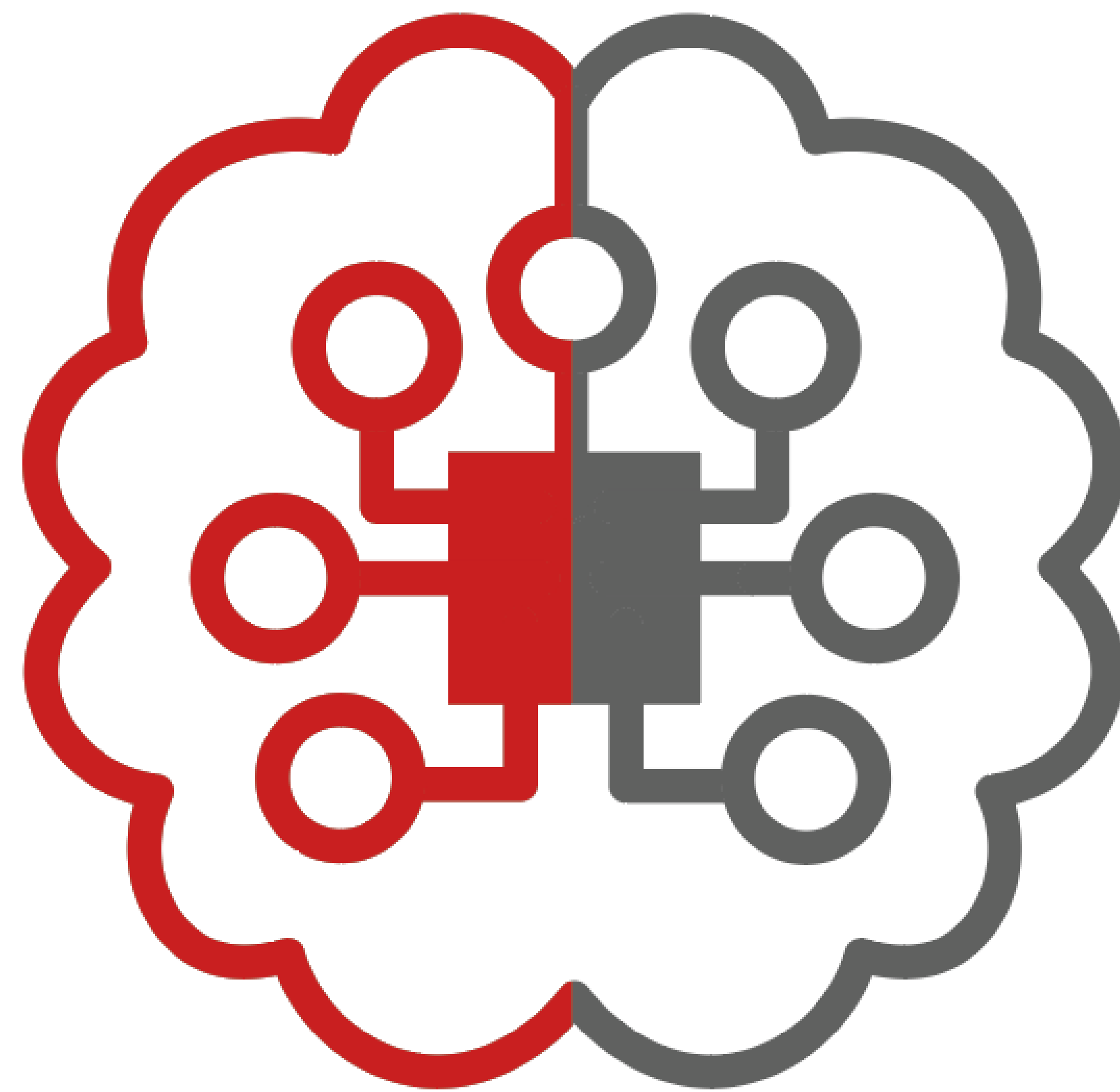




NATIONAL ARTIFICIAL INTELLIGENCE STRATEGY

First Draft of Peruvian National AI Strategy

Government and Digital Transformation Secretariat
PRESIDENCY OF THE COUNCIL OF MINISTERS



1

ARTIFICIAL INTELLIGENCE

2

EXTERNAL
ENVIRONMENT

3

INTERNAL CONTEXT

4

PURPOSE, MISSION
AND VISION

5

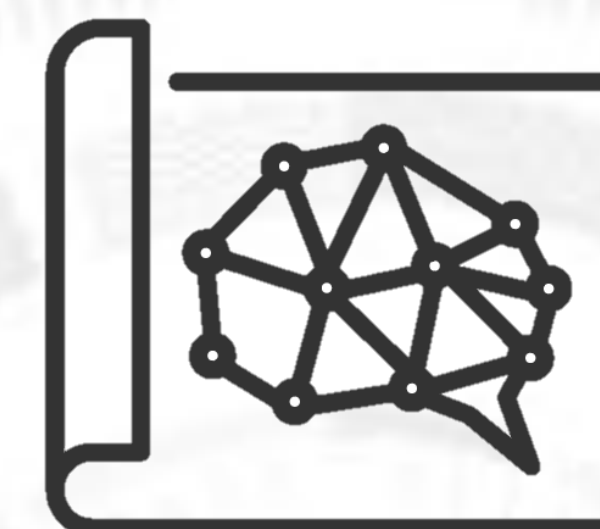
AXES, STRATEGIC
OBJECTIVES AND ACTIONS

6

NATIONAL CENTER FOR
INNOVACION AND
ARTIFICIAL INTELLIGENCE

Objective of the Committee of Experts

Develop the National Artificial
Intelligence Strategy.



AI Expert Committee



Gisselle Bejarano Nicho

PhD (c) - Machine Learning Univ.
Binghamton University



María Elena Maguiña

Statistics PUCP
Senior Data Scientist en Risk models and
implementation - Scotiabank Canada



Claudia Avila

Mag. Business Intelligence and Data
Science Universidad de Alcalá. Special
Monitoring Center and Innovation
Laboratory at Indecopi.



Miguel Paredes Sadler

PhD in Data Science / Applied Machine
Learning MIT. Executive Vice President and
Chief AI & Data Officer (CDAIO) at Rimac



Luis Zuloaga Rotta

Master in Systems Engineering, UNI
Dean of the Faculty of Industrial and
Systems Engineering of UNI



Omar Flórez Choque

PhD. Utah State University. Investigador
de Machine Learning e Inteligencia
Artificial.
Role Model in AI by AI4ALL



Carlos Calderon

MBA - MBA Business School Partner
and Director, Data Science and AI
Academy - UTEC



Paco Valverde Tarazona

Systems Engineer, Univ. of Lima. Manager
of New Solutions in the Innovation and
Transformation Direction - UPC.

AI Expert Committee



Cesar Beltran Castañon

PhD in Bioinformatics at University of Sao Paulo-Brazil. Senior Research Professor at the PUCP.



Flabio Gutiérrez Segura

D. in Computer Science from the Polytechnic University of Valencia - Spain. Professor-Researcher at the National University of Piura.



Efrain Mayhua Lopez

PhD in Multimedia and Communications at Univ. Carlos III de Madrid-Spain. Professor-Researcher at Univ. Católica San Pablo.

With the collaboration of



Coordinator

Wester Zela Moraya

PhD. Artificial Intelligence
Univ. Politécnica Madrid.
SGTD - PCM

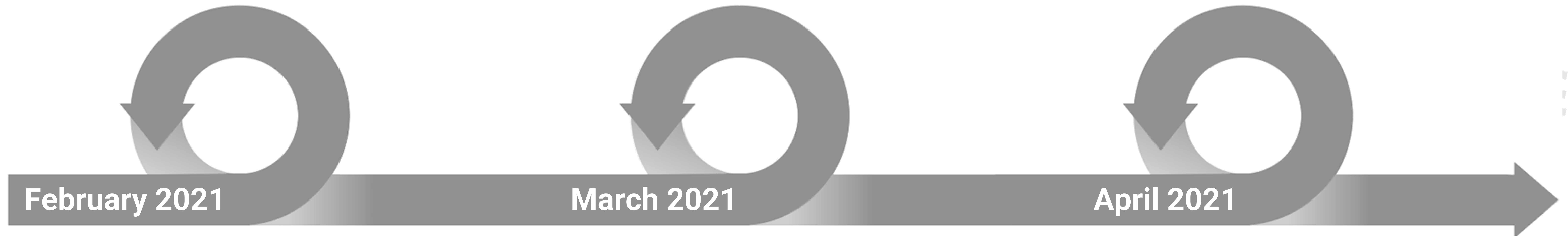


National Strategy for Artificial Intelligence

Roadmap



Stages of Development of the National Strategy



Sprint 1:

Creation of Version 1.0

- Initial analysis and vision
- Development of guidelines and strategy objectives
- Drafting and revision of the document version 1.0
- Closing of version 1.0

Sprint 2:

Version 2.0: Partner friends

- Presentations of the Strategy and methodology for feedback
- Socialization with friendly collaborators
- Collection of suggestions and recommendations
- Revision and update of version 2.0

Sprint 3:

Version 3.0: Peruvian and International Society

- Presentation of the Strategy and Methodology for feedback
- Presentations on AI topics (Ethics, social impact, public sector, etc.)
- Socialization with Peruvian society
- Collection of suggestions and recommendations
- Revision and update of version 3.0

Structure of the National Strategy

- **Artificial Intelligence**

Definition of Artificial Intelligence

- **External Context**

External Analysis (Advances in AI, Strategies of other countries and others).

- **Internal Analysis**

Internal analysis of the AI sector, inventory of available resources and capabilities. SWOT analysis.

- **Purpose, Mission, and Vision of the National Strategy**

Purpose, mission definition, and long-term vision of the National Artificial Intelligence Strategy.

- **Strategic Axes**

In order to align the strategies towards the vision of the National Strategy

- **Strategic Objectives (Priority and Non-Priority)**

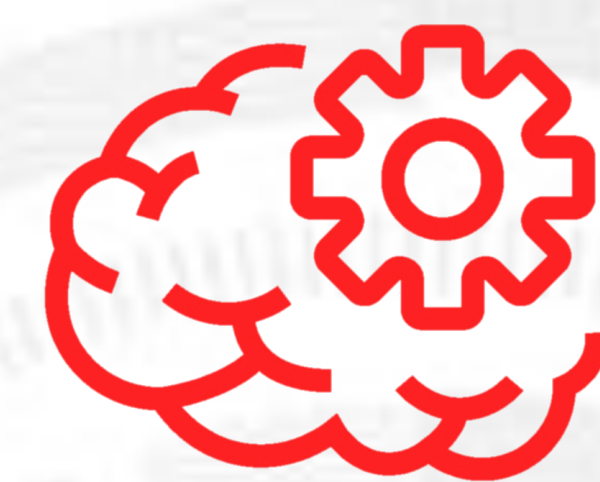
Define the goals or targets developed at the strategic level that the country intends to achieve over a period of time. It will include actions and the means needed to achieve them, which will be translated into specific objectives.

- **National Center for Innovation and Artificial Intelligence**

Proposal to create a national center to accelerate the development and adoption of AI in the country.

National Strategy for Artificial Intelligence

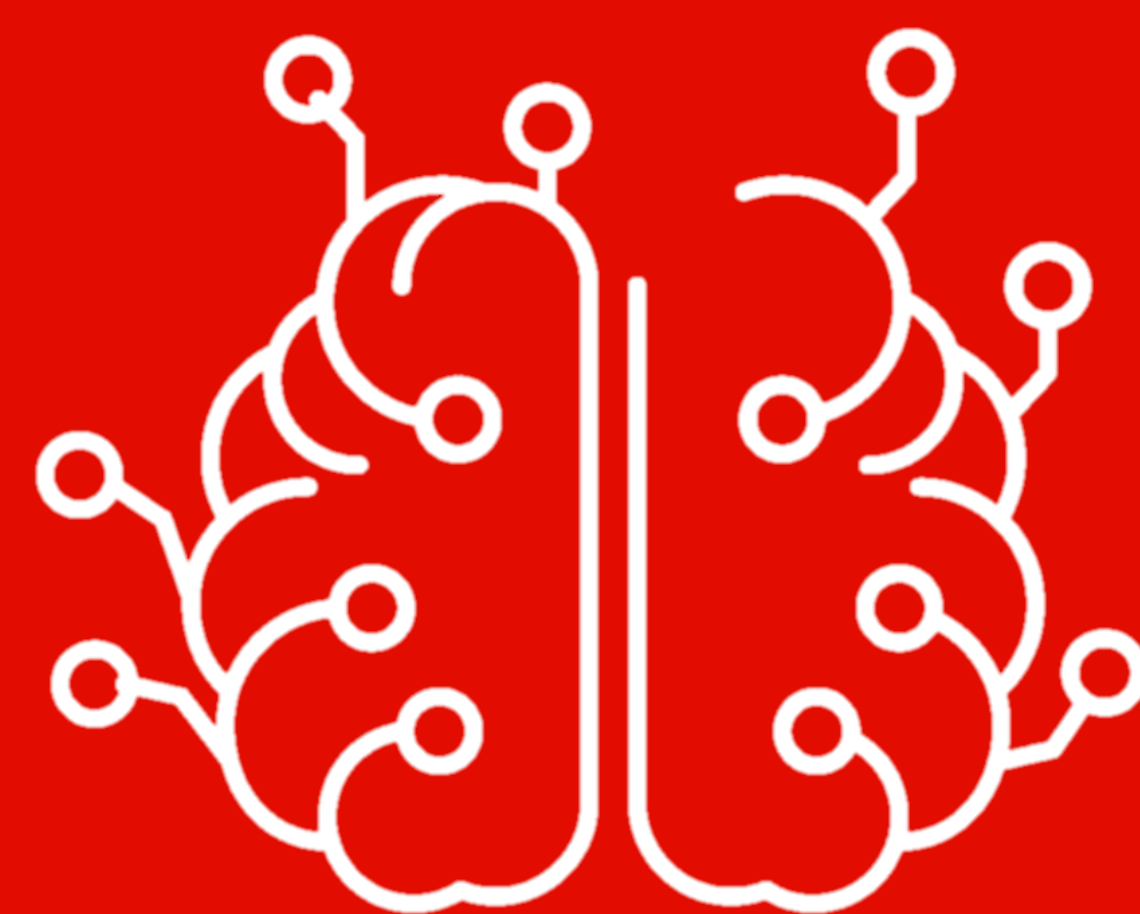
Artificial Intelligence



Artificial Intelligence

Classic definition

Due to the accelerated development of Artificial Intelligence (AI), its definition has been transformed to the point where some consider that AI is everything that has not yet been invented. In order to build its understanding, we will start by mentioning that the term was coined by Professor John McCarthy in 1955. For him, AI was "the science and engineering of making intelligent machines." Around the same time, mathematician Alan Turing also proposed a test to evaluate whether a machine could impersonate a human in its interaction with a real human.



