboration (academia, government, and private sector); conducted 319 knowledge transfers; published 54 scientific publications; had two researchers in the U.S. inventors registration; had 210 cluster users (supercomputer); provided 126,260 public university students and professors with access to the Eduroam network; participated in five international competitions and scientific fairs; provided 4,000 farmers with technical assistance on climate variability and climate change issues; and produced 276 publications in specialized media (Sibaja 2019).

The Entrepreneurship Ecosystem and Civil Society

Costa Rica is ranked fourth in Latin America among the top countries for developing businesses (Bosma and Kelley 2019). The country has several collaborative programs in AI for social good that are linked to regional initiatives and international actors to maximize their impact.

109 In addition to the collaboration between the five universities that constitute CeNAT (*Tecnológico de Costa Rica*, *Universidad de Costa Rica*, *Universidad Nacional de Costa Rica*, *Universidad Técnica Nacional*, and *Universidad Estatal a Distancia*), CeNAT has partnerships with the government through the MICITT and CONICIT, as well as with institutions, businesses, and prestigious national and international research centers.

110 The CNCA participates in scientific research and technological development projects in collaboration with Costa Rican public universities and in coordination with sectors such as government and industry. In these joint projects, the collaborators perform scientific and technical research and tasks, support computer infrastructure development, develop training programs, provide asset management consulting for projects, and collaborate on establishing partnerships and networks (*Centro Nacional de Alta Tecnología* 2017).

Costa Rica is part of the Google Developer Group, which seeks to connect and drive developers to use Google technologies. Within the context of this group, Costa Rica promotes and disseminates technical educational information. It also has a 10x Impact chapter that promotes preparation for the future of work in the context of technological acceleration and automation through education and the dynamism of the entrepreneurship ecosystem.

The country participates in two other recent initiatives. One is fAIr Costa Rica, which a is collaboration between the IDB Group and the government of Costa Rica to promote responsible AI use in the delivery of social services by the public and private sectors. The other is Singularity Summit Costa Rica, which took place in February 2020. This summit gathered experts on technological and social innovation to promote learning about the use of new technologies, including AI.

Use Cases

Table 23 provides a synopsis of the main AI use cases in Costa Rica.

Table 23. Main AI Use Cases in Costa Rica

Name: PARMA		**Country: Costa Rica**
For more information: http://martinvc96.pythonanywhere.com/demo/	Year it began to use AI: 2018	Sustainable Development Goal 3 (good health and well-being)
Actors involved: Costa Rica Institute of Technology, Max Peralta Hospital, Costa Rican Social Security Fund		Current status: Academic project in initial stage
What it proposes: Facilitate and provide access to breast histopathology analyses.		
Brief description of project: Through a system called HATCH, PARMA facilitates the detection of phenotype regulation networks that proliferate cancerous cells after chemotherapy, helping doctors detect anomalies and diagnose breast cancer.		
AI applications	Machine learning platforms, activation maps, deep convolutional networks.	
How AI is used	PARMA develops an algorithm that performs a genomic functional analysis of cancer cells by interfacing RNA for the identification of regulatory networks associated with cell proliferation and death in response to genotoxic chemotherapy. It generates biocomputational tools, analysis of the data, and generation of hypotheses of potential control points of the phenomenon, which were validated experimentally.	

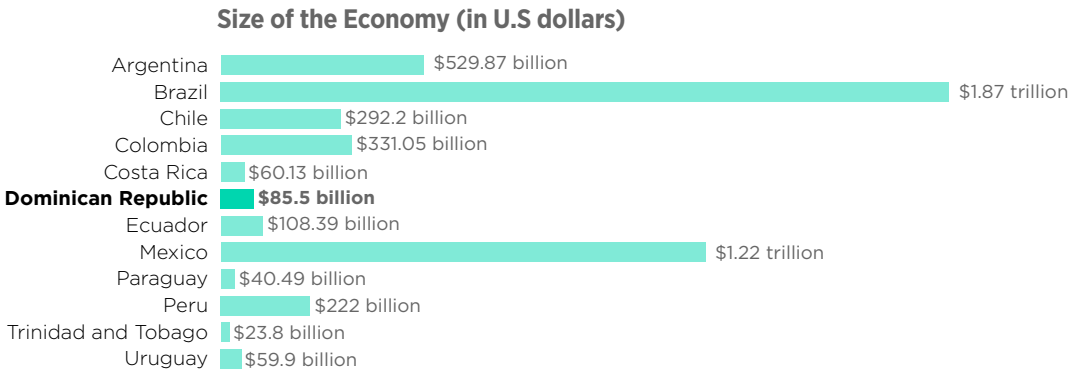
Conclusions

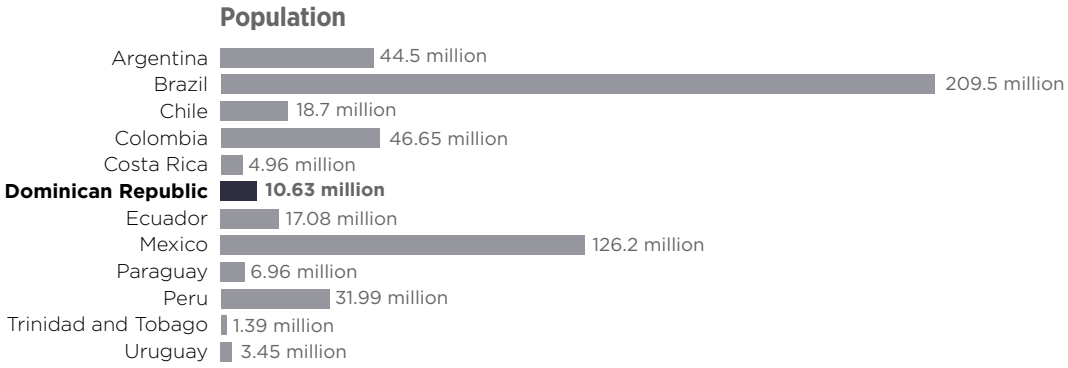
The transformative approach of Costa Rica's digital strategy shows that the public sector is interested in the development of new technologies. However, the AI ecosystem is still incipient, although there are a few promising initiatives such as the fAIr LAC hub in Costa Rica, whose objective is to become a space for experimentation for the multiple actors involved in the application of AI for social good use cases and the delivery of more effective public services.

DOMINICAN REPUBLIC

To describe the current status of AI in the Dominican Republic within a broader context, Figure 12 presents a comparison of selected economic, demographic, education, human development, and equality indicators, while Table 40 presents other socioeconomic indicators.

Figure 12. Dominican Republic Core Indicators: Comparison Chart





Human Development Indicators

	Program for International Student Assessment	English Proficiency (percent)	Skilled Workforce (percent)	Human Development Index	Gini Coefficient
Argentina	N/A	58.38%	63.4%	0.825	41.2
Brazil	N/A	50.1%	62%	0.759	53.12
Chile	1st	52.89%	69.2%	0.843	46.6
Colombia	N/A	57.38%	58.2%	0.747	49.7
Costa Rica	N/A	48.75%	48.3%	0.794	48.3
Dominican Republic	**N/A**	**46.75%**	**46.6%**	**0.752**	**44.7**
Ecuador	N/A	46.75%	46.6%	0.752	44.7
Mexico	3rd	48.99%	40%	0.774	48.3
Paraguay	N/A	52.51%	43.8%	0.702	48.8
Peru	N/A	50.22%	83.6%	0.750	43.3
Trinidad and Tobago	N/A	N/A	71.8%	0.784	40.3
Uruguay	2nd	54.1%	25.5%	0.804	30.5

Sources: Panels a and b: World Bank (2019a); Panel c: (from left to right): OECD (2019);); Education First (2019); United Nations (2019); UNDP (2019); World Bank (2018).

Table 24. Other Socioeconomic Indicators

Main Economic Sector (World Bank 2019a)	**Program for International Student Assessment** (OECD 2019)	**Science, Technology, Engineering, and Mathematics (STEM) Gender Index** (Arredondo et al. 2019)
Tourism	Above the average for the 12 countries	37 percent*
National Entrepreneurship Context Index – Global Entrepreneurship Monitor (Bosma and Kelley 2019)	**CIVICUS Monitor** (2020)	
4.6/10	Operating conditions of civil society organizations: narrowed (2/5)**	

Source: Prepared by the authors.
* Participation of women researchers in the Dominican Republic in the STEM fields (in comparison to men).
** This indicator is explained in Annex B.

Table 25 summarizes the progress made by various sectors in the Dominican Republic in terms of establishing the foundations for driving AI in service of social good.

Table 25. Efforts to Establish the Foundations of AI in the Dominican Republic, by Sector

Government			
Digital strategy	Data strategy	AI strategy	IInfrastructure and connectivity
Academia (top 4)			
Public (1)	Non-centralized (1)	AI-related degree (3)	AI research (2)	AI laborator (2)
Entrepreneurship Ecosystem		**Civil Society**	
National Entrepreneurship Context Index (N/A)		CIVICUS Monitor (2/5)	

Source: Prepared by the authors. The indicators are found in Annex B.

Government

Digital Strategy: Yes

The Dominican Republic's 2016–2020 Digital Agenda is comprised of a set of action lines directed towards generating favorable conditions for implementing a development and innovation model through ICT.[111] Its objectives include increasing competitiveness, technology use, government transparency and employment options, as well as reducing poverty and providing better services through digital government and an open data portal.

The Digital Agenda has five main axes: (1) infrastructure and access; (2) electronic government and digital services; (3) skills training; (4) productive development and innovation; and (5) an enabling environment.

111 For more information, see https://www.siteal.iiep.unesco.org/sites/default/files/sit_accion_files/do_0352.pdf

Furthermore, the agenda has two cross-cutting axes: cybersecurity and social inclusion. Each axis has its own list of indicators for measuring the progress of each objective.

Data Strategy/Open Data Portal: Yes

The Open Data Portal is the official platform of the Dominican Republic.[112] The website is a unified repository of institutional open-access publications. The purpose of this tool is to enable users to convert data into reusable information and take advantage of the different public data bases. It also seeks to facilitate the development of applications by public administration and civil society. The portal has 722 data sets from 195 entities.

AI Strategy: No

At the time of this writing, the government of the Dominican Republic did not have an AI national strategy.

Infrastructure and Connectivity

In 2018, at least 75 percent of the Dominican population had Internet access (UNESCO 2019). The country's score on the World Bank's Digital Adoption Index is 50 percent, while its score on the World Economic Forum's Networked Readiness Index is 42 percent.

Even though income inequality is one of the major obstacles to reducing the digital gap in LAC, the Dominican Republic is one of seven countries in the region that are above the affordability threshold regarding mobile connectivity services (GSMA 2016). This is the case at both the government and ecosystem levels, since for the digital adoption indicators for the public sector and for all actors in general, the Dominican Republic is at the bottom of the scale among the countries studied for this report (GMSA 2016).

On cybersecurity, the Dominican Republic ranks 10th among 33 countries in the Americas and 92nd out of 145 countries worldwide. On the International Telecommunications Union's 2018 Global Cybersecurity Index the country has a score of 0.430 out of 1.

Academia

Although there are AI-related higher education offerings in the Dominican Republic, postgraduate options are still limited, as is AI-related research at specialized centers. However, some promising initiatives have been advanced through the collaboration between the Santo Domingo Technological Institute (*Instituto Tecnológico de Santo Domingo* – INTEC) and the IDB to open the Innovation and Territorial Intelligence Laboratory for Dominican Cities (*Laboratorio de Innovación e Inteligencia Territorial para Ciudades Dominicanas*).[113] The laboratory seeks to encourage open data, accelerate innovative ideas and create interaction tools to implement them, and promote the scaling of the laboratory itself. The project has the support of other actors such as the *Ministerio de Industria, Comercio y MIPyMES* (MICM); the *Consejo para el Desarrollo de Santiago* (CDES); the Santiago Duty-Free Zone Corporation (CZS); and the *Mancomunidad del Gran Santo Domingo* (MGSD). For their part, the respective city councils are supporting this initiative through the Dominican Federation of Municipalities (*Federación Dominicana de Municipios* - FEDOMU) and the Dominican Municipal League (*Liga Municipal Dominicana* - LMD).

Since the QS World University Ranking does not include the Dominican Republic in its university rankings, the top three universities cited in Última Hora (2017) are included in Table 26.

112 For more information, see https://datos.gob.do/

113 For more information, see https://www.iadb.org/es/project/DR-T1160

Table 26. The Top Three Universities in the Dominican Republic and Their Relationship with AI

	1. Pontificia Universidad Católica Madre y Maestra	2. Instituto Tecnológico de Santo Domingo	3. Universidad Autónoma de Santo Domingo
Type of institution	Private	Private	Public
Location	Santiago de los Caballeros	Santo Domingo	Santo Domingo
AI-related degrees	✓	✓	✓
AI-related postgraduate programs	✗	✗	✗
AI research	✓	✗	✗
AI laboratory	✓	✗	✗
Technological Innovation Laboratory	✓	✓	✗

Source: Prepared by the authors based on information obtained from the website of each institution.

Other Relevant Institutions

In addition to the above-mentioned universities, the Americas Technological Institute (*Instituto Tecnologico de las Americas* - ITLA) offers an AI diploma, while the Biotechnology and Industry Innovation Institute *(Instituto de Innovación en Biotecnología e Industria* – IIBI), which specializes in agricultural technology research and innovation, explores the use of emerging technologies, including AI.

The Entrepreneurship Ecosystem and Civil Society

The AI for social good entrepreneurship ecosystem is still incipient in the Dominican Republic. Some initiatives are beginning to appear, such as GENIA, which promotes the development of AI centers in the country and the region.[114] This organization also encourages Dominican youth to acquire the skills needed to bring together the local AI ecosystem with the development of an appropriate agenda.

A civil society initiative worth highlighting is the AI Society of the Dominican Republic (*Sociedad Dominicana de Inteligencia Artificial* - SODIA).[115] This association was founded in 2014 by a group of professors, students, and volunteers as a scientific not-for-profit institution dedicated to the study, research, and dissemination of AI as a scientific-technological discipline. SODIA aims to contribute to the creation of an AI ecosystem in the Dominican Republic by organizing local events and collaborating with international associations such as the U.S. Association for the Advancement of Artificial Intelligence, Canadian Artificial Intelligence Association, Spanish AI Association, Mexican AI Society, and Argentine AI Association.

Conclusions

The Dominican Republic's 2016–2020 Digital Agenda is one of the first steps towards AI adoption. Despite the fact that the country has a data protection law, it does not yet have an institutional AI strategy. However, the country's open data portal and high Internet access rate (75 percent) constitute a solid foundation to harness this new technology. Its main universities have AI-related degree programs that will contribute to providing education and training in this area.

With the support of an entrepreneurial culture and infrastructure investment, it is possible that the private sector and start-up companies will come to play a central role in AI development and adoption, which can also be used as a tool to strengthen mechanisms to mitigate the shortcomings of the most vulnerable groups. This will only be viable with the collaboration of different sectors and the continued support of international organizations.

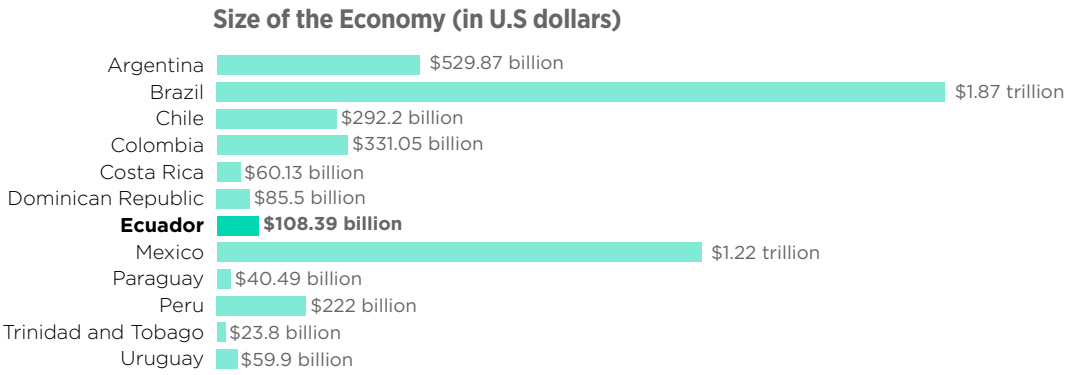
114 For more information, see https://www.lagenia.org/republica-dominicana

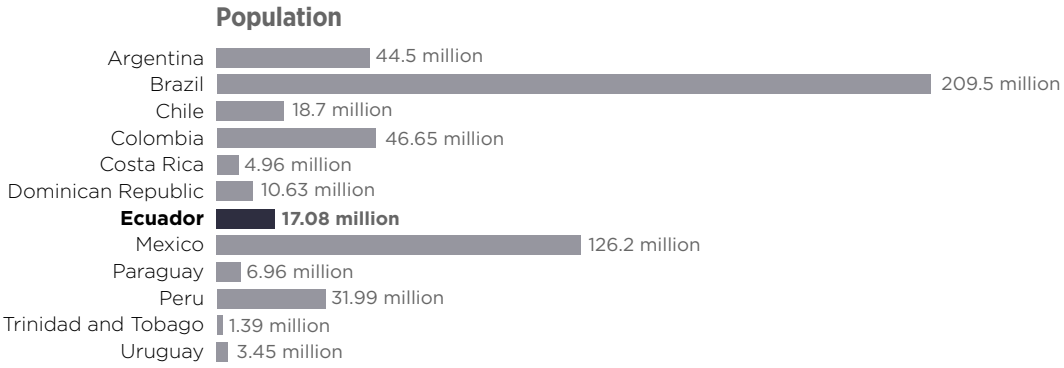
115 For more information, see http://www.socdia.org/

ECUADOR

To describe the current status of AI in Ecuador within a broader context, Figure 13 presents a comparison of selected economic, demographic, education, human development, and equality indicators, while Table 27 presents other socioeconomic indicators.