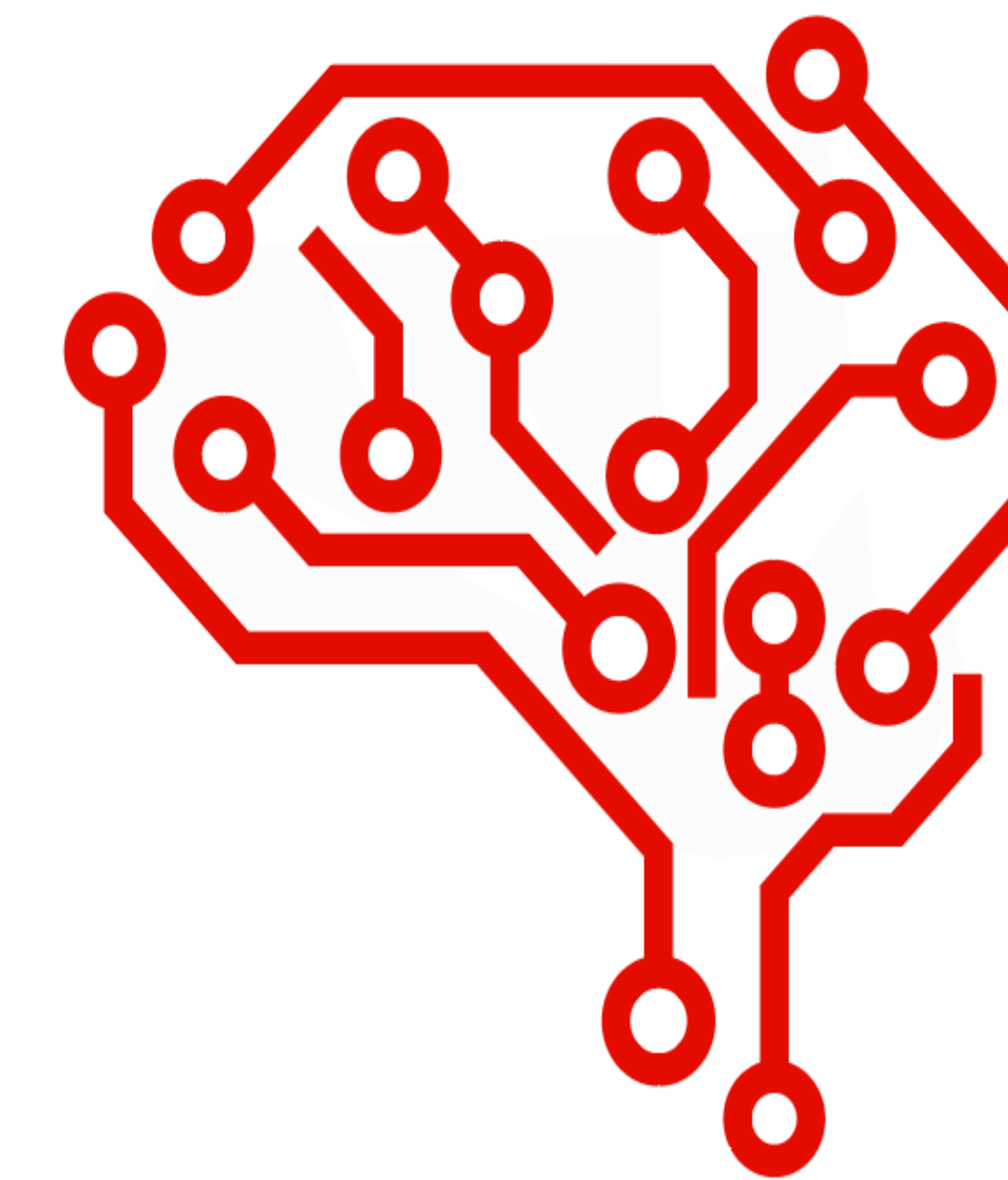
Definition for the Strategy

- In its early days, AI simulated human behavior through rules. However, more recent methods focus on making machines learn from data and their interaction with the outside world automatically. Currently, the OECD proposes the following definition: "An AI system is 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".
- To complement these two definitions, we would also like to mention that AI is influenced by and influences areas such as neuroscience, linguistics, robotics, among others.

Machine Learning

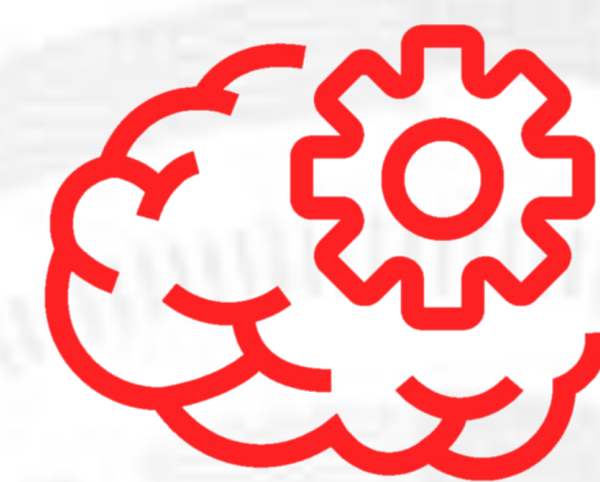
(Automatic or machine learning)

- Set of Artificial Intelligence models trained to learn from data in order to predict outcomes or make decisions without being explicitly programmed to do so.
- Some of the best known types of approaches are: supervised, unsupervised, reinforcement and association rule learning, etc.
- Some of the best known algorithms are: artificial neural networks, decision trees, support vector machines, Bayesian networks, genetic algorithms, deep learning and others.



National Strategy for Artificial Intelligence

External Context

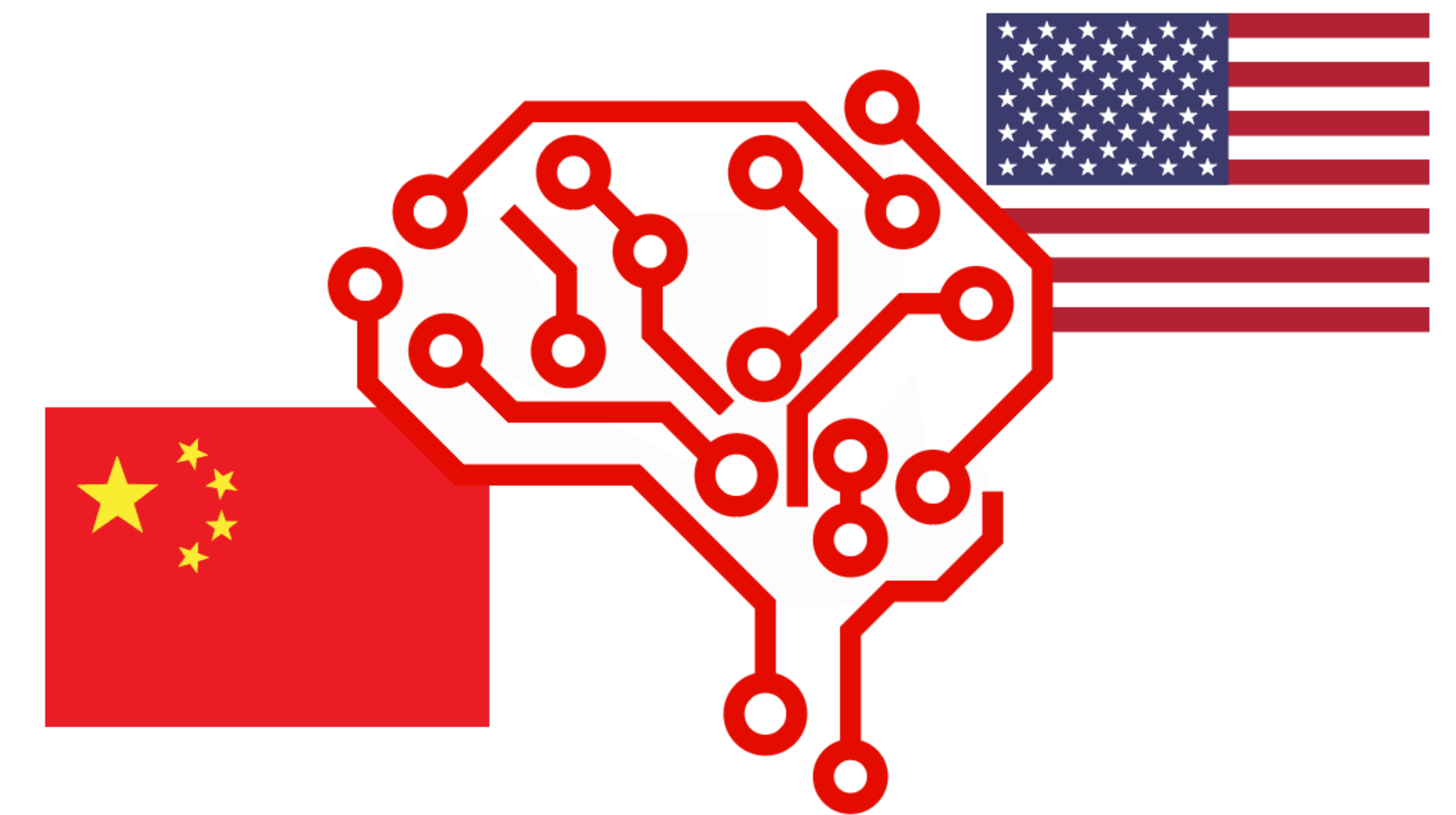


External Context

The data economy and Artificial Intelligence applications are being adopted around the world at such a speed that, for the last 5 years, several nations and multilateral organizations have taken a more conscious stance on the need to promote and govern this process through the design and implementation of National Plans, Strategies and Agendas.

Evidence on international trends (*):

- In recent years many countries around the world have invested in Artificial Intelligence led by the US and China.
- Use cases in almost every industry are accelerating.
- Since 2015, the number of AI-related jobs in the private sector has doubled
- Academic offerings for specialization, Master's and Doctorate degrees have increased significantly.
- AI publications are increasing significantly.
- AI technology or consultancy offerings are growing at an accelerated pace
- Investments in technological infrastructure to support increased adoption and use.
- The number of PhD graduates with AI and Machine Learning has doubled.
- Multilateral organizations and Nations are defining Ethical Frameworks and regulations specifically dealing with AI.
- Private investment in AI projects is increasing.



External Context

In our region, Brazil, Mexico, Colombia, Argentina, Chile, and Uruguay have already made progress in this area, with various documented initiatives.

In all cases, the documents reveal expressions of interest in the direction that governments should take with respect to these phenomena, and many of them are expressed in public policies but with little empirical support or technical basis.

However, the cases of Colombia and Brazil have made significant progress in the implementation of their plans, which include the creation of institutions or agencies specially designed to manage strategies, coordinate efforts, and channel public financing.

In all cases there was a great effort of socialization, dissemination, and involvement with the different stakeholders.

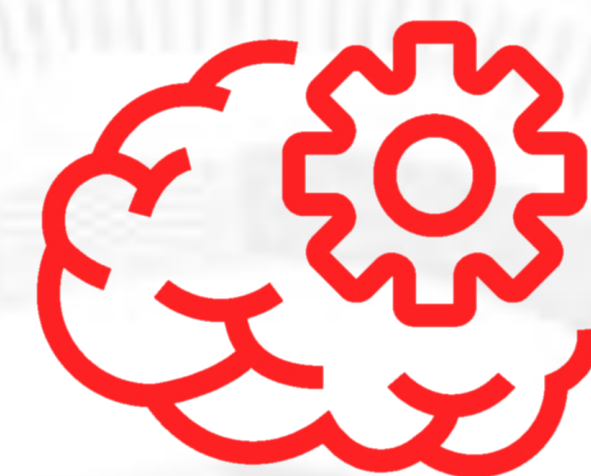
The main fronts addressed for the adoption and use of IA were:

- Closing specialized talent gaps.
- Ensure the provision of actionable data and operations infrastructure.
- Promotion of adoption-oriented investments in sectors such as small and medium businesses and startups.
- Definition of Ethical Frameworks and specific regulation.