Figure 13. Ecuador Core Indicators: Comparison Chart





Human Development Indicators

	Program for International Student Assessment	English Proficiency (percent)	Skilled Workforce (percent)	Human Development Index	Gini Coefficient
Argentina	N/A	58.38%	63.4%	0.825	41.2
Brazil	N/A	50.1%	62%	0.759	53.12
Chile	1st	52.89%	69.2%	0.843	46.6
Colombia	N/A	57.38%	58.2%	0.747	49.7
Costa Rica	N/A	48.75%	48.3%	0.794	48.3
Dominican Republic	N/A	46.75%	46.6%	0.752	44.7
Ecuador	**N/A**	**46.75%**	**46.6%**	**0.752**	**44.7**
Mexico	3rd	48.99%	40%	0.774	48.3
Paraguay	N/A	52.51%	43.8%	0.702	48.8
Peru	N/A	50.22%	83.6%	0.750	43.3
Trinidad and Tobago	N/A	N/A	71.8%	0.784	40.3
Uruguay	2nd	54.1%	25.5%	0.804	30.5

Sources: Panels a and b: World Bank (2019a); Panel c: (from left to right): OECD (2019);); Education First (2019); United Nations (2019); UNDP (2019); World Bank (2018).

Table 27. Other Socioeconomic Indicators

Main Economic Sector (World Bank 2019a)	**Program for International Student Assessment** (OECD 2019)	**Science, Technology, Engineering, and Mathematics (STEM) Gender Index** (Arredondo et al. 2019)
Energy	n.a.	37 percent*
National Entrepreneurship Context Index – Global Entrepreneurship Monitor (Bosma and Kelley 2019)	**CIVICUS Monitor** (2019)	
n.a.	Operating conditions of civil society organizations: narrowed (2/5)**	

Source: Prepared by the authors.
* Participation of female researchers in STEM fields in the public sector (in comparison to men).
** This indicator is explained in Annex B.

Table 28 summarizes the progress made by various sectors in Ecuador in terms of establishing the foundations for driving AI in service of social good.

Table 28. Efforts to Establish the Foundations of AI in Colombia, by Sector

Government				
Digital strategy	Data strategy	AI strategy (being explored)	Infrastructure and connectivity	
Academia (top 5)				
Public (2)	Non-centralized (2)	AI-related degree (5)	AI research (4)	AI laborator (3)
Entrepreneurship Ecosystem		**Civil Society**		
National Entrepreneurship Context Index (52 percent)		CIVICUS Monitor (4/5)		

Source: Prepared by the authors. The indicators are found in Annex B.

Government

Digital Strategy: Yes

In July 2019, Ecuador launched its digital strategy to lead this South American nation to the forefront of technology by promoting the democratization of its telecommunications services. The strategy includes three programs: (1) *Ecuador Conectado* ("Connected Ecuador"), which seeks to reach 98 percent connectivity of telecommunications services by 2021; (2) *Ecuador Eficiente y Ciberseguro* ("An Efficient and Cybersafe Ecuador") whose purpose is to offer 80 percent of government services online by 2021; and (3) *Ecuador Innovador y Competitivo* ("An Innovative and Competitive Ecuador"), which aims to define the National Digital Transformation Agenda.

As part of this strategy, one of the government's goals is to install 1,000 free Wifi hotspots and to encourage e-commerce to make the country an innovative and competitive location (MINTEL 2019).

Data Strategy/Open Data Portal: Yes

In the context of the 2018–2021 National Electronic Government Plan, the Ministry of Telecommunications and Information Society of Ecuador, in coordination with the Presidency of Ecuador and the National Secretariat for Planning and Development, encouraged opportunities for involvement of citizens in the design of solutions that affect them. The National Data Policy came out of this initiative.

Ecuador is developing its own Open Data Portal.[116] As of end of 2019 it had 128 data sets from 16 agencies, and had an Open Data Guide,[117] a support tool to standardize information published by each official entity. Similarly, the government has undertaken other projects, including the creation of a BIOWEB database, which stems from the collaboration between the Secretariat of Higher Education Science, Technology and Innovation (*Secretaría de Educación Superior, Ciencia, Tecnología e Innovación* - SENESCYT) and the Pontificia Universidad Católica del Ecuador to produce the largest collection of data on biodiversity in Ecuador, which currently includes close to 470,000 national species.

AI Strategy: No

As of this writing Ecuador was holding dialogues between government, academia, industry, and civil society on the importance of initiating joint efforts for AI development. With this goal, the International Center for Higher Education Studies in Journalism for Latin America (*Centro Internacional de Estudios Superiores de Comunicación para América Latina* - CIESPAL) held a discussion group in 2019 to discuss progress made in incorporating AI in the fields of finance, transport, and health at the national level.

Infrastructure and Connectivity

Of the 12 countries studied for this report, Ecuador ranks second to last in terms of access to the Internet at 57 percent of the population (IDB 2020). It is also ranked low on the World Bank's Digital Adoption Index (9 out of 12) and on the World Economic Forum's Networked Readiness Index (8 out of 12). This implies that Ecuador still does not have the necessary structural capacity to adopt and develop AI-related technologies. However, the country is in the initial stages of building a framework within which this capacity may be generated and a process where relevant actors such as civil society, academia, and the private sector participate. The International Telecommunications Union's 2018 Global Cybersecurity Index ranks Ecuador 14th out of 33 countries in the Americas with a score of 0.367 out of 1, and 98th out of 145 countries worldwide.

Academia

In Ecuador, the government and academia work jointly to build bridges to connect AI with innovation through the National Science, Technology, Innovation and Ancestral Knowledge System.

According to the 2019 QS World University Rankings, the top three universities in the country for graduate studies (Table 29) have a limited offering of programs or spaces that foster AI development. Of these three, only the Escuela Politécnica del Litoral has undergraduate, graduate, research, and laboratories related to the development of technical AI capacity. It is worth noting, however, that while the other two universities do not offer technical degrees, they do generate knowledge through research on AI-related subjects, including those relating to ethics. Two of the three universities mentioned are private and are located in the capital city of Quito, while the third university is public and has two additional branches, one in Guayaquil and the other in Manglaralto.

116 For more information, see http://www.datosabiertos.gob.ec/

117 For more information, see http://www.datosabiertos.gob.ec/wp-content/uploads/downloads/2016/08/GuiaDatosAbiertos.pdf

Table 29. The Top Three Universities in Ecuador and Their Relationship with AI

	1. Universidad San Francisco de Quito	2. Escuela Superior Politécnica del Litoral (ESPOL)	3. Pontificia Universidad Católica del Ecuador (PUCE)*
Type of institution	Private	Public	Private
Location	Quito	Guayaquil and Manglaralto	Quito
AI-related degrees	✓	✓	✓
AI-related postgraduate programs	✗	✓	✗
AI research	Only as part of the thesis work of students and in fora **	✓	✓
AI laboratory	✓	✓	✗
Technological innovation laboratory	✗	✓	✗

Source: Prepared by the authors based on information obtained from the website of each institution.
* PUCE is also among the top five universities in the 2020 Times of Higher Education ranking.
**This university has hosted academic fora where knowledge on AI was shared.

Other Relevant Institutions

The *Universidad Internacional de la Rioja-Ecuador* offers a master's degree in AI to educate local talent. The country has non-university research centers that are partially committed to AI, such as the *Analítica de Datos e IA Aplicado a la Ciberseguridad* working group and the Smart Data Analysis Systems Group (SDAS Group), created by Professor Diego Peluffo of the *Universidad Yachay Tech*. These initiatives bring together experts and researchers from several academic institutions in Ecuador, Colombia, Brazil, and Argentina to research and analyze time-varying complex data, formal methods for machine learning, and sensor networks.

The Entrepreneurship Ecosystem and Civil Society

Ecuador ranks 91st out of 138 countries on the World Economic Forum's 2015 Global Entrepreneurship Index. No visible efforts have been made in terms of AI for social good. However, important progress has been made on issues relating to the development of an entrepreneurial culture and in promoting technology start-ups. For example, ImpaQto is a coworking space community that has been an important engine for the development of the entrepreneurship ecosystem.

With regard to civil society, topics such as science and technology are on its list of top priorities. Specifically, the *Corporación RED Infodesarrollo* carries out actions directed at designing mechanisms that guarantee citizens' rights to access information technologies.

Use Cases

Table 30 provides a synopsis of the main AI use cases in Ecuador.

Table 30. Main AI Use Cases in Ecuador

Name: SpeakLiz		
For more information: https://www.talovstudio.com	Year it began to use AI: 2019	Sustainable Development Goals 4 (quality education), 8 (decent work and economic growth), 10 (reduced inequalities)
Actors involved: Talov Studio		Current status: Start-up company in initial phases
What it proposes: There are 290 million blind people and 470 million deaf people worldwide. This initiative promotes effective and absolute inclusion of these groups with disabilities.		
Brief description of project: Talov offers accessibility tools that are compatible with mobile telephones that help people with hearing and visual impairments raise their levels of independence in daily tasks. The SpeakLiz application allows users to transform sign language to voice and text in real time.		
AI Applications	Machine learning platforms, natural language processing, image recognition, sound recognition, gesture recognition (human movement).	
How AI is used	Through image and gesture recognition and natural language processing, the AI model translates movements into spoken language.	

Source: Information provided by Talov Studio for the preparation of this report.

Conclusions

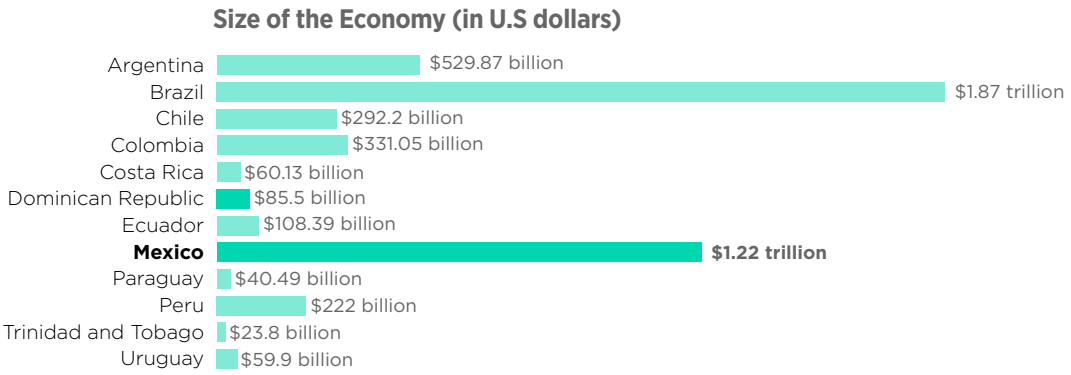
Ecuador's national digital strategy, Ecuador Digital, aims to move the country to the forefront of connectivity, efficiency, cybersecurity, innovation, and competitiveness (MINTEL 2019). The government has shown interest in involving the different sectors to lay the groundwork for the country's digitalization, providing citizens with free Internet and the business sector with incentives for electronic commerce. In the context of the National Open Data Policy, the country created an Open Data Portal as a result of the participation of several sectors in the development of this initiative.

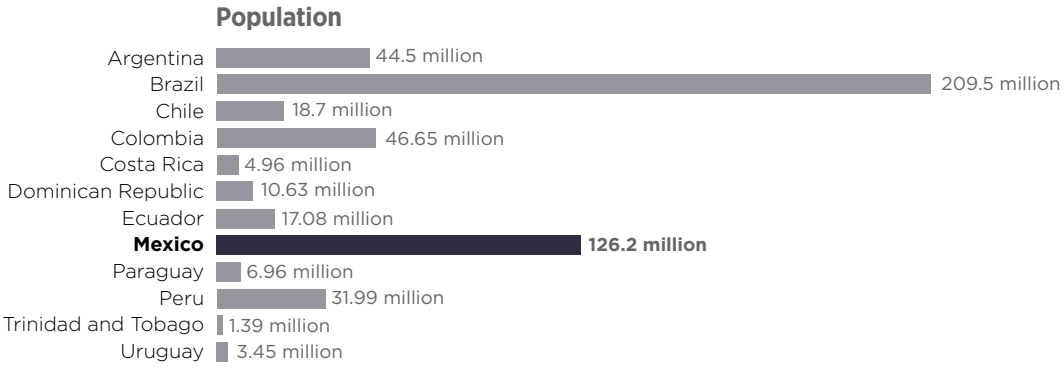
While the academic offering in Ecuador is burgeoning compared with other countries in the region, it is important to recognize that knowledge must also generated in academia through research on AI-related subjects, and also on ethical and technical aspects. According to local experts, Ecuador still has difficulties establishing and developing new businesses. There are a few initiatives to address these issues, such as Ecuador Digital, which offers incentives for companies that seek to bolster the technology sector. The efforts made by Ecuador in AI are incipient. The potential to exploit this technology will depend, among other things, on improving the foundations of the country's digitalization.

MEXICO

To describe the current status of AI in Mexico within a broader context, Figure 14 presents a comparison of selected economic, demographic, education, human development, and equality indicators, while Table 31 presents other socioeconomic indicators.

Figure 14. Mexico Core Indicators: Comparison Chart





Human Development Indicators

	Program for International Student Assessment	English Proficiency (percent)	Skilled Workforce (percent)	Human Development Index	Gini Coefficient
Argentina	N/A	58.38%	63.4%	0.825	41.2
Brazil	N/A	50.1%	62%	0.759	53.12
Chile	1st	52.89%	69.2%	0.843	46.6
Colombia	N/A	57.38%	58.2%	0.747	49.7
Costa Rica	N/A	48.75%	48.3%	0.794	48.3
Dominican Republic	N/A	46.75%	46.6%	0.752	44.7
Ecuador	N/A	46.75%	46.6%	0.752	44.7
Mexico	**3rd**	**48.99%**	**40%**	**0.774**	**48.3**
Paraguay	N/A	52.51%	43.8%	0.702	48.8
Peru	N/A	50.22%	83.6%	0.750	43.3
Trinidad and Tobago	N/A	N/A	71.8%	0.784	40.3
Uruguay	2nd	54.1%	25.5%	0.804	30.5

Sources: Panels a and b: World Bank (2019a); Panel c: (from left to right): OECD (2019);); Education First (2019); United Nations (2019); UNDP (2019); World Bank (2018).

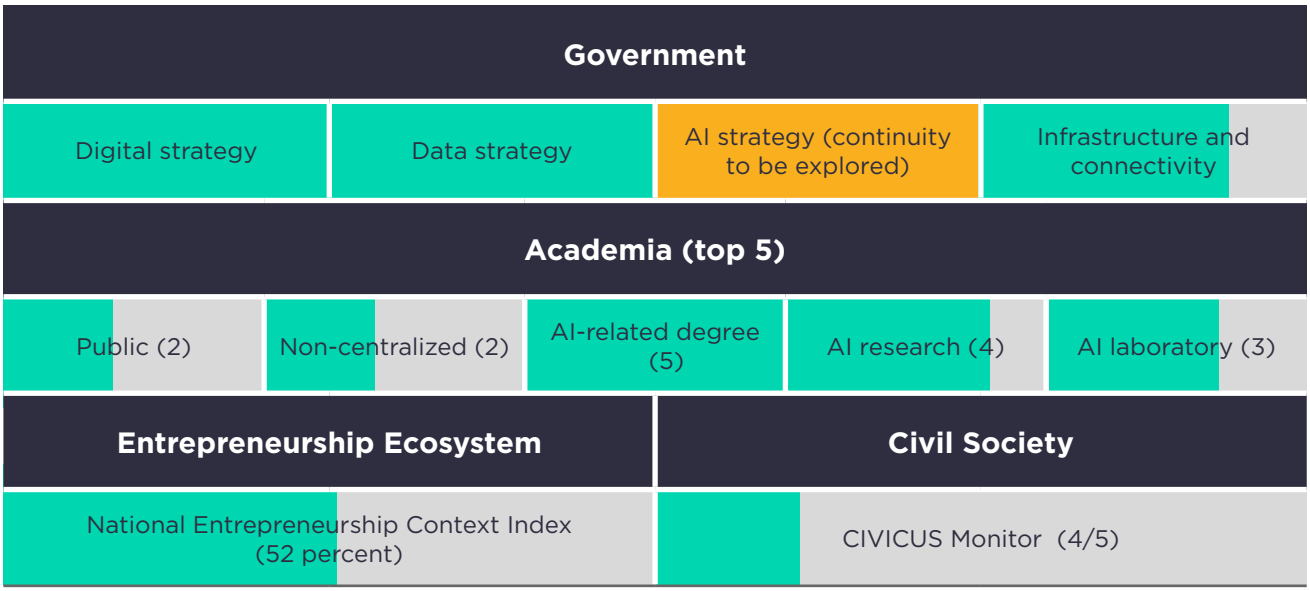
Table 31. Other Socioeconomic Indicators

Main Economic Sector (World Bank 2019a)	Program for International Student Assessment (OECD 2019)	Science, Technology, Engineering, and Mathematics (STEM) Gender Index (Arredondo et al. 2019)
Manufacturing	3rd	32 percent*
National Entrepreneurship Context Index – Global Entrepreneurship Monitor (Bosma and Kelley 2019)	**CIVICUS Monitor (2020)**	
5.2/10	Operating conditions of civil society organizations: repressed (4/5)**	

Source: Prepared by the authors.
* Participation of female researchers in STEM fields in the public sector.
**This indicator is explained in Annex B.

Table 32 summarizes the progress made by the various sectors in Mexico in terms of establishing the foundations for driving AI in service of social good.

Table 32. Efforts to Establish the Foundations of AI in Mexico, by Sector



Source: Prepared by the authors. The indicators are found in Annex B.

Government

Digital Strategy: Ongoing

Mexico developed a National Digital Strategy (*Estrategia Digital Nacional* - EDN) for the 2013–2018 period.[118] This roadmap enabled the government to collaborate with international agencies and institutions, experts, civil society organizations, authorities of other countries, companies, and citizens to promote technological innovation to support the country's development and guide the actions of public officials regarding digitalization (Government of Mexico 2018).

The five major objectives of the 2013–2018 EDN are (1) government transformation, (2) digital economy, (3) educational transformation, (4) effective universal healthcare, and (5) civic innovation and citizen participation. The government established five enablers to achieve these objectives: (1) open data, (2) legal

118 For more information, see https://www.gob.mx/mexicodigital/

framework, (3) digital interoperability and identity (4) digital skills inclusion, and (5) connectivity. Three main indicators were used to monitor advances made regarding the objectives established for this strategy: the World Economic Forum's Networked Readiness Index, the number of Internet users as reported by the National Survey on Availability and Use of Information and Communication Technologies in Households (*Encuesta Nacional sobre Disponibilidad y Uso de Tecnologías de la Información en los Hogares* - ENDUTIH), and the International Telecommunications Union's ICT Development Index.[119]

Even though the current government has kept administration of the EDN within the Office of the President, it has not yet announced a new digital transformation agenda. However, some efforts have been made to democratize connectivity in order to close the country's digital gap. The Secretariat of Communications and Transportation, under Article 9 of the Federal Telecommunications and Broadcasting Law, proposed that "the policies and programs for universal and social coverage have to be planned, determined, instrumented and conducted" in accordance with the 2019 Social Coverage Program. This program was created specifically to provide network, telecommunications, and radiofrequency services to communities identified as having a high and very high risk of digital exclusion.

Data Strategy/Open Data Portal: Yes

In 2015, the government signed the Open Data International Charter,[120] renewing its commitment to adopt open data and to promote transparency and accountability. Based on this endorsement and as part of the 2012–2018 EDN, the Open Data Portal was created. That portal now houses 40,727 data sets of 280 government institutions.[121]

Even though the current government has not yet defined its direction and follow-up for an open data national policy, in 2019 it announced the launch of Data Mexico, an initiative promoted by the Secretariat of Economy to provide an opportunity for better public data and to design an evidence-based economic policy.

In addition, several local governments have driven open data initiatives. An example is Mexico City's Public Innovation Digital Agency (Agencia Digital de Innovación Pública - ADIP) (2018–2024) and, previously, the Laboratory for the City (2012–2018), the first space for civic innovation in the region at the local level. Other states, such as Jalisco, have also made relevant efforts in the same direction.

AI Strategy: Ongoing

On the basis of the EDN, the Mexican government in 2018 presented the first outline of the AI MX 2018 Strategy to lay the foundation for AI development in the country.[122] This is how Mexico became one of the first 10 countries whose public sector implemented actions to advance AI development (Martinho-Truswell et al. 2018).[123]

In addition to the diagnostic document, the National Digital Strategy Coordinator (*Coordinación de la Estrategia Digital Nacional* - CEDN), working in collaboration with the Digital Government Unit of the Mexican Secretariat of Civil Service and the Electronic Government Inter-Ministerial Commission AI Sub-Committee, launched a wide consultation and published the General Principles and the Impact Analysis Guide for the

119 For more information, see https://www.itu.int/es/ITU-D/Statistics/Pages/default.aspx

120 For more information, see https://www.gob.mx/mexicodigital/acciones-y-programas/carta-internacional-de-datos-abiertos

121 For more information, see https://datos.gob.mx/

122 For more information, see https://www.gob.mx/mexicodigital/articulos/estrategia-de-inteligencia-artificial-mx-2018

123 The strategy provides for four main tasks: (1) Develop an adequate governance framework to promote a multi-sectoral dialog with the establishment of an AI Sub-Committee within the Electronic Government Development Inter-Secretarial Committee (*Comisión Intersecretarial para el Desarrollo del Gobierno Electrónico* - CIDGE); (2) Map usage and needs in the industry and identify best practices in government; (3) Submit to a public consultation the recommendations made in the report "Towards an AI Strategy in Mexico" prepared by C Minds and Oxford Insights; and (4) work with experts and citizens through the AI Sub-Committee to ensure the continuity of these efforts during the next government administration.

Development and Use of Systems with AI Elements in the Federal Public Administration of Mexico.[124] Mexico was the first LAC country to carry forth an effort of this nature.

Following the recommendations made in the above-mentioned AI national strategy, and seeking to give continuity to these efforts, more than 10 institutions had established the Ia2030Mx multi-sector coalition by mid-2018.[125] This is an example of an alliance composed of professionals, academic institutions, consolidated and emerging companies, government agencies, and other key actors from the digital ecosystem and AI in Mexico whose aim is to conduct concrete actions in this field. Its first activity was implementation of the first National AI Survey, which involved the participation of more than 1,500 people. At present, the coalition is working on developing a new National AI Strategy proposal through six thematic working groups: (1) ethics; (2) governance, government, and public services; (3) research and development; (4) skills, capacities and education; (5) data, digital infrastructure, and cybersecurity, and (6) Mexicans abroad. These groups are jointly led by recognized institutions such as the UNAM's Complexity Sciences Center, the Mathematics Research Center (*Centro de Investigación en Matemáticas* - CIMAT), C Minds, Erudit AI, the Scientific and Technological Advisory Forum (*Foro Consultivo Científico y Tecnológico* - FCCyT), the Plenum Group, the Federal Telecommunications Institute (Instituto Federal de Telecomunicaciones - IFT), the Secretariat of Economy, the Secretariat of Foreign Affairs (*Secretaría de Relaciones Exteriores*), and the Mexican Society on Artificial Intelligence (*Sociedad Mexicana de Inteligencia Artificial* - SMIA). The results of this collaborative work with more than 189 coalition members are expected by mid-2020 (Gómez-Mont *et al.* 2019).

An example of relevant efforts at the state level that stands out is the AI agenda prepared by the government of Jalisco. Jalisco is the first state in the country – and one of the first subnational governments in LAC – to have an AI department that exploits this technology with a focus on government innovation.

Infrastructure and Connectivity

In Mexico, 66 percent of the population has Internet access (UNESCO 2019). Even though more efforts are needed to increase coverage and offer this service to a larger number of people, the country is already working on public bidding for frequencies to launch 5G services by the end of 2020 (Jaimovich 2019).

Mexico has a score of 60.11 on the World Bank's Digital Adoption Index, ranking it 7th among the 12 countries considered in this report. The World Economic Forum's Networked Readiness Index also ranks Mexico seventh among these 12 countries and 76th among 139 countries worldwide. Even though Mexico still does not have all of the structural capacity to benefit from the opportunities offered by ICT, recent efforts, including those described in this document, promise to bolster development in this field to achieve greater technological capacity in the years to come.

Presently, Mexico is making efforts to reduce the digital gap and to facilitate wider coverage and connectivity for citizens. An example is the recent creation of Mexico's Federal Electricity Commission, the CFE Telecommunications and Internet for All, a government company that aims to achieve country-wide connectivity.[126] Furthermore, although Mexico City and the states of Jalisco, Nuevo León, and Querétaro are developing their own connectivity strategies, the country must address the challenge of making technology and network access affordable to a vast majority of citizens. According to an Intelligence Consumer Survey of LAC by GSMA, around 30 percent of people surveyed in several countries (including Mexico) without Internet connections stated that the price of equipment and services constitute a barrier to their using the technology (GSMA 2016).

124 The general principles document and the impact analysis guide strengthen IT governance in the federal government and provide a framework for analysis of the use of different systems in the public sector to manage social programs, design policies, and deliver services, among other systems. For more information, see https://www.gob.mx/innovamx/articulos/guia-de-analisis-de-impacto-para-el-desarrollo-y-uso-de-sistemas-basadas-en-inteligencia-artificial-en-la-apf

125 For more information, see https://www.ia2030.mx/

126 For more information, see https://www.cfe.mx/CFETelecom/Paginas/default.aspx

In the area of cybersecurity, Mexico scored 0.629 out of 1 on the International Telecommunications Union's 2018 Global Cybersecurity Index of the ranking the country 4th out of 33 countries in the Americas and 63rd out of 145 countries worldwide.

Academia

AI development-related education and research offerings in Mexico are extensive. Academic strengths include the capability of universities to incorporate a large number of students in free programs offered by institutions such as the Tecnológico Nacional de México, comprised of 266 institutions across the country's 32 states; the *Universidad Nacional Autónoma de México* (UNAM); and the *Instituto Politécnico Nacional* (IPN). They all have branches or research centers in the country's different locations. As for private education, the undergraduate and graduate program offerings in fields such as data science and AI specializations have significantly broadened in the last few years.

Table 33 shows the top five universities in Mexico according to the 2019 QS World University Ranking.

Table 33. The Top Five Universities in Mexico and Their Relationship with AI

	1. Universidad Nacional Autónoma de México (UNAM)	2. Tecnológico de Estudios Superiores de Monterrey (ITESM)	3. Universidad Anáhuac México	4. Instituto Politécnico Nacional (IPN)	5. Instituto Tecnológico Autónomo de México (ITAM)
Type of institution	Public	Private	Private	Public	Private
Location	City of Mexico and Metropolitan Area	Branches throughout the country*	State of Mexico and City of Mexico	Branches throughout the country**	City of Mexico
AI-related degrees	✓	✓	✓	✓	✓
AI-related postgraduate programs	✓	✓	✓	✓	✓
AI research	✓	✓	✓	✓	✗
AI laboratory	✓	✓	✗	✓	✗
Technological innovation laboratory	✓	✓	✓	✓	✓

Source: Prepared by the authors based on information obtained from the website of each institution.
Note: The UNAM and the ITESM are also among top five universities ranked in the 2020 Times Higher Education ranking.
* Estado de México, Sinaloa, Puebla, San Luis Potosí, Saltillo, Querétaro, Monterrey, Laguna Coahuila, Irapuato, Hidalgo, Guadalajara, Cuernavaca, Ciudad Obregón, Ciudad Juárez, Ciudad de México, Chihuahua, Chiapas, Aguascalientes, Sonora Norte, Tampico, Toluca, Zacatecas, Morelia, León, and Veracruz.
**León, Zacatecas, Hidalgo, Tlaxcala, Querétaro, Tijuana, Ciudad de México, Campeche, Cancún, Culiacán, Mazatlán, Mochis, Morelos, Oaxaca, Reynosa, and Tampico.

Other Relevant Institutions

The National Council on Science and Technology (*Consejo Nacional de Ciencia y Tecnología* - CONACYT) is a public and independent body that has a consortium that specializes in promoting AI research and implementation projects.[127] Mexico also has the University of Veracruz's Artificial Intelligence Research Center (*Centro de Investigación en Inteligencia Artificial* - CIIA), one of the oldest in the country (founded in

127 For more information, see https://www.consorcioia.mx

1994). There is also SMIA, which is responsible for several publications and coordinates the annual Mexican International Conference on Artificial Intelligence (MICAI, acronym in Spanish), and the Mexican Academy of Computing (AMEXCOPm), which is specifically focused on AI research. Finally, the National Institute of Astrophysics, Optics and Electronics *(Instituto Nacional de Astrofísica, Óptica y Electrónic*a - INAOE) offers a specialized postgraduate course that explores present and future uses of AI.

Other important institutions in Mexico dedicated to promoting the use of AI include:

1. The Center for Research and Advanced Studies (*Centro de Investigación y de Estudios Avancados* - CINVESTAV),[128] a Mexican public institution specializing in science and technology development and in STEM research and postgraduate education. It started the country's first AI program in 1981.
2. The CentroGeo,[129] a public research entity integrated into the CONACYT system and committed to scientific research, education of senior scholars, and technological development and innovation in geospatial information sciences.
3. The Ensenada Center for Scientific Research and Higher Education (*Centro de Investigación Científica y de Educación Superior de Ensenada* - CICESE),[130] a regional entity located in Baja California that is organized into research groups in the areas of parallel and distributed computing, image and visual processing, computational science, processes engineering, and software and AI.

It should be noted that Mexico has a developed supercomputing support program with facilities at the Autonomous University of Puebla and the CINVESTAV-IPN, among other locations. Furthermore, it has recently established AI state research centers in Jalisco and Yucatán. Additional initiatives include the AI center at the Monterrey Institute of Technology and Higher Education.

In view of the foregoing, Mexico's academic sector is considered to be one of the most advanced in AI in Latin America.

The Entrepreneurship Ecosystem and Civil Society

The Mexican entrepreneurship ecosystem has witnessed an explosion on AI topics in the last few years. Examples of the most outstanding start-up companies include Prosperia Labs, Artificial Nerds, Quantum Labs, and other established companies such as Nearshore Solutions, Bluemessaging, and Territorium Life. They all offer different types of services, in some cases, targeted towards the efficiency and automation of processes, and in other cases towards the resolution of social challenges using AI systems.

Even though Mexican high-impact entrepreneurs share challenges similar to those of the rest of the region, they have profited from the increasing interest in the benefits of this technology and the existence of communities of practice that cooperate well. There are also social organizations such as The Data Pub, a community focused on data science, and AI.Saturdays and *De Cero a Ciencia de Datos*, which are groups in Guadalajara that work on training specialized talent and are closely connected with entrepreneurs to articulate larger-scale projects.

A remarkable example of these collaborative efforts between different sectors is the signing of an agreement between the Secretariat of Foreign Affairs and UNAM to develop AI-led solutions for vulnerable migrant communities. Another relevant UNAM project is the establishment of an AI laboratory with the support of Microsoft.

128 For more information, see https://www.cinvestav.mx/

129 For more information, see https://www.centrogeo.org.mx/

130 For more information, see https://www.cicese.edu.mx/

Among efforts at the local level, there is the Global Shapers Mexico City Hub's general AI perception survey; a network community of youth created by the World Economic Forum that has explored and identified examples of AI initiatives for social good;[131] and TalentLand,[132] a consortium comprised of the government of the State of Jalisco and several partners (universities, local governments, industry, civil society) and based in Guadalajara. Since 2017, the consortium has brought together over 60,000 talented youth every year for a week of talks, hackathons, and conferences on the use of emerging technologies such as AI.

Another example of AI for social good is the work of organizations such as C Minds,[133] a women-led institution that is committed to innovation and seeks to accelerate the positive impact of new technologies in Mexico and the region. C Minds has been promoting AI initiatives for social good since 2017. It was an institutional co-author of a study that led to the development of an AI national strategy by the current federal government,[134] and was the co-founder of Mexico's AI National Coalition, of IA2030Mx, and of the first AI Hub for social good in the country (fAIr Jalisco), together with the IDB Group, the government of Jalisco, and the Monterrey Institute of Technology, among other initiatives. Furthermore, it has developed tools, guides, and regulatory frameworks for responsible AI use in Mexico and other LAC countries.

Organizations such as *SocialTic, Artículo 19*, R3D: *Red en Defensa de los Derechos Digitales*, and the NGO *Derechos Digitales* have played a central role in the defense of data privacy, the protection and promotion of rights in digital environments, and discussions about ethical issues, including the opportunities and challenges posed by facial recognition technologies.

Use Cases

Table 34 provides a synopsis of the main AI use cases in Mexico.

Table 34. Main AI Use Cases in Mexico

Name: Support to workers and migrants		
For more information: http://www.saiph.org/ http://infrarural.com/	Year it began to use AI: 2007	Sustainable Development Goals 1 (no poverty), 4 (quality education), 8 (decent work and economic growth), 9 (industry, innovation, and infrastructure)
Actors involved: DLP Pharma Laboratory, *Universidad Nacional Autónoma de México* (UNAM), *Secretaría de Relaciones Exteriores* (SRE), *Infrarural* (project), Gabilooo Digital Consultants		Current status: Government-supported academic project in consolidation phase
What it proposes: To address the lack of updated working skills of worker and migrant populations in rural areas to make them a part of the Fourth Industrial Revolution.		
Brief description of project: To design intelligent tools to guide workers and migrants in rural areas on how to develop their digital and creative abilities so that they can access well-paid jobs through the Internet. These tools are used to introduce workers to tasks they will need to take on in order to use the Internet to acquire certain digital skills while earning a salary. This ensures that rural workers or migrants can make a living while learning.		

131 Through the analysis of 28 cases, it was determined that the AI for public good ecosystem is still in its early stages in Mexico City, with around 60 percent of projects having less than one year of implementation. Furthermore, it was determined that the principal barriers to the development of these initiatives have been the lack of financial resources with a social good approach and the limited availability of and access to quality data, which are the basis of intelligent systems.

132 For more information, see https://www.talent-land.mx/

133 For more information, see http://www.cminds.co

134 For more information, see https://docs.wixstatic.com/ugd/7be025_ba24a518a53a4275af4d7ff63b4cf594.pdf

AI applications	Natural language processing, deep learning platform, decision-making, machine learning platforms, virtual agents.
How AI is used	AI is used to identify the best sequence of small jobs on the Internet to help workers and migrants develop their digital skills and thus access better salaries.

Source: Information provided by UNAM for the preparation of this report.

Name: CEDO Intercultural (Intercultural Center for the Study of Deserts and Oceans)

For more information: cedo.org	Year it began to use AI: 2017	Sustainable Development Goal 13 (climate action)
Actors involved: *Departamento de Ciencias Marinas y Costeras de la Universidad Autónoma de Baja California Sur*, University of Arizona's Udall Center for Studies in Public Policy, and the *Departamento de Ecología Marina del Centro de Investigación Científica y de Educación Superior de Ensenada* (CICESE)		Current status: NGO in consolidation phase
What it proposes: To mitigate the impact of climate change on marine life.		
Brief description of project: The CEDO platform analyzes information available about climate change and evaluates how the communications media are framing this science and the strategies that are being adopted by Mexico's coastal states. The objective is to provide public decision-makers in charge of resource management with an overview of the level of understanding and acceptance of this information on behalf of local fishermen, given the influence this information has on the formulation and implementation of policies.		
AI applications	Machine learning, AI-optimized hardware, emotion recognition.	
How AI is used	CEDO uses natural language for training and building its thematic models. It also applies Latent Dirichlet Allocation, a non-supervised machine learning statistical approach based on term co-occurrence rather than on providing information on how to classify articles or the application of ex-ante interpretations of sets to identify groups of words that may be considered frameworks. The trained model is shown on a panel that shows study results presented graphically and allows them to be used for the classification of additional texts.	