National Strategy for Artificial Intelligence

External Context: Some AI Use Cases in the Public
Sector



External Analysis Use Cases of Local Government

- **Improved citizen service**

- Several municipalities in Norway use chatbots to speed up customer service for simple requests from citizens.
- The municipality of Copenhagen uses NLP technique to analyze and sort through incoming emails from citizens.



- **Decision support**

- The municipality of Espoo (Finland) developed a pilot project to plan the budget allocated for public health services.
- The municipality of Trondheim (Norway) developed an administrative case recommendation system with the aim of speeding up decision making given a similar request.



External Context Use Cases in Justice

- **Robot Judge**

- China has been employing artificial intelligence in the courtroom since 2017. A robot judge is used to hear specific cases such as trade disputes, e-commerce liability claims, and copyright infringement. To date, more than 3 million cases have been handled by a robot judge in China.

- **System to predict future criminal recidivism**

- HART is a system developed by the Durham Police and Cambridge University researchers, using training data from 104,000 people who had been arrested for five years.
- The system uses variables that focus on the suspect's crime history, as well as age, gender, and geographic area, to classify an offender as low, medium, or high risk of committing new serious crimes during the period of next two years.
- HART was developed with the aim of reducing the number of people incarcerated, and of being susceptible to other forms of intervention that would be as or even more effective in reducing the risk of recidivism.



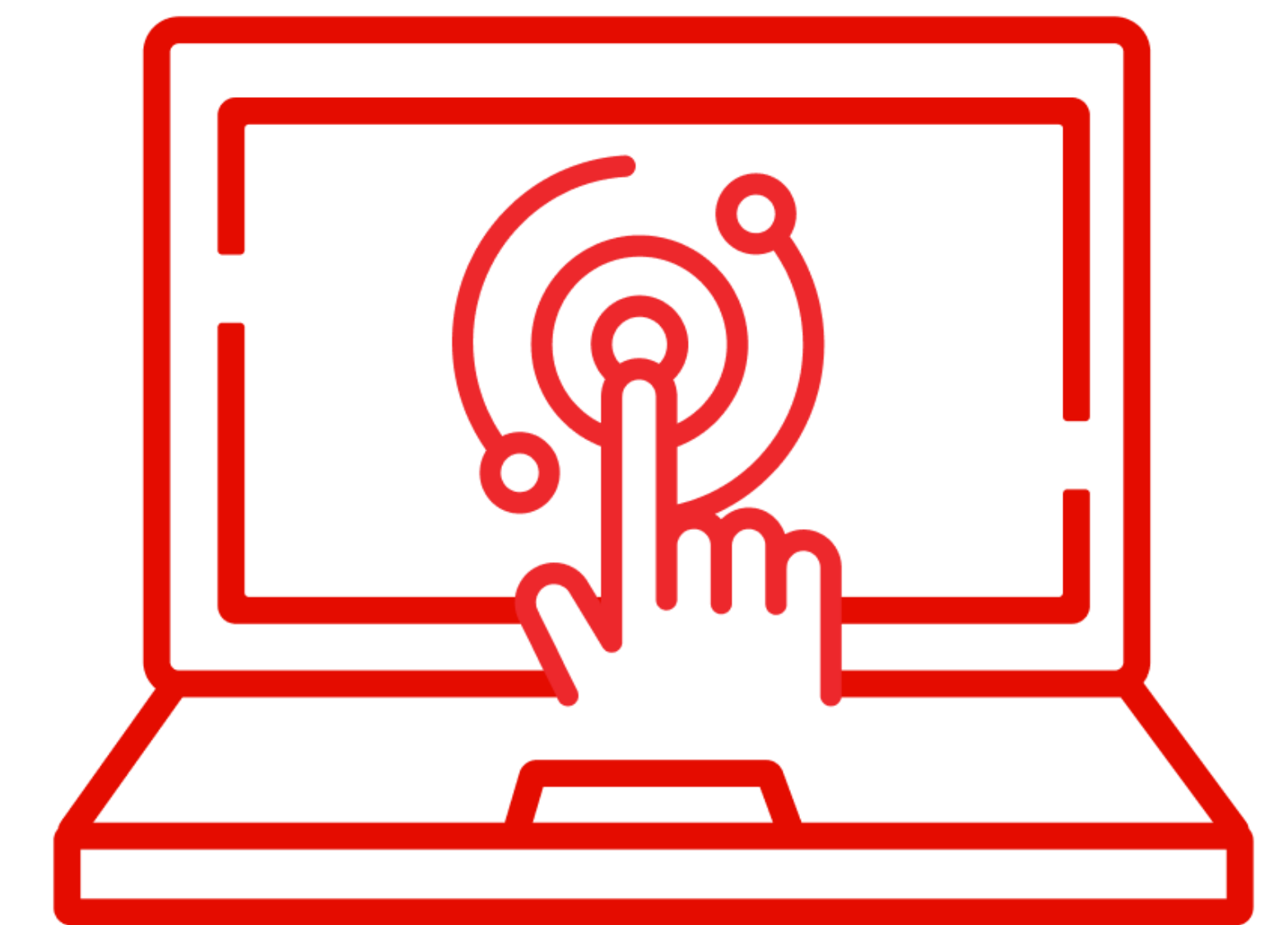
External Context Use Case in Citizen Security

- **Use Cases in Public Transport**

- Within public transportation, include cameras and AI-based systems to be able to detect people fights, follow people, agitators, or suspicious behaviour or any activity that could be a danger to women. It could also detect areas that do not have much light.
- These systems could alert operators to react quickly.

- **AI System to predict crimes in specific places and times**

- PredPol, a Californian company that grew out of a project between UCLA and Los Angeles Police Department, defines "predictive surveillance as the practice of identifying the times and places where specific crimes are most likely to occur, and then patrolling those areas to prevent for those crimes to occur.
- PredPol uses the historical data of a client's police department from a period of two to five years to train a machine learning algorithm, which is subsequently updated on a daily basis. Only three data points are used: crime type, location, and date/time.
- According to PredPol, demographic, ethnic or socioeconomic information is never used. This eliminates the possibility of privacy or civil rights violations seen with other predictive or intelligence-based policing models. .



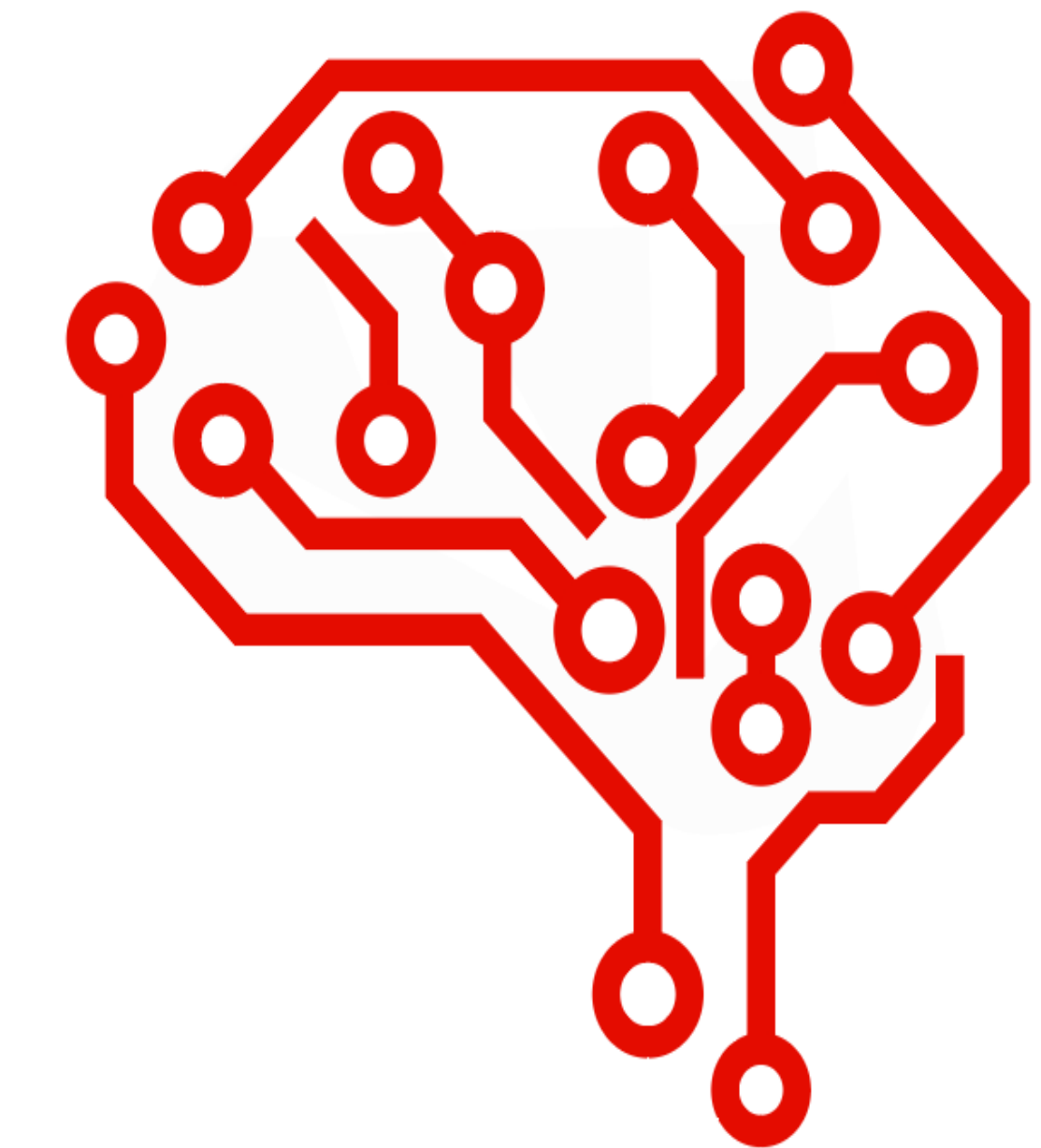
External Context Use Case in Education

- **AI adapted to the needs of each student**

- From school to college, AI could individualize the learning needs of each student.
- The system could respond to the needs of the student, placing greater emphasis on certain topics, repeating things until the student masters it.
- In general, helping the student to learn at her own pace, whatever this could be.

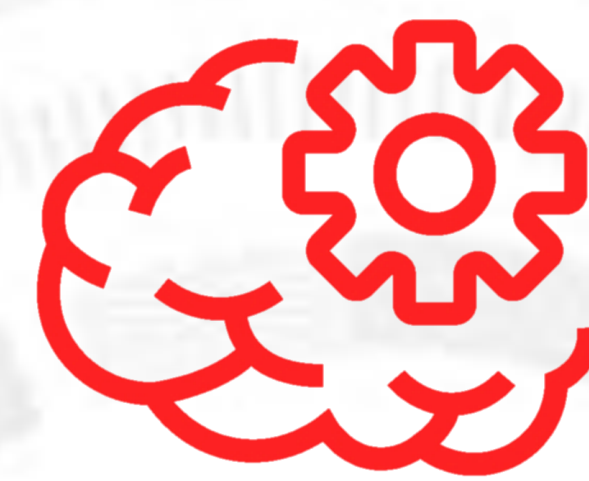
- **AI could give feedback to students and teachers**

- AI could give feedback to teachers and students about the results of the course itself.
- Some AI systems are used to monitor student progress and alert teachers when there might be a problem with student performance.
- These systems could give the support to the students who need it, and to the teacher, to find the areas where he can improve the instructions to the student so that he does not fail with the subject of the course.



National Strategy for Artificial Intelligence

External Context: Some AI Use Cases for Key Sectors
of the Economy



External Analysis Use Cases in Agriculture

- **Digital production and agronomy**

Initiatives dedicated to crop monitoring through sensors and images from drones and satellites).