Source: Information provided by CEDO for the preparation of this report.

Name: Doc.com

For more information: Doc.com	Year it began to use AI: 2012	Sustainable Development Goals 3 (good health and well-being), 4 (quality education), 5 (gender equality), 10 (reduced inequalities)
Actors involved: Doc.com (formerly Docademic)		Current status: Start-up company in initial phase
What it proposes: To facilitate access to health services.		
Brief description of project: Doc.com is an online platform that quickly and efficiently addresses a patient's queries with its product called "Medical Advice." Any type of concern is addressed with this tool along with the advice of a health professional, without the need for a complete medical consultation. Doc.com offers medical counseling and psychological support services to the Spanish-speaking world. To date it has treated more than 250,000 people.		

AI applications	Virtual agents, AI-optimized hardware, decision-making, deep learning, emotion recognition, marketing automation.
How AI is used	On the basis of a recommendation system – an AI technology – a patient's inputs are cross-checked with data bases in order to carry out medical diagnoses.

Source: Information provided by Doc.com for the preparation of this report.

Name: Unima		
For more information: www.unimadx.com	Year it began to use AI: 2016	Sustainable Development Goals 3 (good health and well-being), 8 (decent work and economic growth), 11 (sustainable cities and communities)
Actors involved: Unima		Current status: Start-up company in initial phase
What it proposes: To solve the lack of access to health services.		
Brief description of project: Unima developed a low-cost device that allows doctors, nurses, and healthcare workers to diagnose illnesses on the spot in less than 15 minutes and at a cost of US$1 per test.		
AI applications	Machine learning, image recognition, neural networks.	
How AI is used	AI algorithms are used on a mobile application that carries out diagnostic tests in the field. The procedure entails a drop of blood that initiates a biochemical reaction that develops on a microfluidic paper device, which records a visual reaction that is evaluated by the application through image analysis algorithms and convolutional-coded neural networks. These diagnosis test results suggest a final decision.	

Source: Information provided by Unima for the preparation of this report.

Conclusions

Mexico is a reference point in the region when it comes to the development and implementation of AI for social good. Even though the country still faces important challenges regarding connectivity and is still behind in exploiting the opportunities for the development of a digital society, it has the necessary foundation to accelerate the adoption of new technologies while it addresses the task of closing gaps in access and training in technical and socio-emotional competencies. Accordingly, the current government has made it a priority to overcome the digital gap, and it has announced policies to accelerate and guarantee the inclusion of the entire population in the digital era.

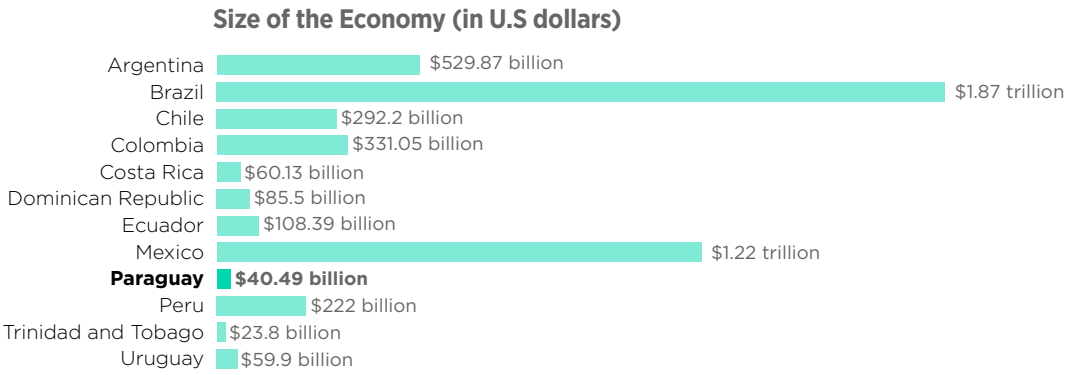
The three biggest allies of digital transformation in the country are academia, the entrepreneurship ecosystem, and civil society. It is evident that Mexico has a very wide offering of degrees, postgraduate degrees, hubs, programs, laboratories, and research centers that provide an education on AI-related subjects. As a result, research on these topics is prolific and there are collaborative initiatives with the business sector as well as with the federal and local governments. Mexico has an entrepreneurial culture that is in the process of consolidation. It is exploring innovative solutions to social challenges together with those civil society organizations that seek to take advantage of these new tools to broaden their impact.

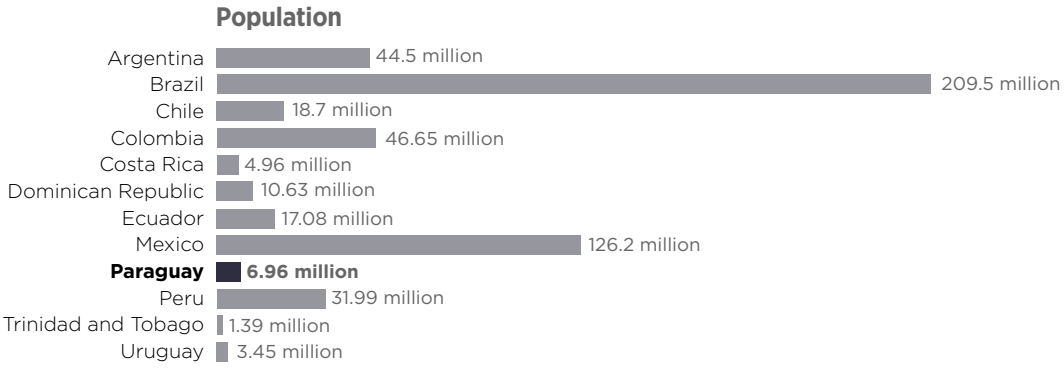
Even though Mexico still has many challenges to overcome, it is among other digitally mature LAC countries that are a fertile ground for materializing the pledge of AI for social good.

PARAGUAY

To describe the current status of AI in Paraguay within a broader context, Figure 15 presents a comparison of selected economic, demographic, education, human development, and equality indicators, while Table 35 presents other socioeconomic indicators.

Figure 15. Paraguay Core Indicators: Comparison Chart





Human Development Indicators

	Program for International Student Assessment	English Proficiency (percent)	Skilled Workforce (percent)	Human Development Index	Gini Coefficient
Argentina	N/A	58.38%	63.4%	0.825	41.2
Brazil	N/A	50.1%	62%	0.759	53.12
Chile	1st	52.89%	69.2%	0.843	46.6
Colombia	N/A	57.38%	58.2%	0.747	49.7
Costa Rica	N/A	48.75%	48.3%	0.794	48.3
Dominican Republic	N/A	46.75%	46.6%	0.752	44.7
Ecuador	N/A	46.75%	46.6%	0.752	44.7
Mexico	3rd	48.99%	40%	0.774	48.3
Paraguay	**N/A**	**52.51%**	**43.8%**	**0.702**	**48.8**
Peru	N/A	50.22%	83.6%	0.750	43.3
Trinidad and Tobago	N/A	N/A	71.8%	0.784	40.3
Uruguay	2nd	54.1%	25.5%	0.804	30.5

Sources: Panels a and b: World Bank (2019a); Panel c: (from left to right): OECD (2019);); Education First (2019); United Nations (2019); UNDP (2019); World Bank (2018).

Table 35. Other Socioeconomic Indicators

Main Economic Sector (World Bank 2019a)	**Program for International Student Assessment** (OECD 2019)	**Science, Technology, Engineering, and Mathematics (STEM) Gender Index** (Arredondo et al. 2019)
Agriculture	n.a.	55 percent*
National Entrepreneurship Context Index – Global Entrepreneurship Monitor (Bosma and Kelley 2019)	**CIVICUS Monitor** (2020)	
n.a.	Operating conditions of civil society organizations: obstructed (3/5)**	

Sources: Prepared by the authors.
* Participation of women researchers in Paraguay in STEM fields (in comparison to men).
**The explanation of the indicator is found in Annex B.

Table 36 summarizes the progress made by various sectors in Paraguay in terms of establishing the foundations for driving AI in the service of social good.

Table 36. Efforts to Establish the Foundations of AI in Paraguay, by Sector

Gobierno			
Estrategia digital	Estrategia de datos	Estrategia de IA	Infraestructura y conectividad
Academia (mejores 3)			
Públicas (1)	No centralizadas (1)	Carrera relacionada IA (5)	Investigación sobre IA (1)	Laboratorio de IA (1)
Ecosistema de emprendimiento		**Sociedad civil**	
NECI (N/A)		Civicus Monitor (3/5)	

Source: Prepared by the authors. The indicators are found in Annex B.

Government

Digital Strategy: Yes

Paraguay has benefited from advisory services from the IDB to develop and structure its Digital Agenda to promote its global competitiveness through technological transformation.[135] The Digital Agenda, which was approved in 2018, envisages four priority components: connectivity, digital government, digital economy, and institutional strengthening (IDB 2018).

Data Strategy/Open Data Portal: Yes

Through the Data Portal,[136] citizens have simple, free, and quick access to open governmental data sets. The

135 For more information, see https://www.mitic.gov.py/application/files/9115/5113/6051/Press_Transformacion_Digital.pdf

136 For more information, see https://datos.gov.py/

portal's objective is to promote transparency and citizen participation. It has 181 data sets published by 31 government institutions and has been used to develop 16 applications.[137] In developing the portal, the government received technical assistance from the Democracy and Governance Program of the U.S. Agency for International Development (USAID) and the *Centro de Estudios Ambientales y Sociales* (CEAMSO).[138]

AI Strategy: No

Even though the Paraguayan government does not yet have a roadmap for the country's development of AI, the Ministry of Information and Communication Technologies, established in 2018, has organized a series of activities to promote this technology, including *IAckathon* (the *InnovandoPy Hackathon* version),[139] whose theme is the use of AI as a catalyst to bring solutions to government services or high social value services that might be incorporated into public administration.

Infrastructure and Connectivity

Paraguay occupies the penultimate position among the 12 countries studied for this report on both the World Bank's Digital Adoption Index and the World Economic Forum's Network Availability Index. However, it is worth noting that as a result of improvements in this area, 65 percent of the Paraguayan population has gained access to the Internet, according to the Digital Adoption Index.

Regarding the existing conditions for ICT development, Paraguay lags farthest behind in LAC in terms of available infrastructure for those technologies (GSMA 2016). It is also among those countries with the most limited broadband coverage, ahead only of Venezuela, Honduras, Haiti, and Cuba.

Regarding network technologies, as measured by the World Economic Forum's Networked Readiness Index, Paraguay occupies the last position among the 12 countries studied for this report and is ranked 105th out of 139 countries worldwide. This is why the development of technologies such as AI is an important area of opportunity for the country. In terms of cybersecurity, the International Telecommunications Union's 2018 Global Security Index gives Paraguay a score of 0.603 out of 1, placing it 5th out of 33 countries in the Americas and 66th out of 145 countries worldwide.

Academia

Since the QS World University Rankings and the Times Higher Education Ranking do not include Paraguay in their university listings, Table 37 shows the top three universities cited by uniRank in 2020. Among these three universities, only the *Universidad Nacional de la Asunción* (UNA) plays a major role in national AI development.

137 Among others, these applications include the Furniture Inventory of the Ministry of Education and Culture (MEC), Public Officials Search Engine, the Infrastructure Requirements Search Tool for the MEC´s micro-planning prioritized institutions, the Paraguayan National Postal Service, and the Search Tool for Public Funds Allocated and Executed by any Government Agency.

138 For more information, see http://www.ceamso.org.py/

139 For more information, see https://hackathon.innovando.gov.py/IAckathon-2019

Table 37. The Top Three Universities in Paraguay and Their Relationship with AI

	1. Universidad Nacional de Asunción (UNA)	2. Universidad Autónoma de Asunción	3. Universidad Católica Nuestra Señora de la Asunción
Type of Institution	Public	Private	Private
Location	Asunción	Asunción	Asunción, Encarnación, Ciudad del Este, Villarrica, Concepción, Carapeguá, San Ignacio, Coronel Oviedo, Pedro Juan Caballero
AI-related degrees	✓	✓	✓
AI-related postgraduate programs	✓	✓	✗
AI research	✓	✗	✗
AI laboratory	✓	✗	✗
Technological innovation laboratory	✓	✗	✗

Source: Prepared by the authors based on information obtained from the website of each institution.

UNA students have been noted for developing applied AI projects. For example, the *Hackathon InnovandoPY* winning team used AI on traffic cameras to identify motorcyclists not wearing their protective helmets, produce relevant statistics, and formulate roadway policies. Another group designed FI-Bot with AI facial emotion recognition capabilities using artificial vision techniques and a trained neural network (UNA 2018a). Another UNA team designed *Mecatronco-Móvil*, a vehicle with an AI-incorporated system for children with restricted mobility that can operate under two modalities: remote control or facial recognition (UNA 2019). Other applications developed by students have incorporated AI technologies to classify levels of pain by interpreting facial expressions, thus creating a high precision medical tool (UNA 2018a).

For its part, the UNA School of Engineering has organized pertinent events such as the First International Workshop on Advanced Computing and Artificial Intelligence, an initiative directed at forging collaborations between institutions in the United Kingdom and Latin American countries that participate in the international collaborative experiment known as the Deep Underground Neutrino Experiment (DUNE) (UNA 2018b). Through its Distributed Systems Laboratory, the UNA School of Engineering also encourages student innovation through programs and internships, including one for the processing of images in horticultural products applied to a hydroponic greenhouse. There are three main areas of research: precision farming, AI, and distributed systems. Applications have focused on hydroponic fertigation, greenhouse automation, image treatment through artificial vision and neural networks, and meteorological and environmental data treatment tabulated in databases, among others.

Other Relevant Institutions

The National Council of Science and Technology of Paraguay (*Consejo Nacional de Ciencia y Tecnología* - CONACYT) has a specialized center for technological research (*Centro Multidisciplinario de Investigaciones Tecnológicas* - CEMIT).[140] In 2019, more than 90 research and development projects were selected, valued at more than US$6 million. Additionally, the Support Program for the Development of Science, Technology and Innovation (PROCIT, Spanish acronym) was designed with IDB financing to stimulate research projects and strengthen technological innovation and Paraguay's National Innovation System.

140 For more information, see https://www.conacyt.gov.py/

The Entrepreneurship Ecosystem and Civil Society

In 2019, Paraguay ranked 125th and 160th (among 190 countries) on the World Bank's ease of doing business and ease of starting business indicators, respectively (World Bank 2019b). These indicators are below average compared with those of other countries in the region. However, Paraguay is establishing incentives to promote entrepreneurship such as the Tigo Conecta Award for medium-sized and large companies; the Micro-Entrepreneur Citi Award for micro and small companies; and the Tourism and Technology Award for the First National Entrepreneurship Competition on "Tourism and Technology."

There are also other events and platforms that, while not focused on AI, are promoting innovation in the digital economy in general. These include the Digital Bank Asunción,[141] an event in financial services innovation, technology and FinTech, as well as company incubation programs such as Challenger Paraguay. In the area of platforms, the IDB has promoted I-Lab Paraguay to develop social innovations to address the country's most compelling challenges (early childhood education, mobility and transportation, among others) with the participation of civil society, government, and industry.[142]

Use Cases

Table 38 provides a synopsis of the main AI use cases in Paraguay.

Table 38. Main AI Use Cases in Paraguay

Name: Layers against inequality		
For more information: layers.hemav.com	Year it began to use AI: 2017	Sustainable Development Goals 1 (no poverty), 2 (zero hunger), 4 (quality education), 8 (decent work and economic growth)
Actors involved: Paraguay MSDA Group, HEMAV, Kress Group		Current status: Consolidated company project
What it proposes: To provide technical support to small farmers and rural agricultural communities.		
Brief description of project: The Layers application allows Frutika, a company owned by the Kress Group, to follow up on small farmers who sell their crops to the company by providing them with technical support and obtaining samples from a single tree to calculate the volume and quality of their production.		
AI applications	Machine learning platforms, AI-optimized hardware, decision-making, deep learning platforms.	
How AI is used	Layers uses a data base that predicts which activities generate good agricultural practices in order to optimize the production of small farms.	

Source: Information provided by the Paraguay MSDA Group for the preparation of this report.

141 For more information, see http://www.digitalbankla.com/proximos-eventos/paraguay/

142 For more information, see http://ilabparaguay.org/

Name: ParaEmpleo		
For more information: paraempleo.mtess.gov.py	Year it began to use AI: 2017	Sustainable Development Goals 1 (no poverty), 5 (gender equality), 8 (decent work and economic growth), 10 (reduced inequalities)
Actors involved: Government of Paraguay through its Ministry of Labor, Employment and Social Security, and JANZZ Technologies with the IDB Labor Markets Division.		Current status: Public sector program in consolidation phase
What it proposes: To facilitate job placement.		
Brief description of project: *ParaEmpleo* is a national job placement platform that speeds up the search for employment and the selection of personnel by linking supply and demand in the labor market.		
AI applications	Cognitive work assistant, natural language processing, decision-making, deep learning platform, machine learning platform, natural language generation, natural recognition.	
How AI is used	The algorithms analyze the data and suggest the best possible matches between candidates and companies. AI helps in real time to quickly and effectively generate standardized, categorized, and usable information by any member of the institution in accordance with his/her function and authorized access to data.	

Source: Information provided by the Ministry of Labor, Employment and Social Security for the preparation of this report.