- **Crop planning and management**

Managing crops, irrigation and workers based on data and predictive analytics

- **Market access and financing**

Crop and cost forecasting, insurance, exchange applications and leftover recovery

- 50% water and energy savings
- Reduction of losses on expensive fertilizers due to over-watering

Some success stories:

[betterfoodventures](https://betterfoodventures.com)



SOIL  SCOUT

 **BLUERIVER**
TECHNOLOGY

External Analysis Use Cases in Fisheries and Aquaculture

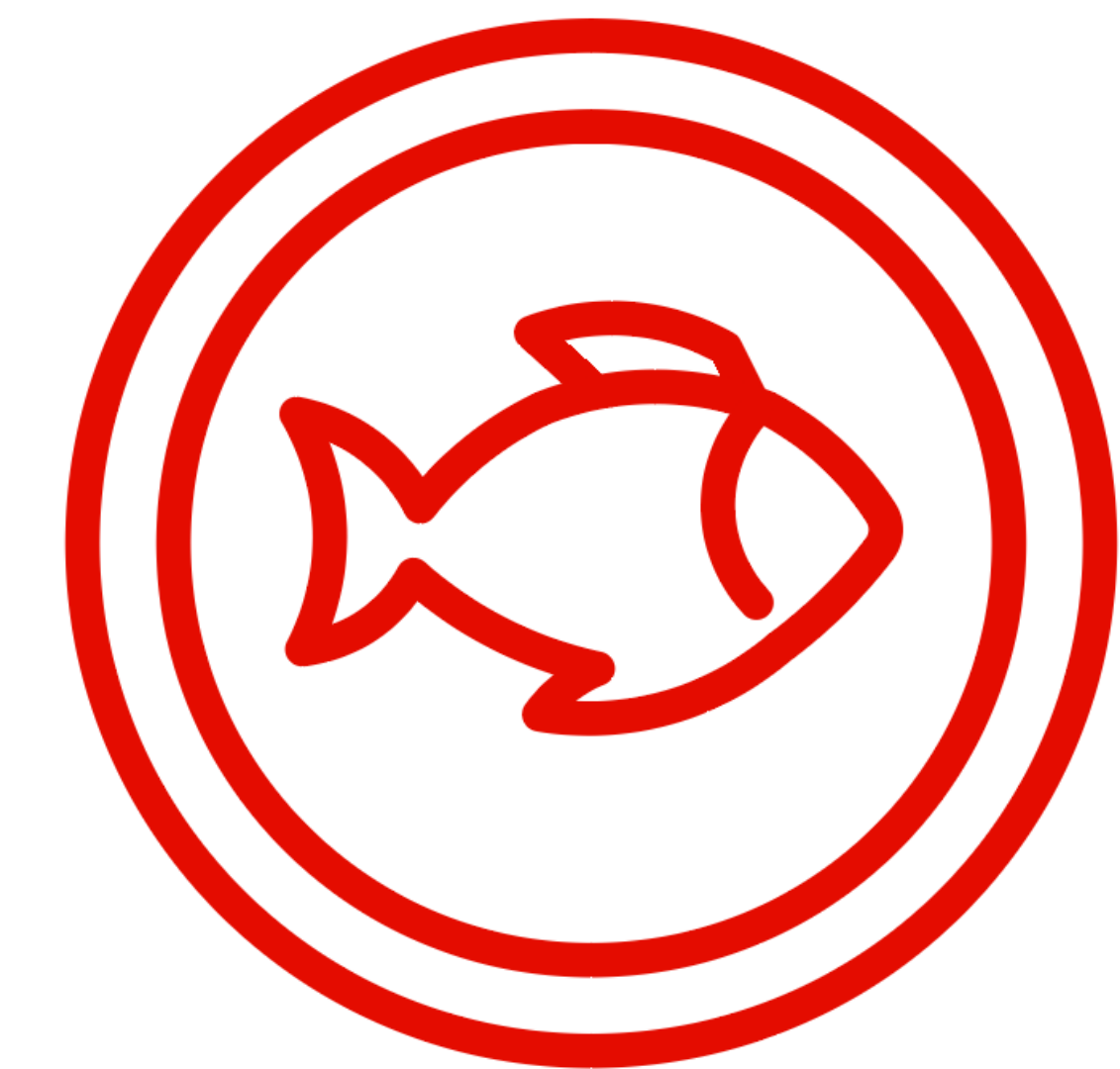
- **Reduction of operating costs**

Reduce the cost of farm maintenance, optimization of inputs and resources.

- Observe Technologies and Umitron Cell offer AI-based technologies for fish feeding frequency pattern detection

- **Managing fish health**

- Norway's Seafood Innovation Cluster developed an ML system to predict possible parasite outbreaks in fish farms.



External Analysis Use Cases in Forest Protection

- **Forest resource management**

Forest monitoring through satellite images.

- SilviaTerra and 20tree.ai use deep learning algorithms to generate highly accurate forest maps and extract attributes such as tree species, size and diameter, etc.

- **Deforestation detection**

Prediction of illegal logging activities.

- Rainforest Connection and Outland Analytics use sensors and deep learning models to detect suspicious sounds such as chainsaws or heavy machinery.



External Analysis Use Cases in Telecommunications

- **Equipment and Network Optimization**

Traffic monitoring to detect problems in the communications equipment or to self-manage the traffic

- Aria Networks and Avanseus use ML algorithms to detect traffic anomalies and anticipate potential network problems.

- **Improved customer service**

Implementation of automatic question and answer system that can reduce the response time to a network problem.

- Success.ai or Vodafone use chatbots systems to solve the most frequently asked questions regarding a network problem.



External Analysis Use Cases for the Mining Industry

- **Process improvement**

- Analysis of machinery operation to determine maximum performance.
 - Freeport-McMoran achieved a 5% increase in copper production by using ML to increase mill throughput at its Arizona mines.

- **Improved scanning**

- New methods for the analysis of images and other sources of information to find mineral deposits.
 - Datarock uses deep learning and computer vision to extract geological information from geospatial imagery.
 - Minerva Intelligence uses semantic web technologies to harmonize databases with geological information for easy analysis.



External Analysis Use Cases in Energy

- **Energy demand forecasting**

- In the UK, National Grid and DeepMind developed an ML algorithm to predict load in the short term, reducing energy consumption by 10%.

- **Optimize power generation**

- GE Renewable Energy uses software that monitors and optimizes the operation of its wind turbines, increasing energy production by 20%.



External Analysis Ethics in AI

- **Biases and discrimination**

- Data and algorithm evaluation
- Multidisciplinary evaluation

- **Job automation**

- Difficulty of measurement - Informality
- Promote digitization jobs
- Promote training

- **Guidelines, worldwide guidelines and proposals**

- Identify negative stereotypes and usefulness of personalization (access to university, access to credits, medicine and others).
- Promote use in vulnerable population problems, for health and logistic applications
- Constant updating





How are the National Strategies going in the world?

50 National Artificial Intelligence Policies as at February 2020.

 Argentina Drafting the "National Plan of Artificial Intelligence". Falls under the Innovative Argentina 2030 Plan and the 2030 Digital Agenda.	 Australia November 2019, AI Roadmap focused on specialization in health, infrastructure and natural resources. Planning for an additional 161,000 AI specialists by 2030.	 Austria June 2019, 'Artificial Intelligence Mission Austria 2030 (AIM AI 2030)'. Outlines seven fields for which AI will be critical	 Belgium March 2019, 'AI 4 Belgium' launched and includes seven major objectives.	 Brazil Consultation period ended January 2020. Building a network of eight research facilities focused on artificial intelligence.
 Canada 2017 federal budget announced five-year, \$125m plan. Led by CIFAR. Research and talent focus. First National AI Strategy.	 Chile Expected April 2020. Ministry of Science, Technology, Knowledge, and Innovation created a committee of 10 experts to develop.	 China July 2017, China launched the most comprehensive AI strategy globally with 2030 targets for a \$1T RMB AI industry.	 Colombia November 2019, first draft issued for 'National Policy for Digital Transformation'. Medellín to become an AI & Robotics Centre of Excellence.	 Czech Republic May 2019, 'National Artificial Intelligence Strategy of the Czech Republic' was launched.
 Denmark March 2019, Denmark announced the 'National Strategy for Artificial Intelligence' with four key objectives.	 Estonia – Kratts Strategy May 2019, Estonian AI experts, led by government CIO produced a roadmap, later adopted as the Estonian National AI Strategy in July 2019.	 Finland June 2019, 'Leading the Way into the Age of Artificial Intelligence' identified 11 key actions following May 2017 Steering Group announcement.	 France €1.5 billion plan announced in 2018 influenced by the 'Vilani Report' to transform France into a global leader in AI.	 Germany €3 billion plan announced Nov 2018 with a dedicated AI strategy to make Germany & Europe a global leader in AI.
 Hungary October 2019, Hungary announced an AI Action Plan, the first pillar of a national AI strategy, expected in 2020.	 India June 2018 working paper on using AI to ensure social growth, inclusion and positioning the country as a leader in AI.	 Indonesia Indonesia Artificial Intelligence Society (IAIS) inaugurated under Smart Indonesia in October 2019. National Strategy expected in 2020.	 Ireland Irish Economic Development Agency led process. AI Master program launched in 2018 and is 100% industry driven.	 Israel Innovation Authority, tasked with AI policies, has warned that a strategy is needed to prevent falling behind.
 Italy March 2018, AGID released a White Paper called "AI at the service of citizens," which was edited by the AI Task Force.	 Japan March 2017, Japan's AI policy, the 'Artificial Intelligence Technology Strategy', was announced second only to Canada with 'Society 5.0'.	 Kenya January 2018, government announced task force to create a five-year strategy on national use of emerging technologies.	 Lithuania April 2019, Artificial Intelligence Strategy announced "to modernize and expand the current AI ecosystem and ensure that the nation is ready"	 Luxembourg May 2019, launched 'Artificial Intelligence: a strategic vision for Luxembourg'.
 Malaysia 2018, Malaysia revealed a National Artificial Intelligence Framework expanding the National Big Data Analytics Framework.	 Malta October 2019, 'A Strategy and Vision for Artificial Intelligence in Malta 2030' Malta.ai launched and aspiring to be the 'Ultimate AI Launchpad'.	 Mexico June 2018, 'Towards an AI Strategy in Mexico: Harnessing the AI Revolution', serves as a foundation for building full AI strategy.	 Netherlands November 2018, AINED published a roadmap for developing a full national strategy.	 New Zealand May 2018, AI Forum of New Zealand, released "Artificial Intelligence: Shaping a Future New Zealand."
 Norway January 2020, Norway issued its National Strategy for Artificial Intelligence.	 Pakistan Presidential Initiative for Artificial Intelligence launched December 2018, focused on training beginners in AI and advanced technology.	 Philippines Nov 2019, AIM, Aboliz School of Innovation, Technology and Entrepreneurship (ASITE) appointed to craft an AI roadmap.	 Poland November 2019, 'Assumptions for the AI strategy in Poland' as an action plan towards developing an AI strategy.	 Portugal February 2019, 'AI Portugal 2030', seeks strengthen economic growth, scientific excellence, and human development using with AI.
 Qatar October 2019, National AI Strategy as a blueprint produced by Qatar Computing Research Institute (QCRI).	 Russia October 2019, Russia published its National Strategy for the Development of Artificial Intelligence by 2030.	 Saudi Arabia September 2019, Royal decree to establish an AI center, to align with the Kingdom's Vision 2030 program.	 Singapore May 2017, AI Singapore is a five-year, S\$150 million national program launched in to enhance Singapore's capabilities in AI.	 South Africa Intsimbi Future Production Technologies Initiative" launched in 2018 with aim to advancing manufacturing sector.
 South Korea May 2018, five-year AI development plan launched with \$195B budget.	 Spain March 2019, the Spanish Ministry of Science, Innovation and Universities launched the RDI Strategy in Artificial Intelligence.	 Sweden National Approach for Artificial Intelligence launched in May 2018.	 Switzerland An Artificial Intelligence (AI) expert group has published its recommendations for a Swiss AI strategy.	 Thailand Thailand's Digital Economy and Society (DES) Ministry has drafted the country's first artificial intelligence (AI) ethics guidelines.
 Tunisia AI Task Force and Steering Committee to develop a national AI strategy. The strategy was scheduled to be published in the first quarter of 2019.	 United Arab Emirates October 2017 announced strategy. First country to create a Ministry of AI and first in the Middle East to launch an AI strategy.	 United Kingdom April 2018, 'Sector Deal' announced. \$1.24B funding as part of the UK's larger industrial strategy.	 United States of America February 2019 by Executive Order to promote and protect AI technology. AI.gov launched Mar 2019. Followed by the National Artificial Intelligence Research and Development Strategic Plan.	 Vietnam Ministry of Information and Communications developing a broad AI strategy.

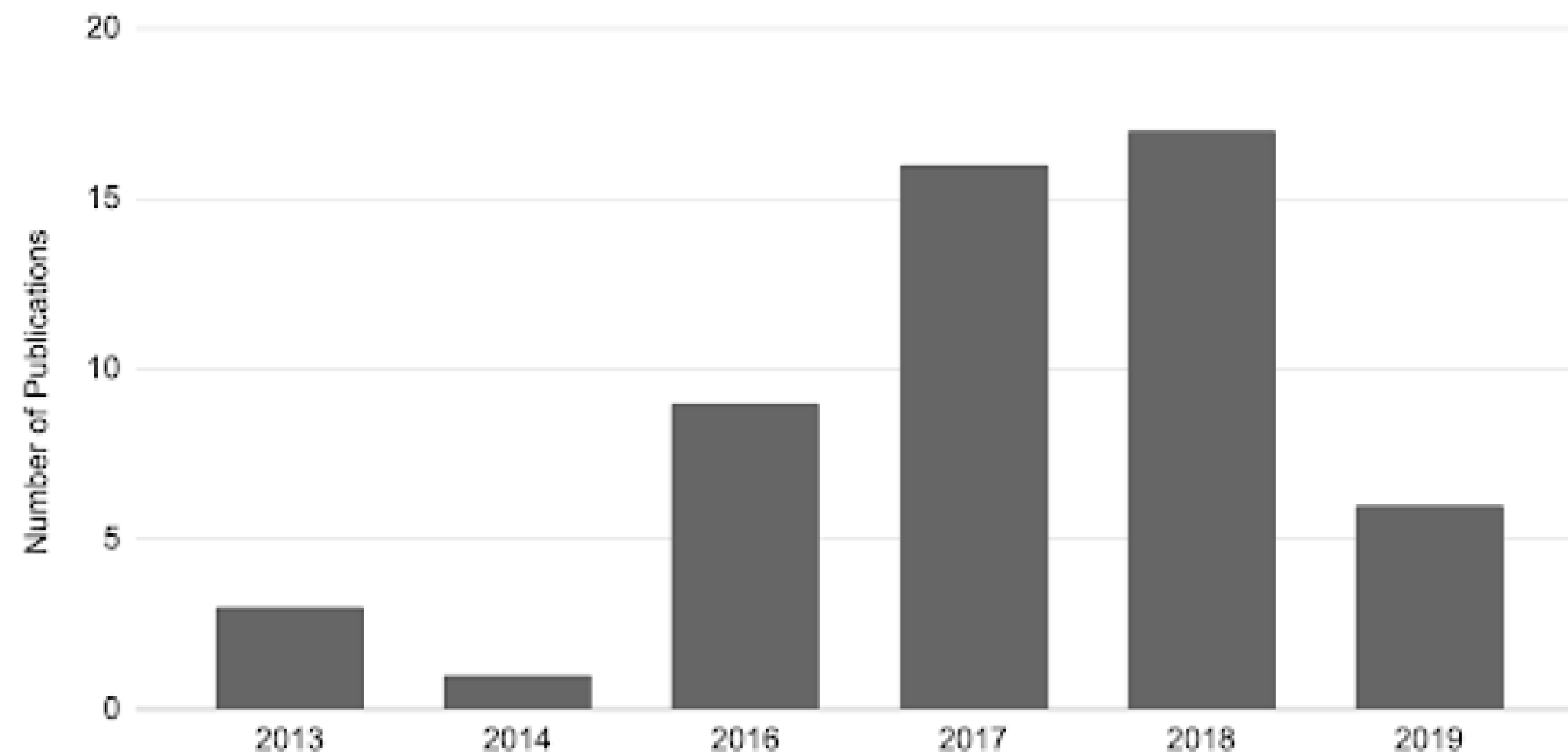
Source: HoloniQ and source government strategy and policy papers.

www.holoniq.com

How are the National Strategies going in the world?