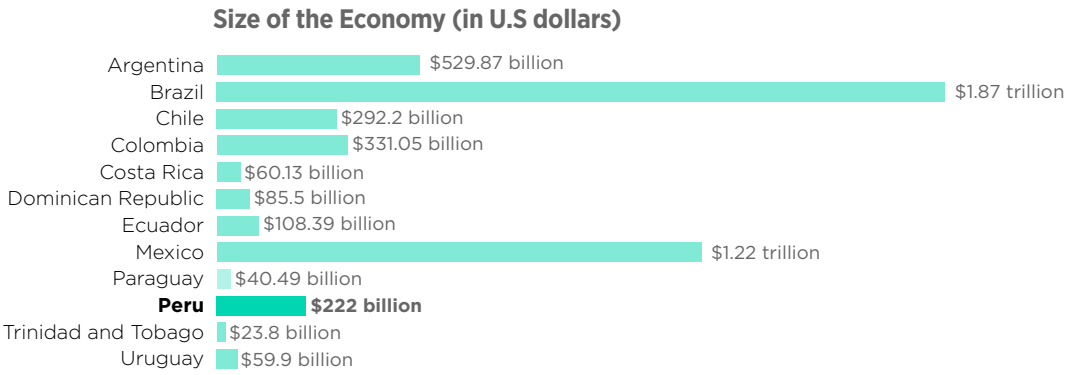
Conclusions

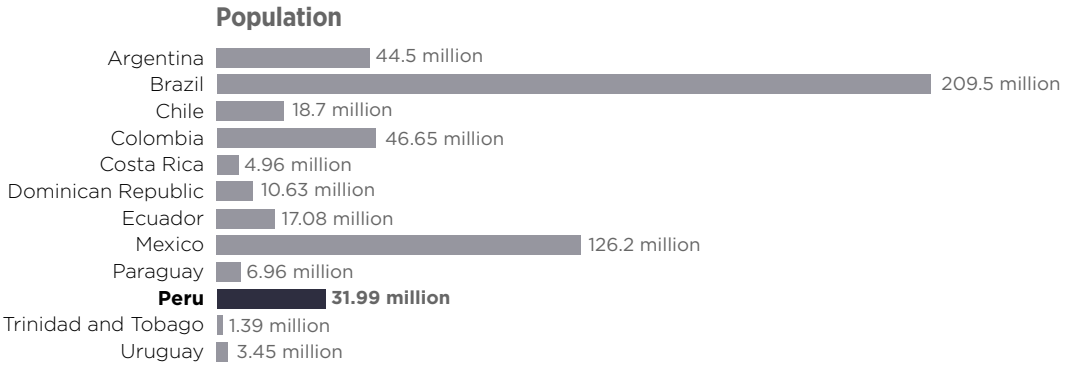
Even though Paraguay has a digital strategy and an open data portal, one of its greatest challenges continues to be the lack of connectivity and infrastructure investment to promote the use and exploitation of ICT. For its part, academia has made relevant efforts to strengthen the STEM fields, for example through hackathons, events, and communications in popular magazines. There are educational offerings in AI-related careers, although the government still needs to establish research centers and give priority to benefiting from the use of new technologies such as AI. The support of institutions such as the IDB and the participation of the private sector in the development and adoption of AI are crucial to leverage projects and research in this area, as was shown in the use cases.

PERU

To describe the current status of AI in Peru within a broader context, Figure 16 presents a comparison of selected economic, demographic, education, human development, and equality indicators, while Table 39 presents other socioeconomic indicators.

Figure 16. Peru Core Indicators: Comparison Chart





Human Development Indicators

	Program for International Student Assessment	English Proficiency (percent)	Skilled Workforce (percent)	Human Development Index	Gini Coefficient
Argentina	N/A	58.38%	63.4%	0.825	41.2
Brazil	N/A	50.1%	62%	0.759	53.12
Chile	1st	52.89%	69.2%	0.843	46.6
Colombia	N/A	57.38%	58.2%	0.747	49.7
Costa Rica	N/A	48.75%	48.3%	0.794	48.3
Dominican Republic	N/A	46.75%	46.6%	0.752	44.7
Ecuador	N/A	46.75%	46.6%	0.752	44.7
Mexico	3rd	48.99%	40%	0.774	48.3
Paraguay	N/A	52.51%	43.8%	0.702	48.8
Peru	**N/A**	**50.22%**	**83.6%**	**0.750**	**43.3**
Trinidad and Tobago	N/A	N/A	71.8%	0.784	40.3
Uruguay	2nd	54.1%	25.5%	0.804	30.5

Sources: Panels a and b: World Bank (2019a); Panel c: (from left to right): OECD (2019);); Education First (2019); United Nations (2019); UNDP (2019); World Bank (2018).

Table 39. Other Socioeconomic Indicators

Main Economic Sector (World Bank 2019a)	**Program for International Student Assessment** (OECD 2019)	**Science, Technology, Engineering, and Mathematics (STEM) Gender Index** (Arredondo et al. 2019)
Agricultural	Above the average for the 12 countries	31.9 percent*
National Entrepreneurship Context Index – Global Entrepreneurship Monitor (Bosma and Kelley 2019)	**CIVICUS Monitor** (2019)	
4.5/10	Operating conditions of civil society organizations: obstructed (3/5)**	

Source: Prepared by the authors.
*National Research and Development Census of research centers conducted in 2015 (CONCYTEC 2016).
** This indicator is explained in Annex B.

Table 40 summarizes the progress made by various sectors in Peru in terms of establishing the foundations for driving AI in service of social good.

Table 40. Efforts to Establish the Foundations of AI in Peru, by Sector

Government			
Digital strategy	Data strategy	AI strategy	Infrastructure and connectivity
Academia (top 3)			
Public (1)	Non-centralized (0)	AI-related degree (2)	AI research (2)	AI laboratory (1)
Entrepreneurship Ecosystem		**Civil Society**	
National Entrepreneurship Context Index (45 percent)		CIVICUS Monitor (3/5)	

Source: Prepared by the authors. The indicators are found in Annex B.

Government

Digital Strategy: Yes

Given the digital gap that separates urban and rural communities, the government of Peru set out its Digital Agenda in 2006.[143] The agenda established that Peru would orient its public policy actions in an intersectoral manner towards the large-scale application and penetration of ICT.

The country is currently leading efforts to develop a new digital strategy. In 2017, the Digital Government Secretariat was created to steer technological innovation processes and the digital transformation of the

143 For more information, see https://www.peru.gob.pe/AgendaDigitalPeru/pdf/CODESI%20-%20Presentacion.pdf

state, administer its digital platforms, and function as the governing body of the *Sistema Nacional de Informática* (National Software Computing System).[144]

In 2018, the Secretariat initiated activities to draw up the guidelines for the formulation of a Digital Government Plan (*Plan de Gobierno Digital* - PGD).[145] The plan includes a diagnostic of the current state of digital government in the country, the projects that will be carried forth within its sphere of competence, and the methodology used for the preparation of the document.

Data Strategy/Open Data Portal: Yes

In 2017, Peru's National Strategy for Open Data[146] was published with the aim of promoting innovation to create public value through the use of open data, while contributing to the country's economic and social development. It also seeks to strengthen citizen participation, as well as innovation, collaboration, and public services within the context of an open government.

Among other issues, the strategy considers the creation of a National Open Data Portal,[147] which offers teaching materials and guidelines to ensure the homogeneous presentation of information, including the Open Government Data Model, Open Government Guide, Manual for Recording Datasets, and Metadata Structure Guidelines. This portal was recognized by the Organisation for Economic Co-operation and Development, along with the portals of Mexico and the United Kingdom, as one of the easiest for citizens to access, thereby facilitating the management and services provided by the government (*El Economista América 2019*).

At present, the Open Data Portal enables access to 1,551 data sets and 1,386 government agencies.

AI Strategy: No

As of this writing, Peru did not have a national AI strategy.

Infrastructure and Connectivity

The population has little access to the Internet: it only reaches 53 percent of Peruvians (UNESCO 2019). Furthermore, Peru's score on the World Bank's 2016 Digital Adoption Index is 55 percent, which suggests that the country is a little over halfway towards widespread adoption of digital technologies.

According to the World Economic Forum's Networked Readiness Index, Peru is ranked 10th out of the 12 countries considered in this report, only ahead of the Dominican Republic and Paraguay.

With regard to the development of the infrastructure needed for a greater percentage of the population to have more and better access to the Internet and the use new technologies, Peru is planning to start to tender spectrum bands of 700 MHz and 3.5 GHz with the aim of adopting 5G networks (Jaimovich 2019).

Peru has a score of 0.401/1 on the International Telecommunications Union's 2018 Global Cybersecurity Index, which places it 12th out of 33 countries in the Americas and 95th out of 145 countries worldwide.

Academia

Table 41 includes Peru's three top universities according to the 2019 QS World University Rankings. Two of these universities offer undergraduate and graduate degrees that prepare students in the use of AI-related technologies.

144 For more information, see https://www.gob.pe/7025-presidencia-del-consejo-de-ministros-secretaria-de-gobierno-digital

145 For more information, see https://www.peru.gob.pe/normas/docs/Anexo_I_Lineamientos_PGD.pdf

146 For more information, see https://www.peru.gob.pe/estrategia.pdf

147 For more information, see https://www.datosabiertos.gob.pe/

Table 41. The Top Three Universities in Peru and Their Relationship with AI

	1. Pontificia Universidad Católica del Perú (PUCP)	2. Universidad Nacional Mayor de San Marcos	3. Universidad Peruana Cayetano Heredia (UPCH)
Type of institution	Private	Public	Private
location	Lima	Lima	Lima
AI-related degrees	✓	✓	✗
AI-related postgraduate programs	✓	✓	✗
AI research	✓	✓	✗
AI laboratory	✓	✗	✗
Technological innovation laboratory	✓	✓	✓

Source: Prepared by the authors based on information obtained from the website of each institution.
Note: The Pontificia Universidad Católica de Perú is among the top five universities in the 2020 Times Higher Education ranking.

Other Relevant Institutions

In addition to the research conducted at these three universities, Peru has KapAITech, which is a group of researchers who work in the field of AI to improve the quality of life of society. The head researcher is Dr. Luis Aguilar of the *Universidad Nacional de Piura*, and major areas of study include machine learning (supervised and non-supervised), deep learning (with generative models), and AI privacy concerns (KapAITech 2019).

Another important institution is Laboratoria,[148] a Peruvian education start-up that trains and educates women in socioemotional skills, web development, and UX design. Laboratoria has helped to reduce gender gaps in the field of technology over the past six years and has over 1,300 alumni in Mexico, Ecuador, Peru, Chile, and Brazil.

The Entrepreneurship Ecosystem and Civil Society

Peru ranks 76th in terms of ease of doing business and 133rd in terms of ease of starting a business among the 190 countries surveyed by the World Bank (2019b).

Incentives include the LEC entrepreneurship and innovation prize (*Líderes Empresariales del Cambio*) sponsored by EY, and the Fundación Everis prizes, which focus on boosting small businesses and making entrepreneurs more visible.[149] Furthermore, the government has a platform called Creatividad Empresarial,[150] which serves as an incubator and accelerator to drive nationwide innovation. However, one of the major challenges noted by the Global Entepreneurship Monitor is the low levels of innovation among Peruvian start-ups and the low impact they have on the country's development (Bosma and Kelley 2019) .

Innóvate Perú is an initiative to strengthen entrepreneurship and the country's innovation ecosystem.[151] The program cofinances projects for business innovation, entrepreneurship, and strengthening the ecosystem's actors, and also carries out other activities such as workshops, events, and open calls.

148 For more information, see https://www.laboratoria.la/

149 For more information, see https://www.premioseveris.pe/

150 For more information, see https://creatividadempresarial.upc.edu.pe/

151 For more information, see https://www.innovateperu.gob.pe/

Peru stands out in the field of FinTech technologies. In 2019, there were more than 120 start-ups in this sector, many of which are in advanced stages and have accessed investment or global competitions to help accelerate their growth. These start-ups include Quantum Talent (AI, data intelligence, education), Crehana (e-learning, EdTech), and Bitinka and Keynua, among others.

The TechCrunch platform noted that in 2019 a new record was reached in terms of the amount of capital, close to US$11 million, invested in Peruvian start-ups. This amount was 24 percent higher than in 2018. Most of these funds went to the FinTech (47 percent) and EdTech (37 percent) sectors.

Among civil society organizations, certain initiatives stand out, including Data Science Research Perú,[152] a non-profit organization that seeks to disseminate, democratize, and decentralize knowledge on data science and artificial intelligence by creating new opportunities for new talent through events (e.g., DataScience Day, Kaggle Days, PyData Lima, and PyCon Perú), workshops, and research.

Use Cases

Table 42 provides a synopsis of the main AI use cases in Peru.

Table 42. Main AI Use Cases in Peru

Name: MIDIS - Detección temprana de anemia		
For more information: http://www.upch.edu.pe/bioinformatic/anemia/app/	Year it began to use AI: 2018	Sustainable Development Goals 3 (good health and well-being), 10 (reduced inequalities)
Actors involved: AYNI LAB of the Ministry of Social Development and Inclusion, the *Universidad Peruana Cayetano Heredia*, and the Ministry of Production		Current status: Government project in consolidation phase
What it proposes: Facilitate access to quality childhood healthcare services.		
Brief description of project: MIDIS is an application used for quick and timely detection of anemia in children in a non-invasive manner. It is an easy-to-use and low-cost portable system based on evaluation of the characteristics of the conjunctiva of the upper eyelid, without the need for a doctor to be present.		
AI applications	Machine learning platforms, image recognition.	
How AI is used	The healthcare personnel in charge take a picture of the child's ocular conjunctiva and send it to a neural networks system that processes the image to determine the hemoglobin level and, therefore, the presence or absence of anemia.	

Source: Information provided by the Social Innovation Laboratory of the Ministry of Social Development and Inclusion for the preparation of this report.

152 For more information, see https://www.datascience.pe/

Name: IRBin		Country: Peru
For more information: https://www.facebook.com/CIRSYSPeru https://www.instagram.com/irbin.pe/	Year it began to use AI: 2018	Sustainable Development Goals 9 (industry, innovation, and infrastructure), 11 (sustainable cities and communities), 12 (responsible consumption and production)
Actors involved: Cirsys and the government of Peru		Current status: Start-up company in consolidation stage
What it proposes: IRBin seeks to educate and create awareness about the importance of recycling, given that 23,000 tons of trash are generated every 24 hours in Peru but only 3 percent of Peruvians separate their waste daily, which creates losses in resources and collection time.		
Brief description of project: Cirsys developed IRBin, the first social robot for recycling in Peru. The robot, almost two meters tall, is a trash container that interacts with users in a playful way each time they throw away trash, seeking to educate them on how to separate waste. It also provides information about the amount of trash it has accumulated and about the users who recycle with the robot, allowing companies to make the right decisions about their waste management business strategies. One out of every three people will use IRBin again, according to the company's research.		
AI applications	Decision-making and image recognition.	
How AI is used	IRBin uses algorithms to intelligently classify trash deposited into the container, thus automating the process. Thanks to the information that is stored online in a database, each IRBin robot contributes to the generalization of the information obtained, which allows for generating more precise adaptive models.	

Source: Information provided by Cirsys for the preparation of this report.

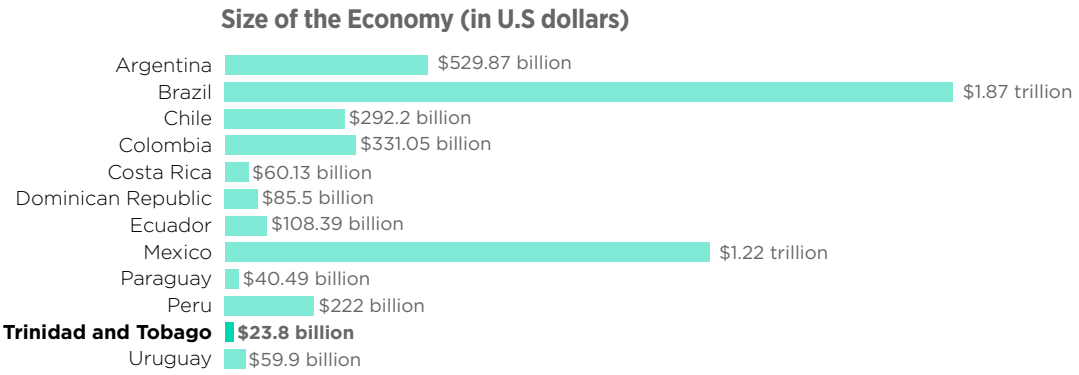
Conclusions

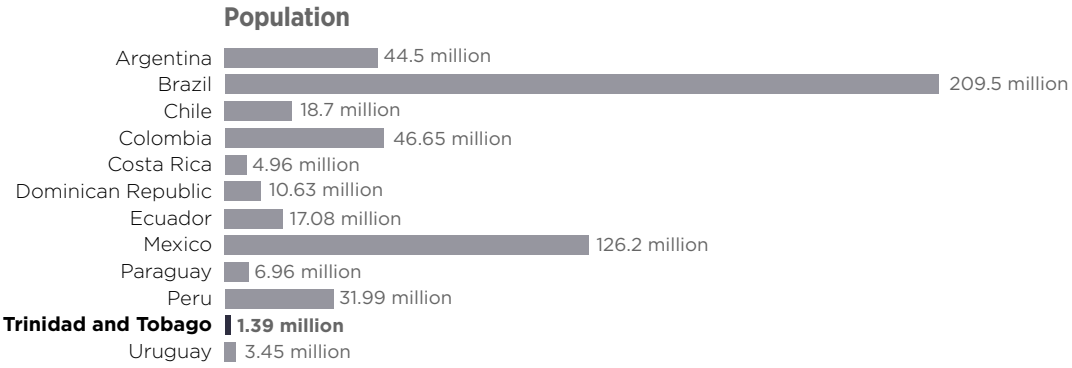
With the aim of using digital tools for the economic and social improvement of Peru, the government has committed to digitalizing the country through the development of a National Digital Agenda and an Open Government Data Strategy. The Secretariat of Digital Government has created an Open Data Portal, which facilitates the management of government services and also allows for performing more transparent and effective processes. In the academic sphere, the country's three top universities have technology and innovation laboratories. While Peru has not yet formulated a nationwide AI strategy, the entrepreneurial sector and civil society have pushed forward ambitious and encouraging initiatives focused on developing human talent, reducing digital gaps, and exploiting new technologies such as AI applied to public health and the environment (recycling).