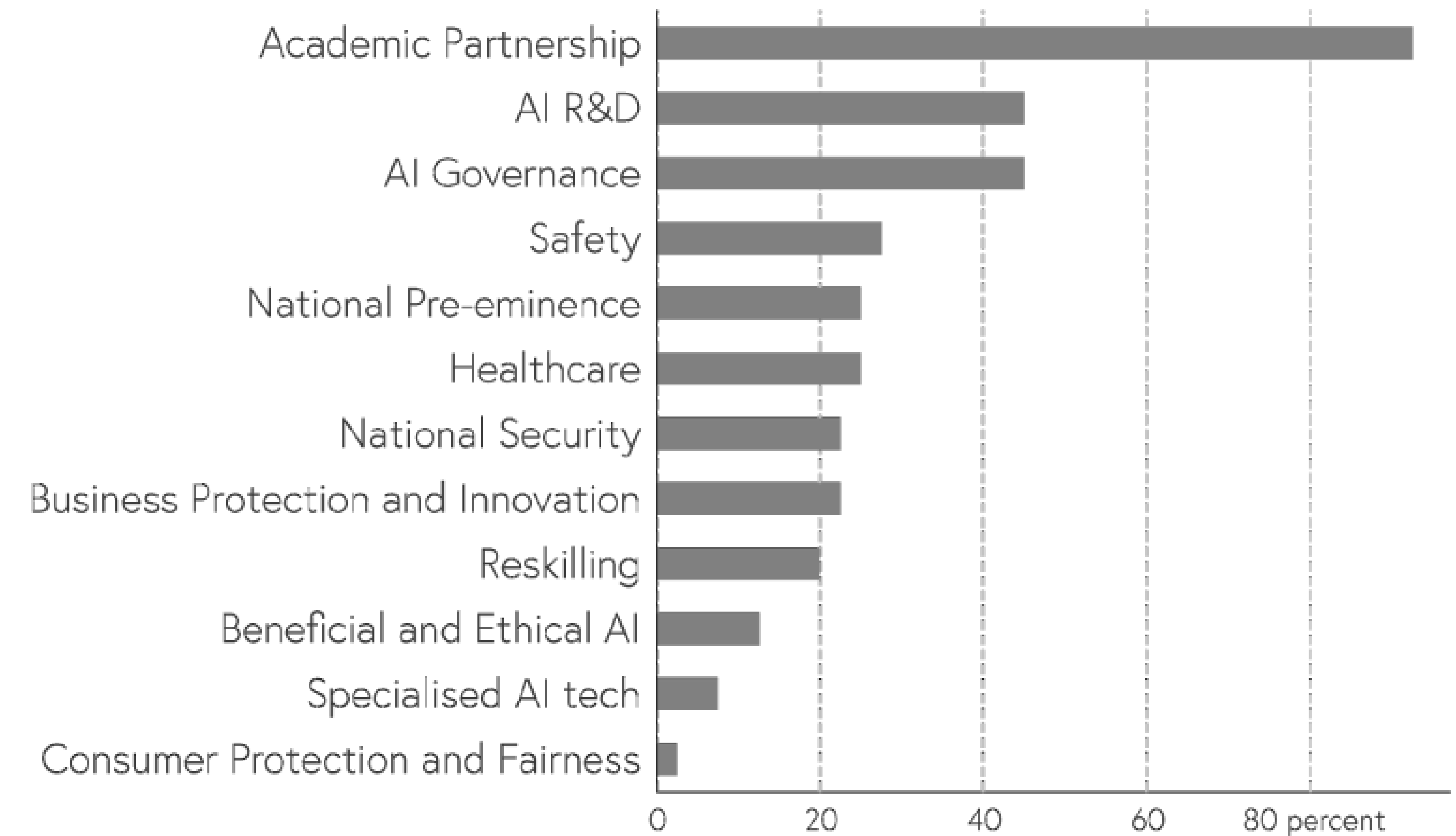
Number of Government AI reports published across different years

Source: PwC analysis based on multiple official government sources, 2019.



Percent of Global and National AI strategy documents mentioning Topics (%)

Source: PwC based on 48 AI Strategy documents.

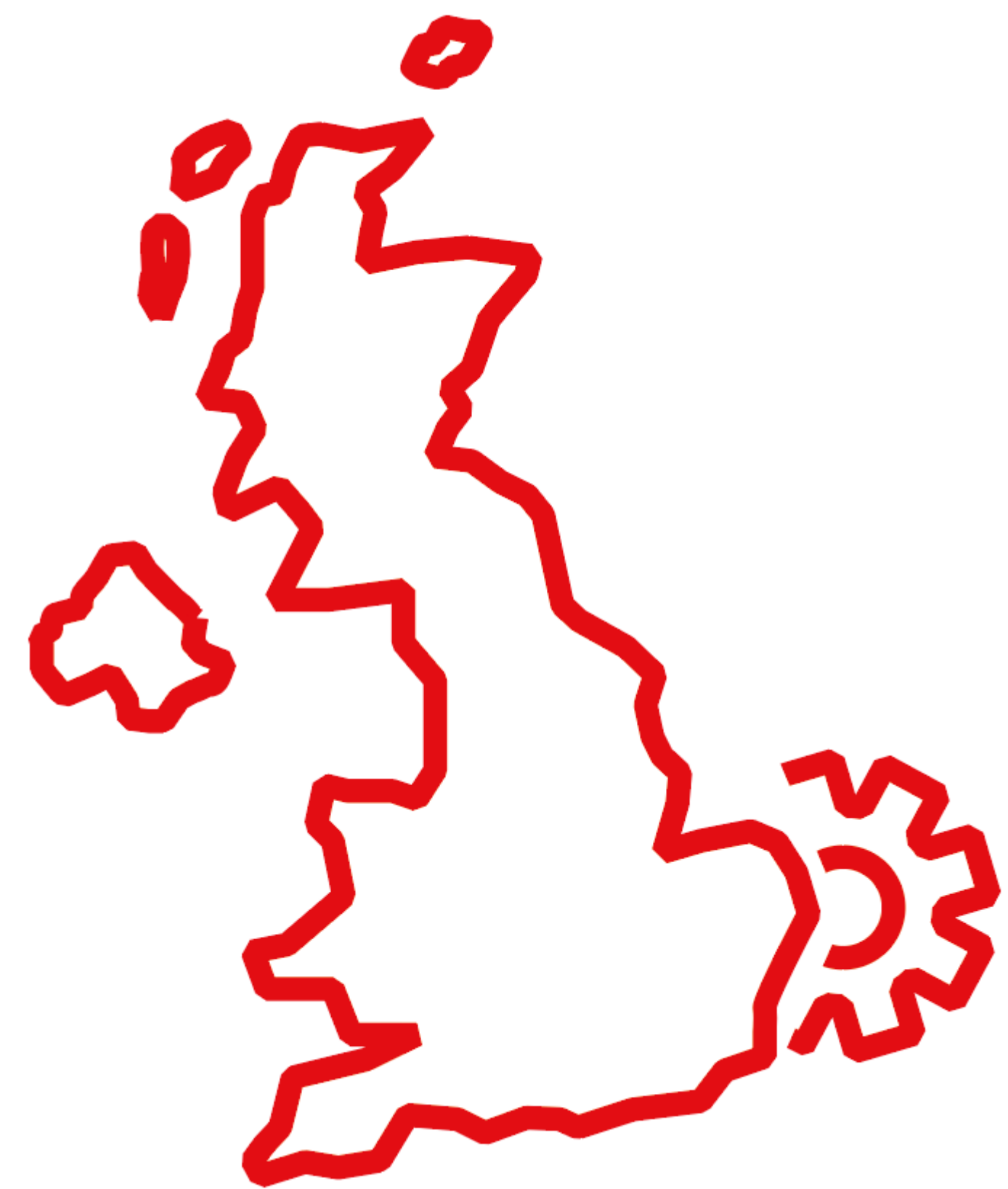


How are the National Strategies going in the world?

“...Researchers argue that AI is adding something new to an economy's productivity engine and rewriting the economic growth equation.

...In recent times, there has been an unprecedented level of global activity and investment in AI. In recent years, 14 of the world's advanced economies have announced a total of \$86 billion in AI programs and activities.”

Artificial Intelligence, Australian Government



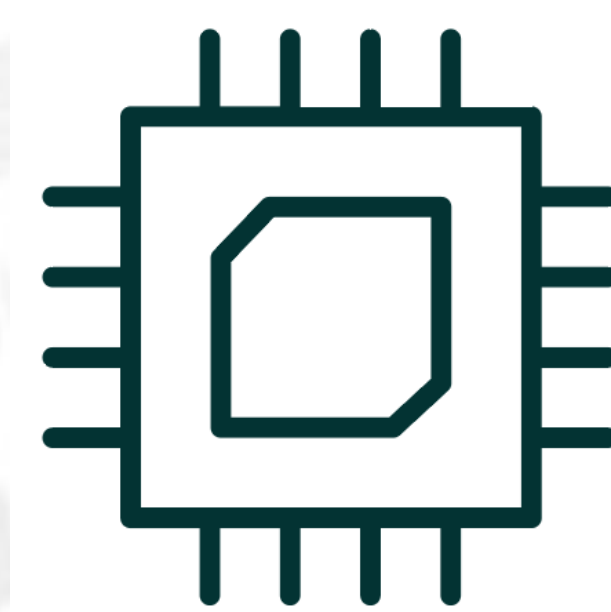
“In terms of formal education and training towards... proposes the following policy initiatives: The creation of 16 new doctoral training centers in universities across the country, delivering 1,000 new PhDs over the next 5 years.

Industry funding for new AI Masters places. In addition, 2,500 places have been created for data processing and AI courses from 2020.”

United Kingdom AI Strategy Report

National Strategy for Artificial Intelligence

Internal Analysis

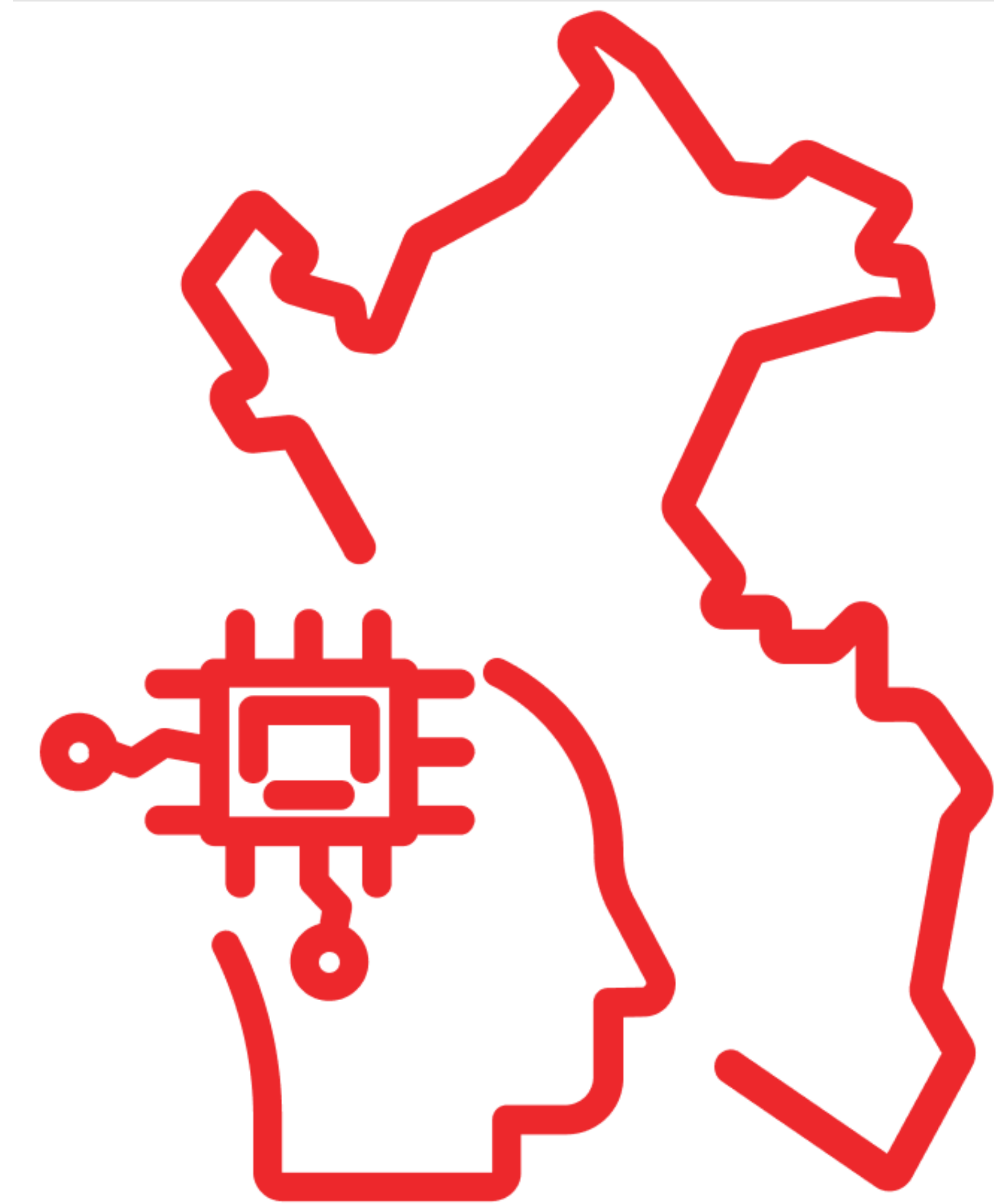


Internal Analysis

In Peru, some progress has been observed in the development and adoption of Artificial Intelligence, mainly from large economic groups and a small sector of academia; while the public sector has made very few attempts. These use cases have been centralized mainly in Lima.

These are some of the situations encountered:

- The country's main economic groups are carrying out or have carried out AI projects.
- There are AI projects in the private sector, most of those projects are Machine Learning, few in Deep Learning.
- It has been observed that the number of publications in Scopus Indexed Journals with an AI component has quadrupled in the last 5 years in the country, mainly due to incentives provided by concytec, innovate and other public funds.
- The main universities that publish on AI topics are in Lima, followed by Arequipa.
- The areas of publication with some AI component are mainly Computer Science, Engineering and Medicine with 50% of the total number of publications.
- Currently many Peruvian universities have master's programs in data science, in addition to master's and doctoral programs with AI courses.



Main organizations using AI in Peru

- **Main economic groups:** Breca Group (Brescia family), Intercorp (Carlos Rodriguez Pastor), Belcorp (Eduardo Belmont).
- **Companies / Large Corporations:** Banks, Telcos, Retail, Insurance, Mining / Fishing, Manufacturing, etc.
- **Startups:** Quantum Talent, Emptor, Fitness Pass, Xertica, Teckton Labs, Latin Fintech, Chazki, qAlra, SpaceAg, etc.
- **Consulting Firms:** McKinsey, EY, MS, DMC, Everis, Accenture, Globant
- **Technologies (and their partners):** Google, Microsoft, AWS, IBM, etc.

There is evidence that in some cases everyone uses Machine Learning, some NLP, little Deep Learning.



Labor market situation in Peru

The recruitment of professionals with knowledge of AI (or related subjects) in different sectors:

- **Private Sector:** Corporations, Companies, Startups, Consulting Firms, Technological Firms
Salary ranges: 95% of the salaries are between S/. 2,000 - S/. 20,000
(min: S/. 2,000 1st quart: S/. 4,000 mean: S/. 6,000, median: S/. 7,500, 3rd quart: S/. 12,500)
- **Academia:** As research professors in Engineering, Computer Science, Diplomas, Business Schools.
- **Government:** As hired staff in public institutions like Government and Digital Transformation Secretariat, SUNAT, MEF, Minedu, Comptroller General of the Republic, Judiciary and others.
- **Otros sectores:** Multilaterales (BID, Banco Mundial, CAF), ONGs / Think tanks (Innovations for Poverty Action - IPA / JPAL, etc.)

State of the local academy in terms of training of professionals with AI knowledge



Undergraduate Studies:

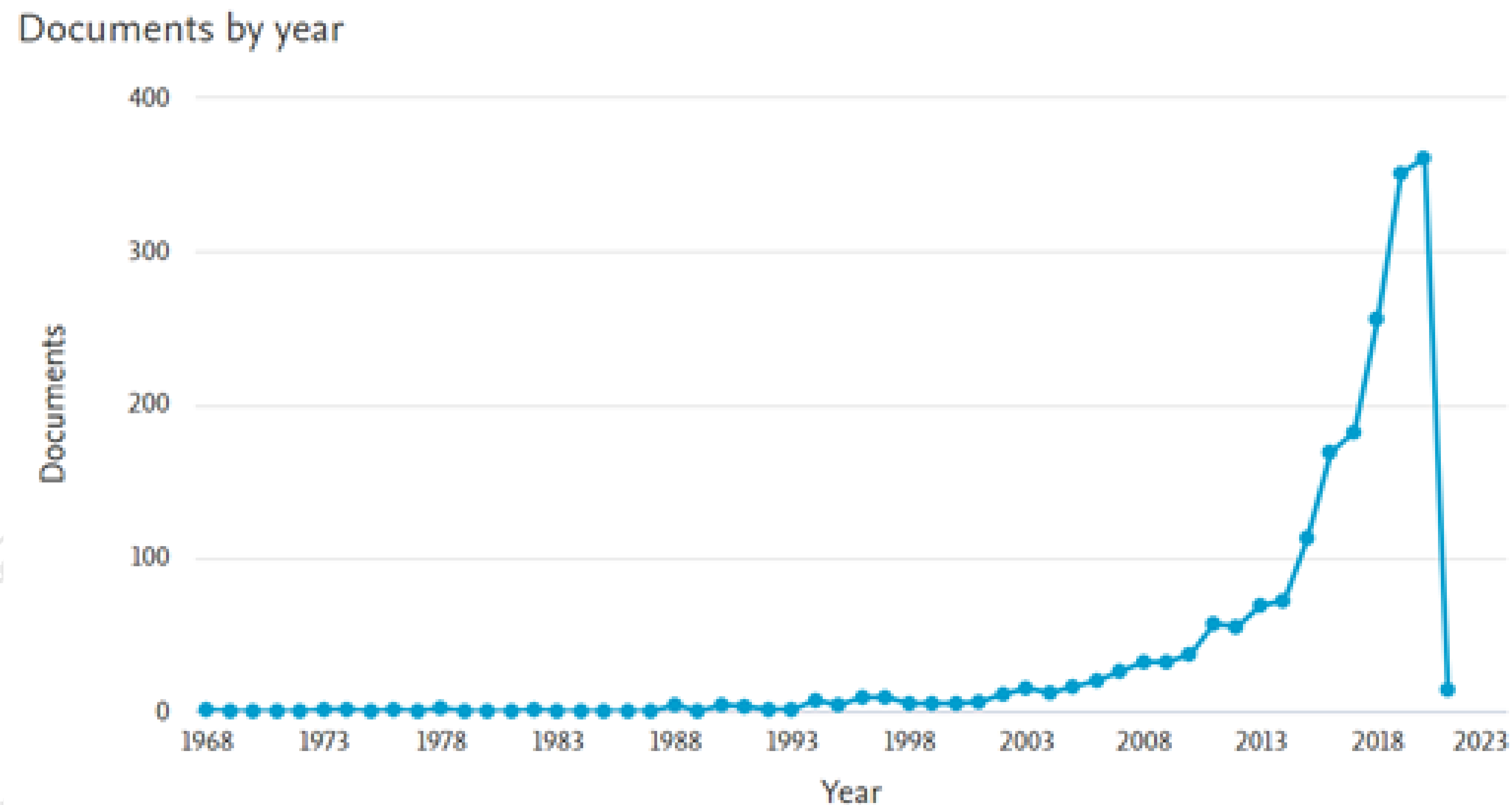
- Traditional Computer/Systems/Computer Engineering, Computer Science careers that have been updating their curricula.
- Other related majors - Economics, Mathematics, Physics have begun to focus on foundational support or AI courses.

Postgraduate studies:

- PUCP - Doctorate Program in Computer Science
- UNI - M.S. and Ph.D. programs in systems engineering with AI courses, M.S. in Computer Science.
- URP - Masters in Data Science
- UPC - Master in Data Science
- UNSA - Master in Computer Science
- UP - MBA in Business Analytics, Diploma in Analytics
- UDEP - Diploma in Data Science (with Pompeu Fabra University)
- UTEC - Masters in Computer Science with specializations, Diploma in Data Science for Business
- Several institutions that teach Data Science / Analytics / AI courses: DMC, UNI, Colectivo23, BetaHouse, Kurios, Instituto de Analítica Avanzada (Breca), Digital House, Crehana, etc.

Total annual AI publications of the Peruvian academic sector collected from Scopus

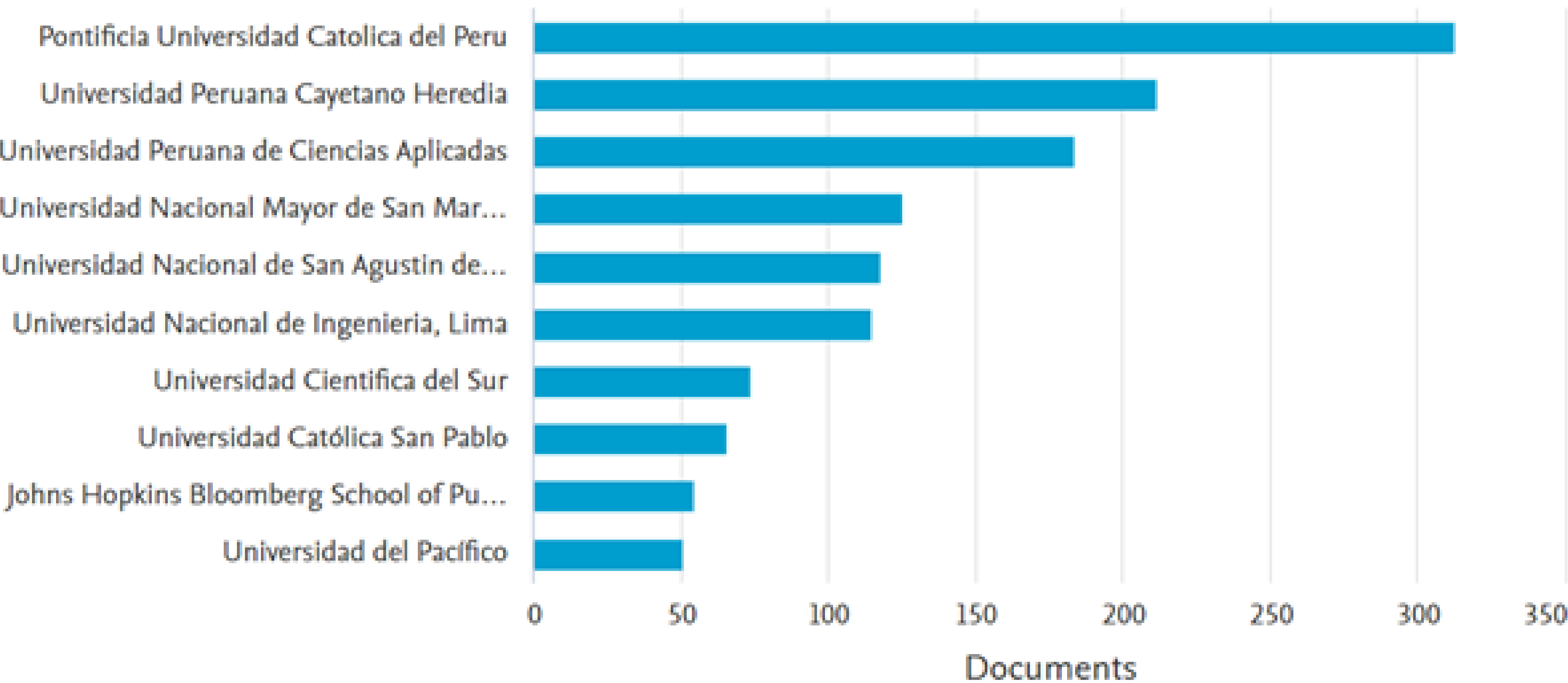
In the last 7 years there has been an increase of almost 400% in AI publications in Scopus journals from the Peruvian academic sector.