TRINIDAD AND TOBAGO

To describe the current status of AI in Trinidad and Tobago within a broader context, Figure 17 presents a comparison of selected economic, demographic, education, human development, and equality indicators, while Table 43 presents other socioeconomic indicators.

Figure 17. Trinidad and Tobago Core Indicators: Comparison Chart





Human Development Indicators

	Program for International Student Assessment	English Proficiency (percent)	Skilled Workforce (percent)	Human Development Index	Gini Coefficient
Argentina	N/A	58.38%	63.4%	0.825	41.2
Brazil	N/A	50.1%	62%	0.759	53.12
Chile	1st	52.89%	69.2%	0.843	46.6
Colombia	N/A	57.38%	58.2%	0.747	49.7
Costa Rica	N/A	48.75%	48.3%	0.794	48.3
Dominican Republic	N/A	46.75%	46.6%	0.752	44.7
Ecuador	N/A	46.75%	46.6%	0.752	44.7
Mexico	3rd	48.99%	40%	0.774	48.3
Paraguay	N/A	52.51%	43.8%	0.702	48.8
Peru	N/A	50.22%	83.6%	0.750	43.3
Trinidad and Tobago	**N/A**	**N/A**	**71.8%**	**0.784**	**40.3**
Uruguay	2nd	54.1%	25.5%	0.804	30.5

Sources: Panels a and b: World Bank (2019a); Panel c: (from left to right): OECD (2019);); Education First (2019); United Nations (2019); UNDP (2019); World Bank (2018).

Table 43. Other Socioeconomic Indicators

Main Economic Sector (World Bank 2019a)	**Program for International Student Assessment** (OECD 2019)	**Science, Technology, Engineering, and Mathematics (STEM) Gender Index** (Arredondo et al. 2019)
Energy	n.a.	n.a.
National Entrepreneurship Context Index – Global Entrepreneurship Monitor (Bosma and Kelley 2019)	**CIVICUS Monitor** (2020)	
n.a	Operating conditions of civil society organizations: narrowed (2/5)*	

Source: Prepared by the authors.

*This indicator is explained in Annex B.

Table 44 summarizes the progress made by various sectors in Trinidad and Tobago in terms of establishing the foundations for driving AI in service of social good.

Table 44. Efforts to Establish the Foundations of AI in Trinidad and Tobago, by Sector

Source: Prepared by the authors. The indicators are found in Annex B.

Government

Digital Strategy: Yes

Trinidad and Tobago's National Information and Communication Technologies Plan for 2018 to 2022 consists of a comprehensive system of programs on ICT connectivity and adoption issues.[153] The plan centers on leveraging empowerment, innovation, industry, education, and infrastructure to transform the nation and open the doors to a dynamic, sustainable, and prosperous future that reaps the benefits of new technologies.

In 2009, the state-owned National Information and Communication Technology Company Limited (NICTCL) was created to implement the National ICT Strategy.[154] This public company provides support to all

153 For more information, see http://mpac.gov.tt/sites/default/files/file_upload/publications/NICT%20Plan%202018-2022%20-%20August%202018.pdf

154 For more information, see https://ictsymposiumtt.gov.tt/index.php/2018/09/06/about-the-ict-symposium-2018/

government agencies involved in the management of ICT strategies and programs, as well as in the design and implementation of solutions. To achieve this, four National Company and ICT Innovation Symposiums were organized by the Ministry of Public Administration. One of NICTCL's objectives is to promote and create awareness about the role played by information technologies, communication, and innovation in the digital transformation of Trinidad and Tobago.

Data Strategy/Open Data Portal: No

Although Trinidad and Tobago does not yet have an Open Data Strategy, the government does have an Open Data Portal run by the Department of Computing and Information Technology of the University of the West Indies St. Augustine Campus.[155] The portal is based on the CKAN global platform, one of the world's leading open-source data portals.[156] As of this writing, the portal housed 30 data sets on subjects such as agriculture, imports and exports, and digital access, among others.

Other platforms that provide open data in a decentralized manner include the Science & Technology Research Database (STResearchTT),[157] which corresponds to the National Institute of Higher Education, Research, Science and Technology (NIHERST).[158] This portal is an open and public government database that seeks to encourage research and innovation.

AI Strategy: No

As of this writing, the country did not have an AI national strategy. However, the Trinidad and Tobago Chamber of Industry and Commerce (2017) has organized talks on the subject to explore aspects such as the impact of AI development on the legal profession (CHAMBER TT, 2017).

Infrastructure and Connectivity

Seventy-seven percent of the population of Trinidad and Tobago has Internet access. The nation ranks fourth among the 12 countries studied in this report in terms of network development for wider digitalization (UNESCO 2019), although it is still below the average, ranking 8th on the World Bank's 2016 Digital Adoption Index. The country's score on the World Economic Forum's Networked Readiness Index is 49 percent.

Trinidad and Tobago received a score of 0.188 out of 1 on the International Telecommunications Union's 2018 Global Cybersecurity Index, ranking it 19th out of 33 countries in the Americas and 123rd out of 145 countries worldwide.

Academia

Since the QS World University Ranking does not include Trinidad and Tobago in its university rankings, Table 45 presents the top three universities cited by uniRank in 2020.

155 For more information, see https://data.tt/

156 For more information, see https://ckan.org/

157 For more information, see http://stresearchtt.niherst.gov.tt/

158 For more information, see http://www.niherst.gov.tt/index.html

Table 45. The Top Three Universities of Trinidad and Tobago and Their Relationship with AI

	1. University of West Indies, St. Augustine	2. University of Trinidad and Tobago	3. University of the Southern Caribbean
Type of institution	Public	Public	Private
Location	St. Augustine	Arima	St. Joseph
AI-related degrees	✓	✓	✓
AI-related postgraduate programs	✓	✓	✗
AI research	✓	✓	✗
AI laboratory	✗	✗	✗
Technological innovation laboratory	✓	✗	✗

Source: Prepared by the authors based on information obtained from the website of each institution.

Other Relevant Institutions

The School of Business and Computer Science Global Learning Institute (SBCS GLI) of Trinidad and Tobago is a tertiary-level training center offering several certifications and diplomas, some of which are related to technological and engineering areas. For example, it has a computing academic area that offers certifications on web development, information technologies, and computer and information systems, among others. For its part, the NIHERST Research Center promotes STEM disciplines, mainly among children and youth. Despite its institutional independence, it receives public and private financing.

The Entrepreneurship Ecosystem and Civil Society

In 2014, Trinidad and Tobago, together with Barbados, stood at the front of the Caribbean region as one of the best countries for entrepreneurship (*El País* of Costa Rica 2014). According to local experts, a successful future is envisaged for this entrepreneurial culture thanks to the multiple initiatives launched by public and private institutions. One of these initiatives is the Youth Business Trinidad and Tobago (YBTT), a not-for-profit organization focused on financing young entrepreneurs' projects. There are also international actors such as the Young Leaders of the Americas Initiative (YLAI) and the government initiative, National Entrepreneurship Development Company Limited (NEDCO), both of which promote entrepreneurship activities in general. However, impact entrepreneurship that uses autonomous and intelligent systems has not yet been developed.

In terms of civil society, initiatives by certain individuals to promote discussions and specific actions to support technological development are worth underlining. Brigette Hyacinth, an international lecturer, is a thought leader on leadership topics, human resources, AI, and digital transformation, and the author of *The Future of Leadership: Rise of Automation, Robotics and Artificial Intelligence*. In her book, she presents an overview of what is happening in the world of AI and new technologies and advises readers on how to best take advantage of these changes.

IAMovement, an NGO created in 2014 to promote positive social and environmental change, is promoting awareness and education on key social, environmental, and economic problems.[159] It has also become a platform for the national debate and dialogue on AI and its development and implementation.

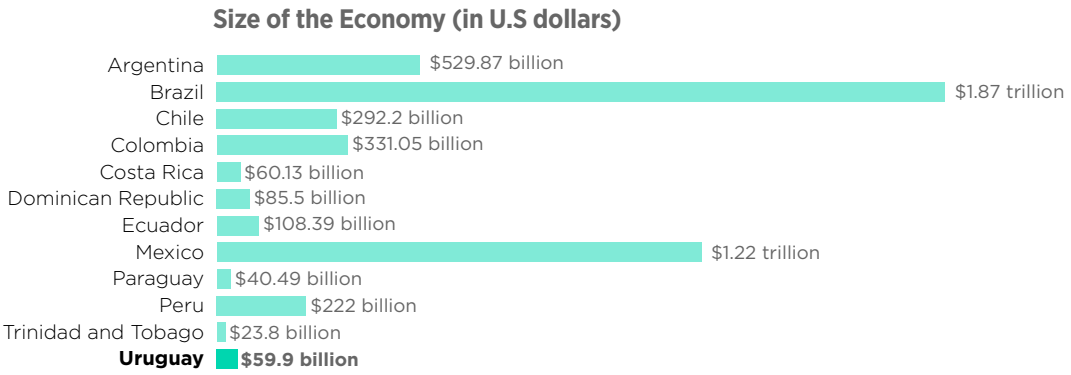
Conclusions

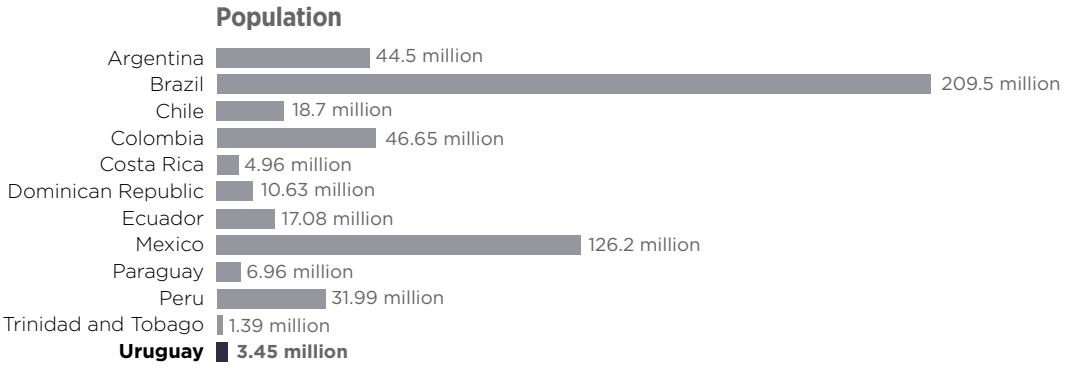
Artificial Intelligence is still not one of the priorities of the public or private sectors in Trinidad and Tobago. The government has shown interest in supporting and increasing the number of entrepreneurs, incubators, and accelerators in the country, but it remains to be seen how this ecosystem will evolve in terms of the exploitation of new technologies such as AI to solve the country's more urgent challenges.

URUGUAY

To describe the current status of AI in Uruguay within a broader context, Figure 18 presents a comparison of selected economic, demographic, education, human development, and equality indicators, while Table 46 presents other socioeconomic indicators.

Figure 18. Uruguay Core Indicators: Comparison Chart





Human Development Indicators

	Program for International Student Assessment	English Proficiency (percent)	Skilled Workforce (percent)	Human Development Index	Gini Coefficient
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Brazil	N/A	50.1%	62%	0.759	53.12
Chile	1st	52.89%	69.2%	0.843	46.6
Colombia	N/A	57.38%	58.2%	0.747	49.7
Costa Rica	N/A	48.75%	48.3%	0.794	48.3
Dominican Republic	N/A	46.75%	46.6%	0.752	44.7
Ecuador	N/A	46.75%	46.6%	0.752	44.7
Mexico	3rd	48.99%	40%	0.774	48.3
Paraguay	N/A	52.51%	43.8%	0.702	48.8
Peru	N/A	50.22%	83.6%	0.750	43.3
Trinidad and Tobago	N/A	N/A	71.8%	0.784	40.3
Uruguay	**2nd**	**54.1%**	**25.5%**	**0.804**	**30.5**

Sources: Panels a and b: World Bank (2019a); Panel c: (from left to right): OECD (2019);); Education First (2019); United Nations (2019); UNDP (2019); World Bank (2018).

Table 46. Other Socioeconomic Indicators

Main Economic Sector (World Bank 2019a)	**Program for International Student Assessment** (OECD 2019)	**Science, Technology, Engineering, and Mathematics (STEM) Gender Index** (Arredondo et al. 2019)
Agricultural	Second	49 percent*
National Entrepreneurship Context Index – Global Entrepreneurship Monitor (Bosma and Kelley 2019)	**CIVICUS Monitor** (2019)	
4.7/10	Operating conditions of civil society organizations: open (1/5)**	

Source: Prepared by the authors.
* Participation of female researchers in Uruguay in STEM fields (in comparison to men).
***his indicator is explained in Annex B.

Table 47 summarizes the progress made by the various sectors in Uruguay in terms of establishing the foundations for driving AI in service of social good.

Table 47. Efforts to Establish the Foundations of AI in Uruguay, by Sector

Government				
Digital strategy	Data strategy	AI strategy	Infrastructure and connectivity	
Academia (top 4)				
Public (1)	Non-centralized (2)	AI-related degree (4)	AI research (4)	AI laboratory (1)
Entrepreneurship Ecosystem		**Civil Society**		
National Entrepreneurship Context Index (47 percent)		CIVICUS Monitor (1/5)		

Source: Prepared by the authors. The indicators are found in Annex B.

Government

Digital Strategy: Yes

Uruguay's 2020 Digital Agenda (*Agenda Uruguay Digital 2020*)[160] is the fourth such strategy developed by the country. The purpose of the first two versions (2006–2008 and 2008–2010[161]) was to guarantee the institutionalization of digital infrastructures. Once this goal was achieved, the third agenda (2011–2015)[162] prioritized the improvement of services that were already under way and, little by little, an expansion plan based on previous achievements has been implemented. This agenda, in effect during the preparation of

160 For more information, see https://www.gub.uy/agencia-gobierno-electronico-sociedad-informacion-conocimiento/politicas-y-gestion/programas/agenda-digital-del-uruguay

161 For more information, see https://www.gub.uy/agencia-gobierno-electronico-sociedad-informacion-conocimiento/sites/agencia-gobierno-electronico-sociedad-informacion-conocimiento/files/2019-01/Agenda%20Digital%202008-2010.pdf

162 For more information, see https://www.gub.uy/agencia-gobierno-electronico-sociedad-informacion-conocimiento/sites/agencia-gobierno-electronico-sociedad-informacion-conocimiento/files/2019-01/Agenda%20Digital%202011-2015.pdf

this report, differs from previous ones in that it centers on citizens. Its main purpose is fairness, and it is guided by the country's social strategy and the Sustainable Development Goals.

The *Agenda Uruguay Digital 2020* is based on four pillars that are grouped into nine objectives and 46 specific goals. The four pillars are (1) social policies and inclusion; (2) sustainable economic development; (3) government management linked to citizenship through technology; and (4) governance for the information society with an enabling framework that favors its social appropriation. The purpose of technology transformation is to create a structure of accessible social opportunities. The six goals are to (1) promote digital inclusion for low-income retired individuals through the Ibirapitá Plan; (2) develop the professional digital skills of over 60,000 people; (3) provide programming classes to over 5,000 youth; (4) design more than five ICT study programs; (5) train over 1,000 students and workers in domotics, robotics, biotechnology, and nanotechnology; and (6) create the National System of Timbó Portal Repositories to disseminate scientific articles.

The agenda's outcomes will be monitored by the Agency for the Development of Electronic Government and Information Society and Knowledge (*Agencia de Gobierno Electrónico y Sociedad de la Información y del Conocimiento* - AGESIC), a body that articulates all of the involved institutions.[163]

Uruguay assumed the presidency of the Digital Nations group (previously known as Digital 5, Digital 7, and Digital 9), thus becoming the first Latin American nation to join this collaborative network of governments of the most digitalized countries in the world that seeks to exploit digital technology to improve the lives of citizens.[164]

Two remaining challenges for Uruguay are the promotion and support of transformational innovation projects, and ensuring that technological dynamism is at the service of social change and responds to the limitations that citizens experience in terms of accessibility – not only access to the Internet, but also to technology in general. The digital agenda aims to facilitate the relationship between technological firms and the government and Uruguayans in terms of their development.

Data Strategy/Open Data Portal: Yes

In 2016, Uruguay published its national open data plan, *Plan de Acción Nacional de Datos Abiertos de Gobierno*,[165] in the context of its adhesion to the International Open Data Charter and in conformity with the principles of the Open Government Partnership, of which it is a member.

The National Open Data Catalogue (*Catálogo Nacional de Datos Abiertos*),[166] created as part of the plan, allows for accessing the information available from public entities, academia, civil society organizations, and private companies. This is a key differentiator, since most open data portals only include government data. Currently, the catalogue contains 21 categories of information from 47 organizations and over 2,000 data sets.

AI Strategy: Yes

The issue of AI ethics was central to the roadmap for data science and machine learning promoted by

163 Among Uruguay´s most recent accomplishments is increased ICT infrastructure coverage; access of new populations to the fiber optic network; availability of access to high-velocity moderate-cost services; and Internet access for all families with children who attend school, each of whom receives a computer with this service.