Total AI publications of the Peruvian academic sector by university collected from Scopus

It is observed that of the first 10 universities that have published topics related to AI in Scopus, 8 belong to Lima and 2 to provinces (Arequipa)

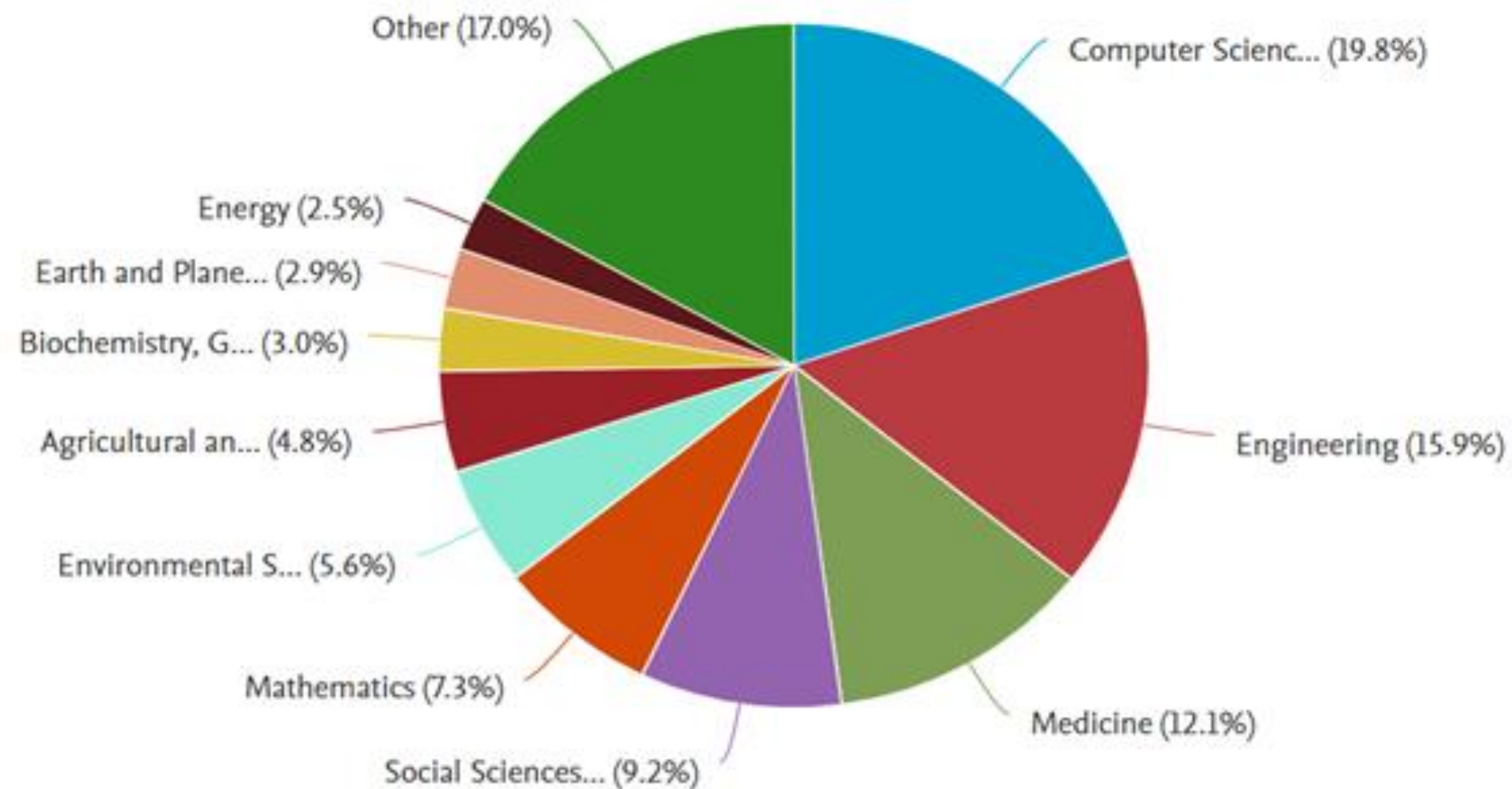
Documents by affiliation



Total AI publications by area of knowledge of the Peruvian academic sector collected from Scopus.

It is observed that the areas of knowledge that they are publishing about AI are Computer Science, Engineering, Medicine, Social Sciences, Mathematics and others.

Documents by subject area





Results of the Peruvian Public Sector AI Status Survey (January 2021)



Results of the Peruvian Public Sector AI Status Survey (January - 2021)

Question: Are you using Artificial Intelligence (AI) or Data Science in your institution?

Type of Institution	No	Yes	Total
State Companies	12		12
Local governments	375	29	404
Regional governments	28	2	30
Public Autonomous Organism	7	1	8
Ministries	17	6	23
Justice Deparment	1		1
Social Programs	3		3
Universities	6	1	7
Total	449	39	488

(*) 454 public institutions responded.

Results of the Peruvian Public Sector AI Status Survey (January - 2021)

Question: In which use cases do you apply AI or Data Science in your organization?

- Prediction of criminal acts
- Facial recognition for assistance taking
- Use cases in agriculture such as identification of crop types using satellite imagery
- Natural gas and electricity monitoring using AI and regulation automation with Big Data
- AI In Social Programs
- Control of users of basic services (electricity and water)
- Tax applications
- Risk management
- Virtual assistants
- Customs risk management



Some AI Component Applications developed in Peru for COVID 19

Applications with AI Components Developed During the COVID Pandemic in Peru

"Peru in your hands" developed in conjunction with private companies with expertise in mobile applications, **artificial intelligence** and data analytics:

Team: (UNI), (UP), (UTEC), MIT, Stanford University, INSEAD Paris, Universitat Pompeu Fabra & Barcelona GSE & IPEG & CEPR, Tekton Labs, Kambista, Sapia, Mr. Burns, Media Labs, AmigoCloud, Alicorp, the Korean Ministry of Interior, the Andean Development Community and the Inter-American Development Bank.



Applications with AI Components Developed During the COVID Pandemic in Peru

Project "COVID: Dynamic Virus Control".

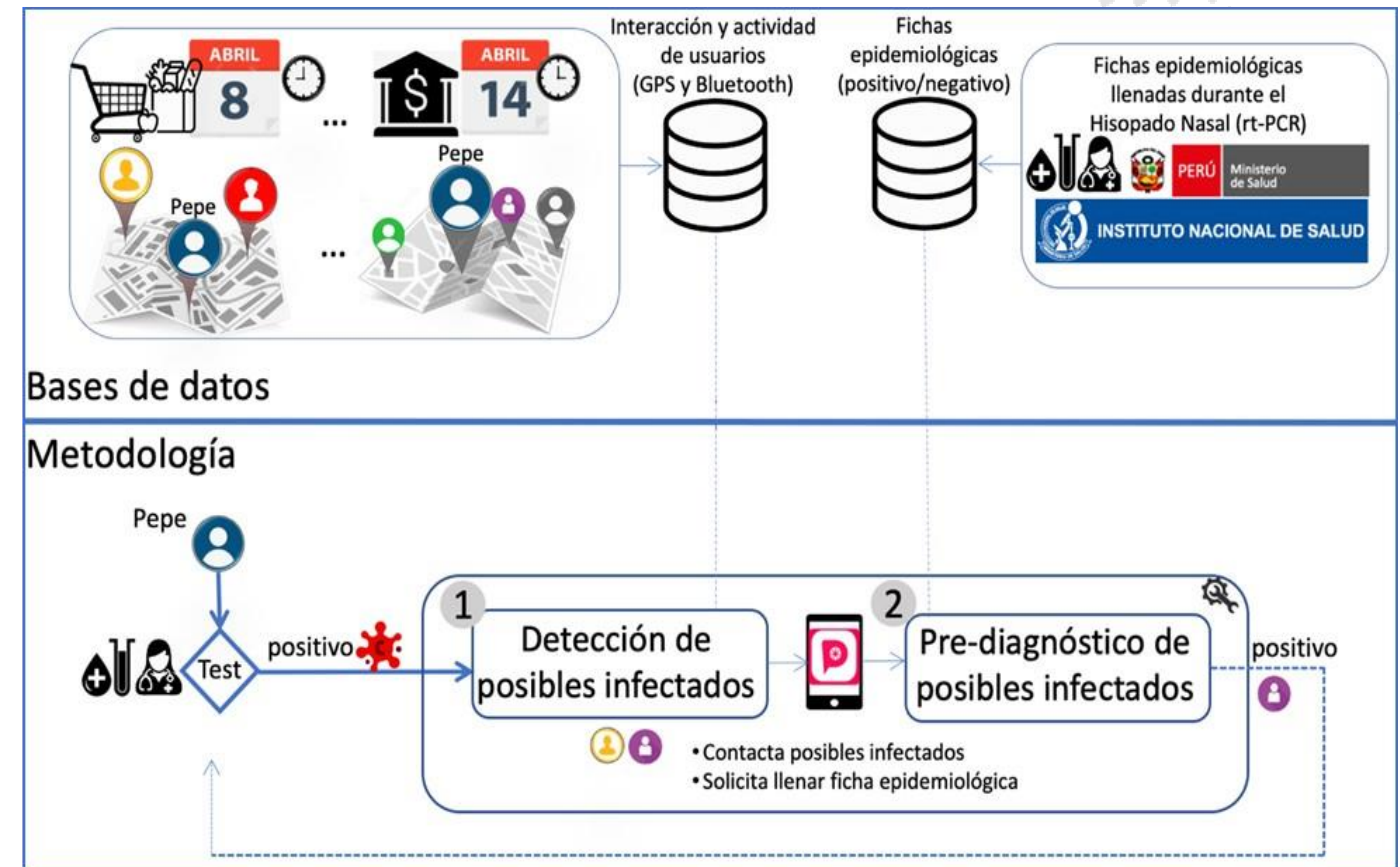
Winner of the "Special Projects: Response to COVID-19" contest organized by Concytec.

Proposal: dynamic control of virus infection in the Peruvian population with the use of artificial intelligence.

Two processes:

First: detection of potential COVID-19 infectees.

Second: pre-diagnosis of the virus.



Applications with AI Components Developed During the COVID Pandemic in Peru

Intelligent Integrated System for recording, reporting, alerting, monitoring and assisting people symptomatic of COVID-19 (SIAMA)."

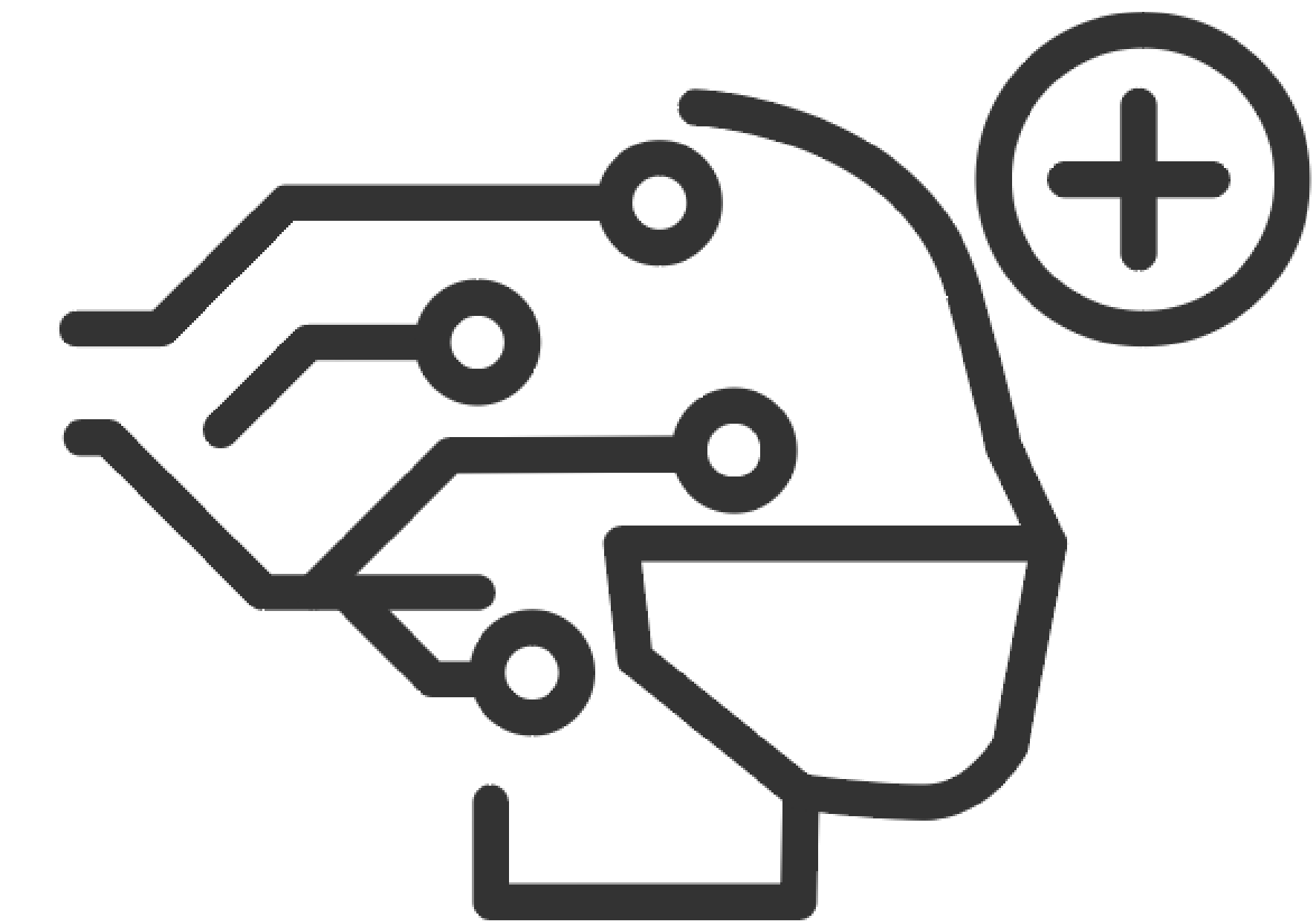
"SIAMA", a system to inform, alert, monitor and assist COVID-19 symptomatic people in Latin America, when delivering data and information does so through its App or web platform, generating automated alerts.

The innovative system has a voice assistant, which, by means of periodic questions, will be informing the nearest healthcare personnel of the infected inhabitant.

What technologies do you use?