164 For more information, see https://www.gub.uy/agencia-gobierno-electronico-sociedad-informacion-conocimiento/comunicacion/noticias/uruguay-asumio-presidencia-del-digital-9

165 For more information, see https://www.gub.uy/agencia-gobierno-electronico-sociedad-informacion-conocimiento/sites/agencia-gobierno-electronico-sociedad-informacion-conocimiento/files/documentos/publicaciones/plan_de_accion_nacional_de_datosabiertos_2016_2018.pdf

166 For more information, see https://catalogodatos.gub.uy

Transforma Uruguay (Mesa, 2019). Different civil society actors participated in preparation of the roadmap and several projects were financed, including one on the traceability of algorithmic decision-making, a topic that was already being explored through initiatives financed by the National Agency for Research and Innovation (*Agencia Nacional de Investigación e Innovación* - ANII).

In May 2019, the Uruguayan government started implementation of its AI strategy in the public administration,[167] which received citizen feedback through online consultation with what is known as Uruguay Digital. To date, progress is reported at 70 percent,[168] and the government is working on the development of guides and good practices.[169] The aim of this strategy is to establish the principles of AI use and adoption for the improvement of government services. It is based on four pillars: (1) AI governance in public administration; (2) skills development for AI; (3) AI use and adoption; and (4) digital citizenship and AI.

Infrastructure and Connectivity

In the last few years, Uruguay has achieved significant progress in connectivity, reducing the digital gap by half across households with different income levels. In 2019, 70 percent of the poorest households and 99 percent of the wealthiest households had Internet access. Internet use has also sharply evolved: 79 percent of the population goes online every day, compared to 31 percent in 2010 (EUTIC 2019).

Uruguay ranks the highest on the World Bank's 2016 Digital Adoption Index among the 12 countries examined in this report, and it ranks 24th out of 180 countries worldwide. This suggests that the sectors of government, society, and business are ready to address the country's digital development.

For its part, the World Economic Forum's 2016 Networked Readiness Index ranks Uruguay 43rd out of 139 countries worldwide. This means that the country has sufficient potential to reap the benefits of emerging technologies and capitalize on the opportunities that digital transformation offers, especially with regard to steering the role of government in its work of providing services for social good.

When it comes to issues of infrastructure for connectivity, Uruguay already has the first prototypes for launching 5G networks. It is quite possible that Uruguay will take the lead in the region with this type of network (Forbes, 2019).

Considering the importance that cybersecurity has for implementation of 5G, it is encouraging to see that, with a score of 0.681 out of 1, Uruguay ranks 3rd out of 33 countries in the Americas and 51st out of 133 worldwide on the International Telecommunications Union's 2018 Global Cybersecurity Index.

Academia

Uruguay has stood out for the progress of its different sectors in implementing digital technologies and strategies, including AI. The case of academia is no exception.

The University of Montevideo, one of the country's top four universities according to the QS World University Rankings (2019), offers an undergraduate degree in data science for business, where students are trained in the use of tools for analyzing large volumes of data. While not all universities have specialized laboratories for AI, the top four universities offer degrees relevant to its development and lead research projects on the subject (Table 48).

167 For more information, see https://www.gub.uy/participacionciudadana/consultapublica

168 For more information, see www.uruguaydigital.uy

169 For more information, see https://www.gub.uy/agencia-gobierno-electronico-sociedad-informacion-conocimiento/comunicacion/publicaciones/politica-estrategia-datos-para-transformacion-digital

Table 48. The Top Five Universities in Uruguay and Their Relationship with AI

	1. Universidad de la República (UDELAR)	2. Universidad de Montevideo (UM)	3. Universidad Católica del Uruguay (UCU)	4. Universidad ORT Uruguay
Type of institution	Public	Private	Private	Private
Location	Seven branches*	Montevideo	Montevideo, Punta del Este, Salto	Montevideo
AI-related degrees	✓	✓	✓	✓
AI-related postgraduate programs	✓	✗	✗	✓
AI research	✓	✓	✓	✓
AI laboratory	✓	✗	✗	✗
Technological innovation laboratory	✗	✓	✗	✗

Source: Prepared by the authors based on information obtained from the website of each institution.
Note: Uruguay is not included in the Times Higher Education ranking.
* Montevideo, Punta del Este, Rivera, Rocha, Paysandú, Salto and Tacuarembó.

Other Relevant Institutions

The Technological Laboratory of Uruguay (*Laboratorio Tecnológico del Uruguay* - LATU) has a technological park with five centers, including the Center for the Development of Technology Companies (C*entro de Desarrollo de Empresas Tecnológicas* - CDET) and the Center for the Start-Up of Technology Companies (Ingenio). The ICT4V Technology Center carries out machine learning projects, including one for fraud prevention in financial transactions,[170] while the Center for Innovation in Engineering (*Centro de Inovación en Ingenería* – CI2) seeks to foster an entrepreneurial and innovative spirit among engineers and specialists to increase research and development and innovation.[171]

The Entrepreneurship Ecosystem and Civil Society

Uruguay's entrepreneurship ecosystem is strengthening entities that are more and more specialized in AI, including the National Development Agency (*Agencia Nacional de Desarrollo* - ANDE) and the Support Network for Future Entrepreneurs (RAFE, Spanish acronym). The latter is the main institution that promotes entrepreneurship in the country. While this report did not identify specialized programs for strengthening the capacity of entrepreneurs in the exploitation of AI, the high level of the country's digitalization and the various programs that support entrepreneurs make Uruguay a fertile landscape for AI adoption in this sector.

With regard to the efforts of civil society, the Uruguayan Association of Computer Scientists (*Asociación de Informáticos del Uruguay* - AsIAP) is a professional organization that contributes to the progress and dissemination of ICT through the diffusion of research, studies, and proposals. Among its major objectives is to provide advice to the government on ICT technical, ethical, and legal issues; organize training courses for professionals; and foster technological specialization in higher education centers. The *Jornada de Informática de Actualización Profesional del Uruguay*, held annually, has addressed issues related to AI since 2017 (Presidency of Uruguay 2017). The AsIAP receives support from Microsoft, IBM, *Universidad ORT-Uruguay,* and Red Hat.

170 For more information, see https://ict4v.org/es/proyectos/aplicacion-de-aprendizaje-automatico-a-la-prevencion-de-fraude-en-transacciones-de-credito

171 For more information, see http://www.cii.uy/quienes-somos/

For its part, the Latin American Open Data Initiative (*Iniciativa Latinoamericana por los Datos Abiertos* - ILDA) was created in 2012 as a research program to promote and understand the use of open data in Latin America. The ILDA disseminates information through publications about AI and the risks that it presents.

Use Cases

Table 49 provides a synopsis of the main AI use cases in Uruguay.

Table 49. Main AI Use Cases in Uruguay

Name: Detección de bots		
For more information: www.idatha.com	Year it began to use AI: 2015	Sustainable Development Goal 16 (peace, justice, and strong institutions)
Actors involved: IDATHA, Uruguay's National Agency for Research and Innovation		Current status: Consolidated company with project in scaling stage.
What it proposes: IDATHA analyzes political conversations on networks, primarily helping to understand the needs of users and combat misinformation coming from malicious sources.		
Brief description of project: IDATHA creates synergies to detect bots that undermine the perception that social network users have about the country's political reality.		
AI Applications	Natural language recognition, virtual agents, deep learning platforms, AI-optimized hardware, decision-making, automation of robotic processes, cyber defense, compliance, content creation, peer networking, cognitive worker assistant, emotion recognition, image recognition.	
How AI is used	Uses the Kybalion technology product, which allows for the quantitative and qualitative analysis of conversations on social networks and news portals, detecting bots that may be disseminating false news and distorting public perception.	

Source: Information provided by the IDB for the preparation of this report.

Name: Reducing Domestic Violence (Disminución de la violencia doméstica)		
For more information: n.a.	Year it began to use AI: 2018	Sustainable Development Goals 5 (gender equality), 16 (peace, justice, and strong institutions)
Actors involved: Inter-American Development Bank, Chicago Crime Lab, Globant, and the Uruguayan government.		Current status: Multilateral project in consolidation phase
What it proposes: With the aim of preventing future domestic violence cases, an algorithm was designed to calculate the probability of recidivism of such reports through a machine learning process and strategies designed by international intelligence centers.		
Brief description of project: A predictive model was generated that uses AI algorithms to identify the probability that a victim of domestic violence will experience another event of this nature.		
AI applications	Uses machine learning technology that takes decisions.	
How AI is used	This tool serves to advise the decision-making process that will eventually lead to reducing gender violence indices and preventing femicides.	

Source: Information provided by the IDB for the preparation of this report.

Name: Adaptive Mathematics Platform (PAM), Ceibal Plan		
For more information: https://www.ceibal.edu.uy/	Year it began to use AI: 2013	Sustainable Development Goal 4 (zero hunger)
Actors involved: Management Boards of the Uruguayan Education System: Central Board Council (CODICEN), Early Childhood and Primary Education Council (CEIP), Secondary Education Council (CES), Technical-Professional Education Council (CETP) Developers: Bettermarks		Current status: State-owned company in scaling stage
What it proposes: Address the lack of curricular adaptation in mathematics and logical thinking.		
Brief description of project: PAM is an adaptive online platform that complements mathematics instruction by a teacher with customized educational processes according to the needs of every student. It also provides teachers with tools to work with their classes, establishing learning targets and proposing activities. It has integrated assessment tools for immediately providing feedback and reports.		
AI applications	Data analysis to support decision-making.	
How AI is used	A network node allows for identifying the conceptual areas of every student and for those needing reinforcement, giving suggestions to each student in his/her autonomous work, as well as to the teacher.	

Source: Information provided by the PAM for the preparation of this report.

Conclusions

Uruguay's Digital Strategy consists of a comprehensive plan that addresses issues such as the democratization of technologies and the inclusion of vulnerable groups; government-private sector relationships; the government's transparent use of data; including technology coursework in education sectors; and AI and digital citizenship. Uruguay and Colombia are the only countries in the region that are implementing an AI strategy. Furthermore, Uruguay might possibly become the first country in the region to have its own public 5G network.

In the academic sphere, the high percentage of women involved in STEM research is notable (Table 46. Similarly, the country has a wide range of both private and public entities committed to the promotion and adoption of AI in different productive sectors.

While the entrepreneurial momentum is growing and consolidating itself, the government's interest in increasing the incentives to accelerate this process should be emphasized. Civil society organizations operate in an environment that is conducive to carrying out activities in support of national digitalization efforts that promote AI for social good.

6. GENERAL CONCLUSIONS

The ethical development and implementation of AI in the service of public good is a relatively new and propitious approach to tackling the main challenges faced by Latin America and the Caribbean, which include reducing poverty and inequality gaps. The success of harnessing this technology will depend on numerous factors, including the following:

- Development of a shared vision with which to align the efforts and actors of the AI ecosystem
- Delivery of digital infrastructure facilitated by governments in association with the private sector
- Development of local talent and research on relevant issues
- Adoption of AI by civil society to advance its goals
- Decision-making that places humans at the center of every AI-related conversation and activity
- Strengthening of the entrepreneurship ecosystem
- Respect for the ethical framework and guidelines for developing and adopting AI.

The 12 countries studied in this report have reached different levels of progress for each of the aforementioned factors. To date, Uruguay, Colombia, Argentina, Chile, and Mexico have led the way in laying the solid foundation necessary to develop these types of systems.

A priority to accelerate adoption of AI in the pursuit of democratizing its benefits is for each country to have an AI plan based on a digital strategy and an open data strategy. Those plans will have to be anchored in a resilient infrastructure and guarantee the connectivity of citizens. As cross-cutting principles, those national strategies will have to encourage innovation, research and development, entrepreneurship, and interaction between sectors seeking to promote the progress and consolidation of local AI systems.

In the academic field, it will be critical for the region's public and private universities to continue to offer specialized talent training programs and to drive research on relevant issues in close collaboration with governments and industry. All of this is aimed at ensuring an education system that is aligned with country and regional needs. Furthermore, to make training in technology and innovation more accessible and inclusive, a priority will be to include more degrees related to AI and its ethics in branches of public universities that are located on the outskirts of capital cities.

From the perspective of the entrepreneurship ecosystem, the outlook is encouraging in terms of the types of use cases identified through the survey on AI ethics conducted for this report. Numerous entrepreneurs are experimenting with new business models to produce a social impact and attain financial self-sustainability to expand their operations. While impact entrepreneurs using AI still have a long way ahead, they are already showing results that could grow into a public policy framework propelling this ecosystem.

For their part, start-ups and civil society organizations are using AI as a tool in creative and innovative ways to solve the structural challenges they face. In particular, civil society organizations have the opportunity to benefit from AI in an ethical manner so as to leverage the impact of their projects, principally those where AI for social good clearly offers added value. Furthermore, this sector has enough convening power to initiate a serious dialogue around the possible ethical risks of the use of this technology and can propose mitigation strategies.

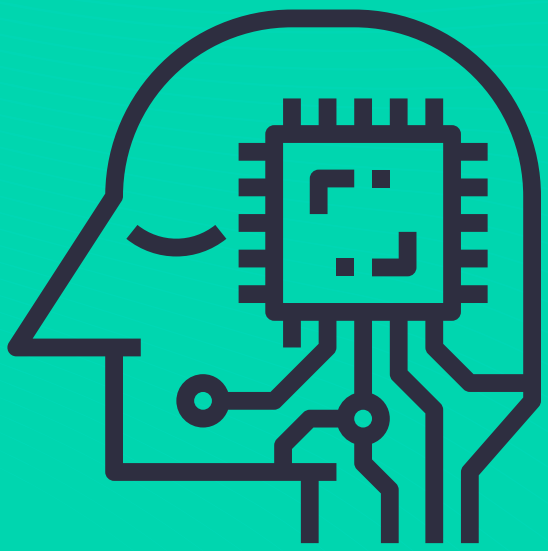
AI is being used as a strategic tool to tackle the region's major challenges. The use cases presented here reflect the potential of this technology in core areas such as health, education, social inclusion, and climate

change, among others. The use cases also serve to scale solutions in view of broadening their impact. Documenting and sharing these cases, as well as the progress that is being made at the country level in establishing the foundations of AI for social good, are fundamental to project the voice and experience of LAC in international fora. Discussions will take place about the mechanisms to develop governance frameworks, standards, and ethical principles for AI that are inclusive, have a local perspective, and contribute to prosperity and fairness in all regions.

Going forward, it will be important to promote and ensure the development of ethical and responsible AI on a cross-cutting basis. The countries studied have made incipient efforts to engage in discussions and debates on privacy, accountability, security, transparency, explainability, fairness and discrimination, professional responsibility, the promotion of human values, and environmental impact. However, it is imperative to transform these dialogues into concrete prevention and mitigation measures. LAC has great potential to harness AI, but this will require a profound commitment to do so in an ethical and responsible manner.

ACRONYMS

AI	Artificial Intelligence
ECLAC	Economic Commission for Latin America and the Caribbean
EU	European Union
GEM	Global Entrepreneurship Monitor
IDB	Inter-American Development Bank
IEEE	Institute of Electrical and Electronics Engineers
IMF	International Monetary Fund
ITU	International Telecommunications Union
LAC	Latin America and the Caribbean
NECI	National Entrepreneurship Context Index
NGO	Nongovernmental organization
OECD	Organisation for Economic Co-operation and Development
SDG	Sustainable Development Goal
STEM	Science, Technology, Engineering, and Mathematics
UNESCO	United Nations Educational, Scientific and Cultural Organization
WEF	World Economic Forum



ANNEXES

ANNEXES

Annex A. Country Selection

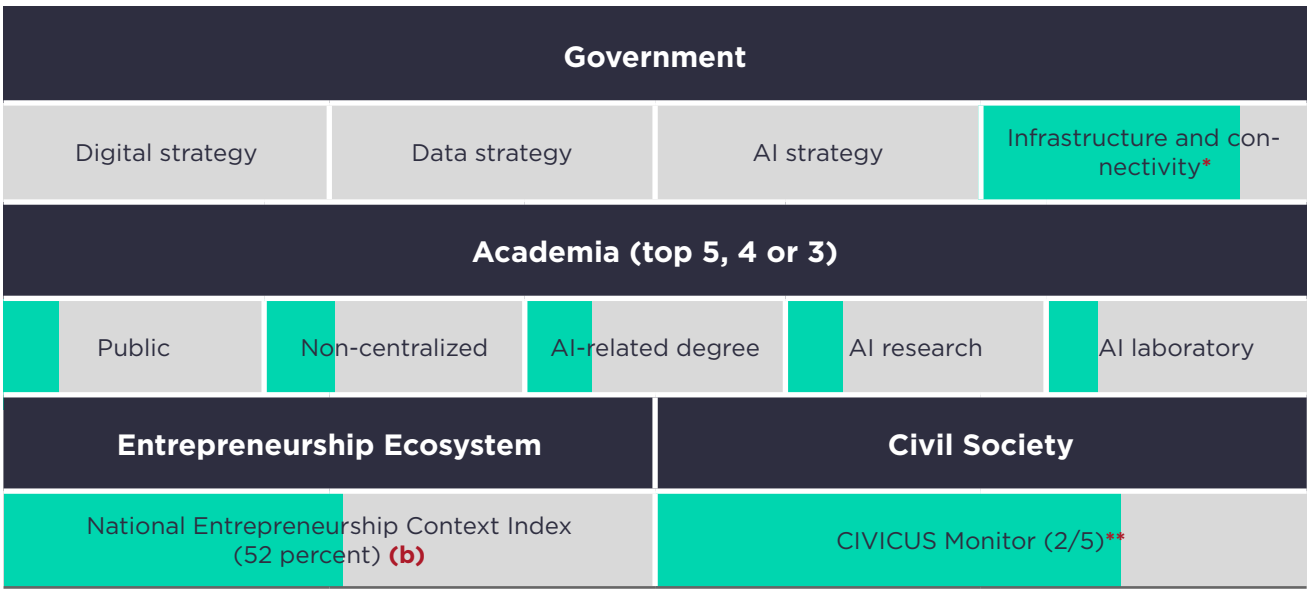
As a preliminary exercise, this report includes the analysis of 12 Latin American and Caribbean countries that were selected on the basis of a subregional evaluation and on the following 21 criteria:

1. Digital Strategy
2. Data Strategy
3. Existence of Open Data Portals
4. Open Data Index (Open Knowledge Foundation)
5. Adherence to the OECD AI principles
6. Beijing Consensus Signatories (UNESCO 2019)
7. Progress in AI Policy
8. Ranking on the Economist Automation Readiness Index 2018
9. Ranking of Government Preparedness for AI according to the Government AI Readiness Index 2019 Compiled by Oxford Insights
10. Ranking on the World Bank Digital Adoption Index
11. Percentage of the Population that Uses the Internet
12. Population (World Bank 2019a)
13. Percentage of LAC Population
14. GDP (2017–2018)
15. Per Capita GDP
16. GDP Ranking among LAC Economies
17. Number of Secure Internet Servers per 1 million people
18. Network Speed (2019)
19. Bandwidth Speed (2019)
20. Research and Development Expenditure as a Percentage of GDP
21. Number of Researchers per Million Inhabitants

Annex B. General Overview of Countries

Table B1 summarizes the information presented under each country's section. It includes data from the Global Entrepreneurship Monitor's 2018–2019 and 2019-2020 Global Reports (Bosma and Kelley 2019; Bosma and Hill 2020) as well as information from World Bank's Digital Adoption Index.

Table B1. Summary of Progress in Technology and AI by Country



Source: Prepared by the authors.

*The average score of the Digital Adoption Index and the Networked Readiness Index is calculated.
** While it is normal that higher scores signal higher qualifications, the barometer was inverted for this index so that it is more easily understood, since higher scores are less desirable in this case.

Legend:

- Full or striped colors
  - Green: The country has a strategy
  - Orange: The country is developing a strategy
  - Grey: The country lacks a strategy
  - Grey and white stripes: No information is available
- Barometer: The green barometer indicates the progress or level of the country in the issue for the bloc of countries

Country Profile

In order to understand the different starting points of each of the 12 countries analyzed, it is important to consider their economic indicators, level of education, and progress in human development and equality. This information is provided in the three-panel figure at the beginning of each country profile, where it is compared to the median for all 12 countries so as to comprehend the relative position of the specific country.

- **Economy and Population:** Size of the economy (GDP), main economic sector, and number of inhabitants (World Bank 2019a).
- **Education:** Indicators directly related to education, given that schooling is one of the fundamental elements to determine the future of technology (Silagadze 2018). This includes unskilled labor, the Program-

me for International Student Assessment (PISA) exam,[172] and English language proficiency (Education First 2019), considering that a significant number of programming languages are in English and a person's proficiency level may constitute a competitive advantage.

- **Human Development and Equality:** The Human Development Index and the Gini inequality index contextualize the social scenarios of selected countries, since the purpose of AI for social good is to reduce the gaps that they reveal. The gender index was also added for the fields of science, technology, engineering, and mathematics (STEM). However, extensive research by the authors of this report did not identify a database that reported the percentage of women in Latin America's STEM labor market. Therefore the data for each country were cited from different sources. Hence, in contrast to all other indicators, these data do not have an internal ranking for the 12 countries studied.
- **Civil Society:** CIVICUS Monitor is an organization that monitors the state of civil society freedoms in the world and provides ratings from 1 to 5 in its tracking tool.173 The figures rate the conditions under which civil society may act in a given country:
    - 1/5 - open
    - 2/5 - narrowed
    - 3/5 - obstructed
    - 4/5 - repressed
    - 5/5 - closed
- **Entrepreneurial Environment:** The National Entrepreneurial Context Index (2019–2020) of the Global Entrepreneurship Monitor (GEM)174 determines how favorable an environment is for entrepreneurs based on a top rating of 10 (Bosma and Kelley 2019).

Key Players

In an increasingly complex world resulting from globalization and new disruptive technologies, intersectoral cooperation is essential. The commitment and collaborative participation of industry, government, academia, and civil society are critical elements for responsible adoption of AI towards fulfilling the Sustainable Development Goals. It is therefore important to study the players involved and the actions that they undertake in order to develop regional, national, and local AI ecosystems.

The sections that follow describe the role that each actor plays in terms of AI to serve the public good and the type of information that was analyzed for each one of these groups in this report.

>Government

According to the IDB and other organizations that have studied AI in different regions of the world, government action is essential for a country to have the tools needed to adopt and develop digital and AI initiatives (IDB 2019; Google, 2019; Oxfords Insights and IRDC 2019). In any private or public initiative, the more a government contributes (whether in the fields of education, health, or employment, among others) the greater the percentage of successful cases and the sector's growth (Bernard 2017; Mazzucato 2015).
The work of governments concerning the promotion of AI has two dimensions: the government's own use of AI, and the creation of tools for encouraging its use in the country. On the one hand, AI allows governments to become more efficient when they use these technologies to reduce costs and redesign processes so as to provide improved public services and asset management (Pombo, Gupta, and Stankovic 2018).175

172 PISA is a project of the Organisation for Economic Co-operation and Development whose goal is to evaluate the formal education of students once they have reached the final stage of compulsory education at the age of 15.

173 For more information, see https://monitor.civicus.org/about/

174 For further information, see https://www.gemconsortium.org/file/open?fileId=50443

175 Including extensive use of ICT, among other criteria.

On the other hand, governments have the power to (1) provide the infrastructure required for AI adoption; (2) design regulatory and policy frameworks that define a country's roadmap in digital technology and AI; and (3) drive adoption of AI in specific industries of the economy, and in the process define the course of the country's transformation in this regard (Navarro 2018). The government can carry out its work by relying on spaces for meeting, dialogue, and exchange with other players such as entrepreneurs, citizens, civil society organizations, academia, international organizations, and global and regional networks for public governance and digital government. Similarly, it can provide the infrastructure necessary to carry out initiatives that promote digital adoption among a greater number of users. Such infrastructure is part of a state-of-the-art regulatory framework for data protection, as well as standards for inter-operability and open-source gateways, since these platforms are crucial for training AI systems that depend on the analysis of large amounts of data.

In order to determine government progress regarding strategies and infrastructure geared towards promoting AI development, this report considered the four pillars that constitute the foundations of successful AI adoption in a country: digital strategy, open data strategy, AI strategy, and connectivity and infrastructure indicators. In the case of the latter foundation, connectivity was estimated on the basis of the percentage of the population with Internet access and the number of mobile subscriptions, since ICT sector experts believe mobile technology capacity is directly related to the broadband scalability capacity of a country. For infrastructure, the report used the World Bank's Digital Adoption Index and the World Economic Forum's Networked Readiness Index.

Furthermore, progress made by each country in relation to 5G networks was reported, given the potential that this technology has to accelerate delivery of cloud services. These services reinforce AI systems to the extent that they allow them to analyze data and learn more quickly. The convergence of 5G networks (speed) with the Internet of Things (sensors and data) and with AI (predictive and trends analysis) has the potential to accelerate the economic and social transformation included in the Fourth Industrial Revolution. Finally, information is provided on the state of cybersecurity in each country. Cybersecurity is paramount for any system that uses AI because it refers to good practices for protection of systems, networks, and programs from digital attacks. These cyberattacks tend to be aimed at accessing, changing or destroying sensitive information; extorting money from firms, the government, or users; or interrupting normal business processes.

Table B2 summarizes the information being analyzed:

Table B.2. Summary of Information Analyzed under the Government Section

Government			
Digital strategy	Data Strategy	AI Strategy	Infrastructure and Connectivity
Yes/No/Ongoing	Yes/No/Ongoing	Yes/No/ Ongoing/ Continuity to be explored	Networked Readiness Index Digital Adoption Index 5G Cybersecurity

Source: Prepared by the authors.

>Academia

Academia plays a fundamental role in the production of talent, as well as in AI research and development, since it is where an understanding of diverse fields is deepened, generating new knowledge that streng-

thens the foundations needed to propel adoption of AI in the service of social good (Oxford Insights and IRDC 2019). Moreover, it is in academia that expert talent fostering technological innovation is trained.

In the academic setting, which consists of universities, research centers, and training institutes, it is important to examine how a country guarantees that AI learning is made accessible to the general population. This will depend on the way in which opportunities are distributed across the country and on the significant presence of public universities, among other factors. Furthermore, it is necessary to determine what type of knowledge is produced in higher education institutions and whether or not they have the ability to conduct laboratory experiments in AI. Consequently, the Academia section for each country records the curricular programs offered in AI, the existence of postgraduate studies and research in AI, the presence of AI or technological innovation laboratories, and the public or private nature of training centers and the geographical location of their branches across the country. The description of the academic sector is complemented with additional information, by country, about other universities and research centers that deal with these areas of knowledge.

The universities described in this report are those ranked highest for undergraduate studies, in most cases according to the 2019 QS World University Rankings. This ranking is obtained from "a comparative analysis of performance according to metrics that are fundamental to the mission of each institution: teaching, research impact, academic reputation, student employability and internationalization (Quacquarelli Symonds 2020, xx). On the rankings, 40 percent of the score is determined by a survey conducted among scholars worldwide, hence to a considerable extent it is derived from the reputation of academic institutions.

To complete the academic picture concerning AI programs, we identify universities in the QS World University Rankings that are also among the top five universities in the Times Higher Education Ranking, where other factors are measured and different weights are applied. This ranking is based on "a series of data that provide detailed performance information across all the core areas of university activity, which allows comparison and benchmarking against other institutions – whether competitors or collaborators – across regions, subjects and other key criteria" (THE 2020). The 2019 QS World University Rankings and the 2020 Times Higher Education Rankings are the most widely considered global ranking systems.

>The Entrepreneurship Ecosystem and Civil Society

As shown in a study by Endeavor (2018), AI has played a critical role in configuring and boosting the entrepreneurship ecosystem, while also helping to create new business models. An ecosystem's level of development is a determining factor in the application and evolution of AI in a country. In LAC, a major characteristic of AI entrepreneurship is that while its apogee is incipient, there is optimism about the industry's development perspective.

Since a large variety of reports on this topic are available, with the aim of not duplicating efforts, this report does not include a detailed account in the countries studied of the use of AI by the entrepreneurship ecosystem and BigTech (giant technological companies such as Apple, Google, Amazon, and Microsoft). However, examples of initiatives and ventures that benefit from AI to achieve a greater impact on social problems and on environmental issues are presented, since this report precisely centers on this use.

Additionally, in the context of the IDB Group's Civil Society Engagement Strategy, civil society organizations and groups devoted to social issues, human rights (including digital rights), and the reduction of technological gaps play a fundamental role in influencing the development guidelines and standards for responsible and person-centered use of AI.[176] Therefore, for each country examples are included of social organizations and initiatives that promote the responsible use of AI and/or fulfill an important function in its study, development, or promotion.

176 For more information, see https://www.iadb.org/es/sociedad-civil/home

It is worth noting that this report refers to impact entrepreneurs or social entrepreneurs as those who are a part of the AI ecosystem and seek – through the development of AI-based technological tools or their use as a central part of disruptive business models – to influence efforts to solve social challenges or further the achievement of other societal goals.

>Use Cases

One of the goals of this report is to document pertinent AI initiatives, progress, and cases in the service of social good in the region. Towards this end, the report presents use cases that explore or use AI as part of their strategies for solving societal and environmental problems. This analysis was based on research of secondary sources conducted by C Minds and the IDB Group and on a variety of recommendations from experts. It was conducted with the participation of companies such as Microsoft, Google, Opinno/MIT35, and other collaborators from public-private institutions such as Uruguay's Agency for the Development of Electronic Government and Information Society and Knowledge (*Agencia de Gobierno Electrónico y Sociedad de la Información y del Conocimiento* – AGESIC). This exercise produced 29 documented cases that are already being implemented and that make up a diverse sample of applications which involve several issues, sectors, executing agencies, and geographical locations.

These use cases will be a part of the first phase of the IDB's FAIrLAC Observatory, a constantly evolving space that will also report on other examples in the region that have not been included in this report, as well as on new initiatives.

Annex C. Summary of the 31 Use Cases

The selection criteria for the use cases were as follows:

- The project has been implemented (not in the idea phase)
- The project incorporates and implements autonomous and intelligent systems
- The project falls within the context of a social good, as defined by the Sustainable Development Goals
- Project developers and implementers have completed a detailed worksheet for the use case within the available timeframe.

Country	Name of Case	Issue	Implementors	Page
Argentina	Amanda Care	Health	Start-Up Company	44
	Dymaxion Labs	Agriculture	Start-Up Company	45
	Kilimo	Agriculture and Environment	Start-Up Company	45
	Laura	Justice	Government	46
	Prometea	Justice	Government	46
Brazil	LAURA	Health	Start-Up Company	54
	Livox	Education	Start-Up Company	54
	Portal Telemedicina	Health	Company	55
	R1T1	Health	Company	55
	Traive	Labor	Start-Up Company	56
Chile	ALeRCE	Education	University	64
	DART	Health	University and Government	65
	NotCo	Environment and Food	Company	65
	Predicción de lugar de delitos	Security	Government	66
	U-Planner	Education	Start-Up Company	66
Colombia	1DOC3	Health	Start-Up Company	73
	Acuerdos de paz	Justice	Start-Up Company	73
	SISBÉN	Social Inclusion	Government	74
Costa Rica	PARMA	Health	University	80
Ecuador	SpeakLiz	Social Inclusion and Education	NGO	89

Mexico	*Ayuda a obreros y migrantes*	Labor and Social Inclusion	University	96
	CEDO	Climate Change	NGO	97
	Doc.com	Health	Company	97
	Unima	Health	Start-Up Company	98
Paraguay	Layers - *Terrenos inteligentes*	Agriculture	Start-Up Company	103
	ParaEmpleo	Labor	Government	104
Peru	AYNI Lab	Health	Government	109
	IRBin	Environment	Start-Up Company	110
Uruguay	*Detección de bots*	Justice	Consolidated Company	121
	Disminución de la violencia doméstica	Justice and Gender Equality	Multilateral Project	121
	PAM	Education	Government	122

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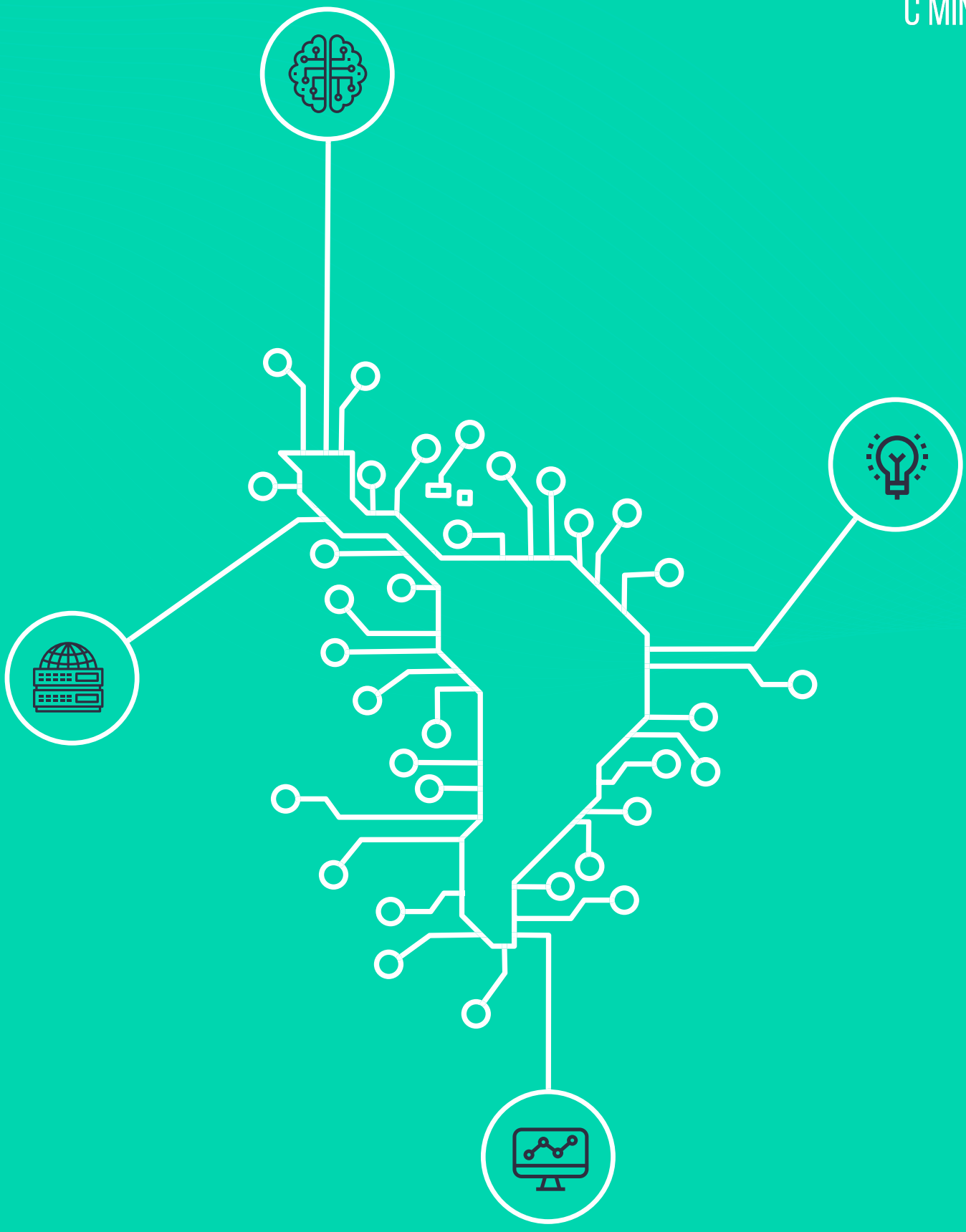
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