SIAMA uses Deep Learning (AI technique) that integrates a chatbot based on natural language.

It provides patients with a better order in the level of urgency, in addition to the integration of the voice assistant (Google home or Alexa), which allows the interaction of symptomatic people, through voice commands;



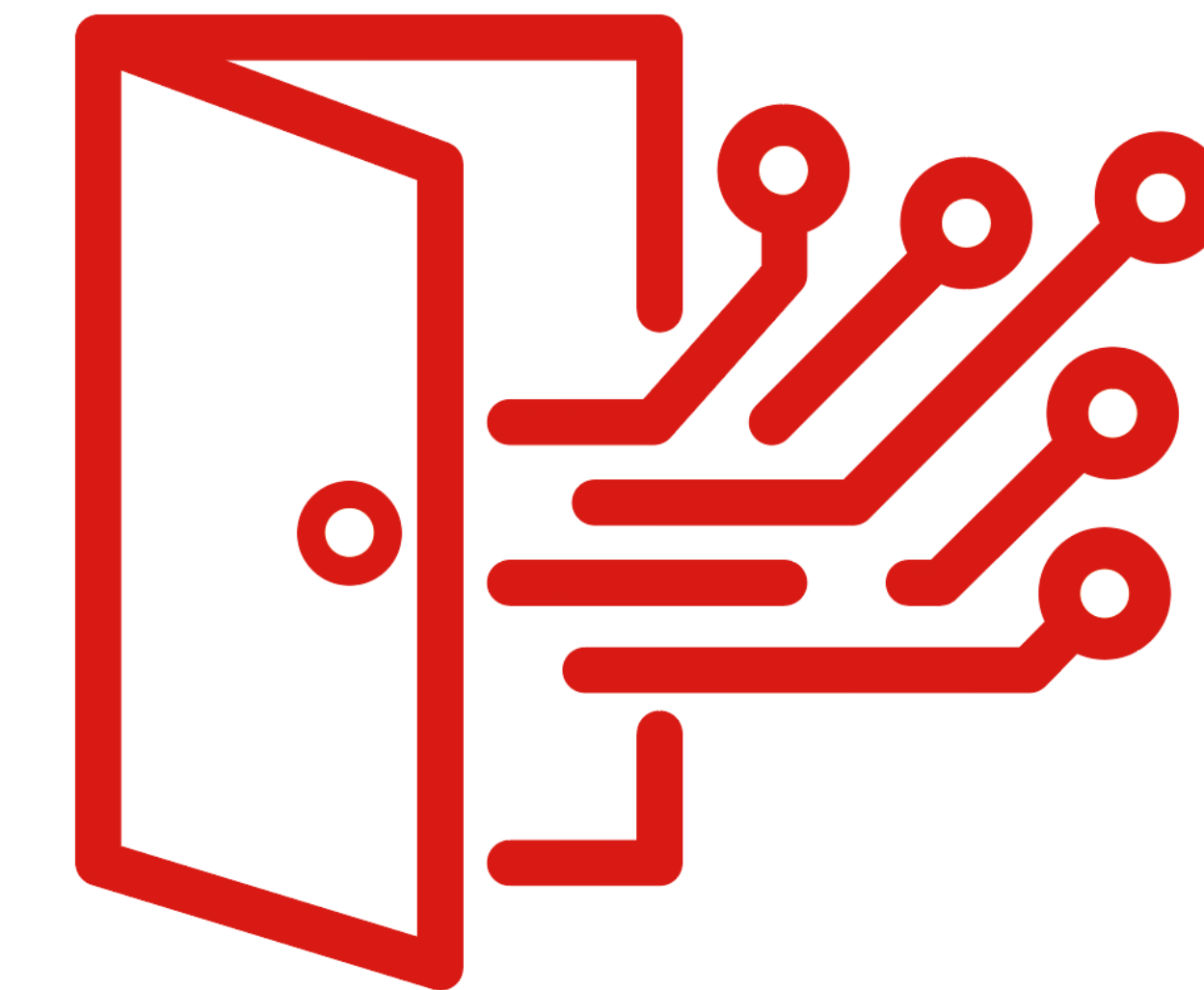
Applications with AI Components Developed During the COVID Pandemic in Peru

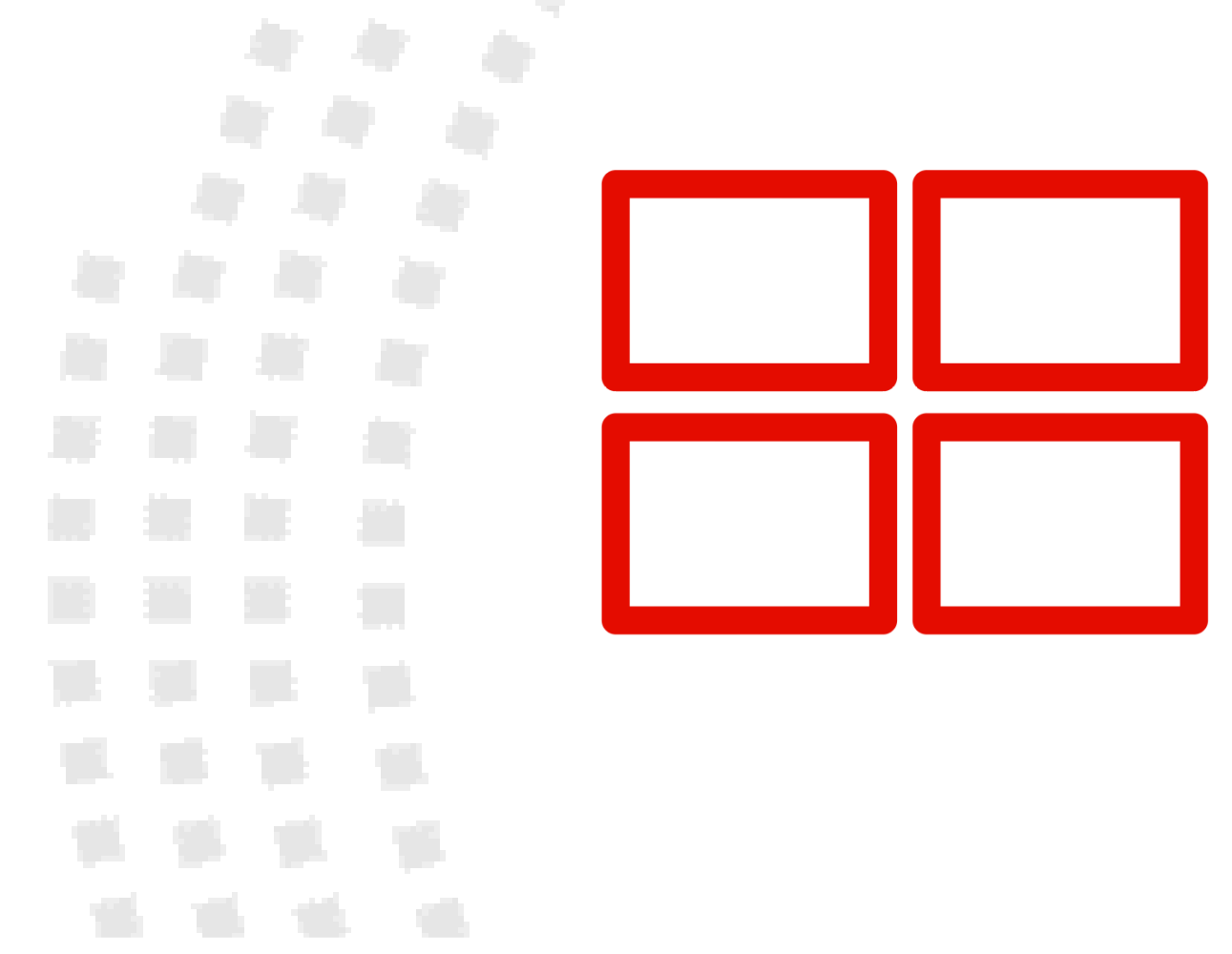
Smart Security Office" platform to control Covid-19
Company: MDP Consulting

Winning project of the InnovaCovid-19 Challenge, of the Innóvate Perú Program, will receive a co-financing of up to S/. 450,000
Manages and controls the access of employees and visitors to work centers, through identity validation, detection of mask use, body temperature measurement and rapid triage for the prevention of Covid-19.

Technology:

Facial recognition, temperature sensor to monitor the worker's health status and detect if he/she is wearing a mask.
It allows for periodic triage of personnel through a **chatbot**.





Strengths

- The country has scientific, mathematical and engineering talent.
- Large economic groups interested and investing in AI
- Government interested and promoting through PCM, CONCYTEC, FONDECYT, Innóvate and others.
- There is a network of contacts with universities and top companies.
- Programs such as Beca Presidente
- Peruvian universities researching these topics

Weaknesses

- Lack of high-level Educational Opportunities
- Very little development of advanced AI (Deep Learning) in the private sector.
- Incipient government on IA issues
- Data situation at the country level, and at the level of organizations (private, NGOs, etc.).
- Soft skills, English, and talent research capabilities
- Salary incentives for academic researchers in AI are low.

Opportunities

- Online Training (MOOCs)
- Growing labor demand in the private sector, public sector, and academia for these AI positions (including from major companies such as Amazon, Google, etc.).
- Growing interest and funding from Multilateral organizations
- Peruvian Diaspora in top places
- More Peruvians studying and researching IA in the world
- The needs of attention to SMEs

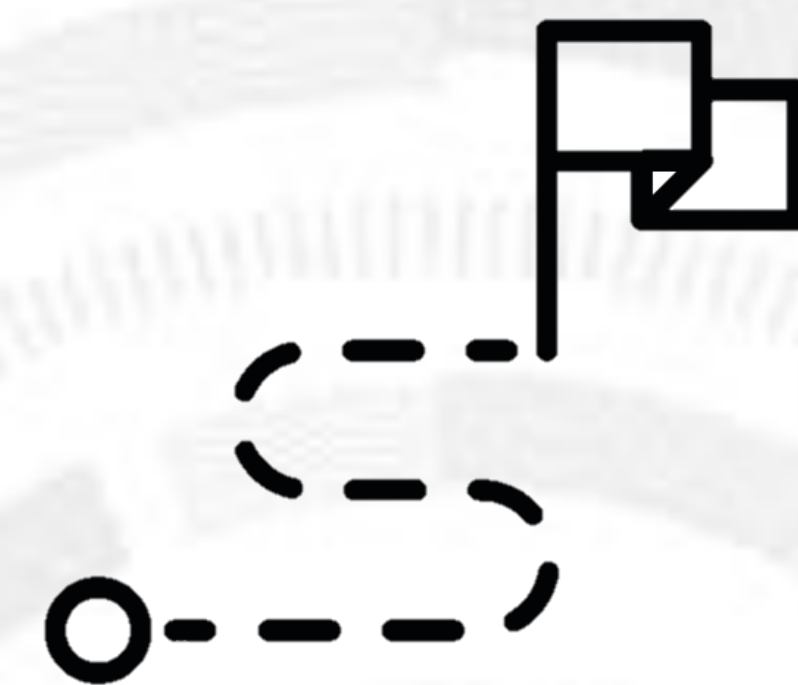
Threats

- Brain Drain: growing labor demand in the private sector from major Amazon, Google, etc.
- Other countries more AI advanced than us
- Political instability
- Few institutions in Peru promote AI development
- External sector attracts "all" talent
- Peruvian society may have some fears about the use of AI as its use is further promoted.



National Strategy for Artificial Intelligence

Purpose, Vision and Mission



Purpose of the National Strategy for Artificial Intelligence

For a country like Peru, the adoption of new technologies such as Artificial Intelligence represents a **historically unprecedented opportunity and at the same time a great threat** to be left behind in the global socio-economic development and to deepen our shortcomings.

This historical singularity presents an enormous responsibility for all members of our Society, not only the State, but also for the Private Sector, the Academia and the Civil Society. Then it becomes imperative the will to govern this adoption process with a **National Strategy for Artificial Intelligence (ENIA)** that facilitates the conditions to take advantage of these opportunities and mitigate the risks derived from this process.

It is clear that the functioning of Society has been digitized on almost all fronts, driving a new economy whose main asset is Data.

Creating value with these assets is an imperative not only for the private sector, but also for the public sector, which must also meet the new demands of a digital citizenship.


Purpose of the National Strategy for Artificial Intelligence



In this context, the most advanced nations have deployed efforts during the last 4 years to express their intentions to govern a process that turns AI into a tool for socio-economic development and that is not a consequence of chance.

This has been the main purpose for which various manifestations have been proposed, ranging from Strategies, Plans and National Agendas that in their first stages contain diagnoses of the starting point and aspirations for the end of this decade, through public policy recommendations, strengthening of some sectors and prioritization of public-private initiatives to ensure the first steps towards a National Artificial Intelligence Strategy.

The following National Artificial Intelligence Strategy (ENIA) is proposed for the **period 2021-2026**, which can be updated every 2 years according to new technological advances and the situation of the country and the world.



IA VISION

Peru is recognized as a Latin American leader in research, development, innovation, deployment, use, adoption of AI, and in its ethical and responsible use in the production of public and private goods and services. These efforts aim to accelerate national development and promote digital inclusion while ensuring the reduction of social gaps.

MISSION

Implement the National AI Strategy, promoting the development of human talent, infrastructure and the production of goods and services based on AI for the benefit of a more inclusive and multicultural Peruvian society that takes advantage of Industry 4.0 technologies in favor of sustainable development.

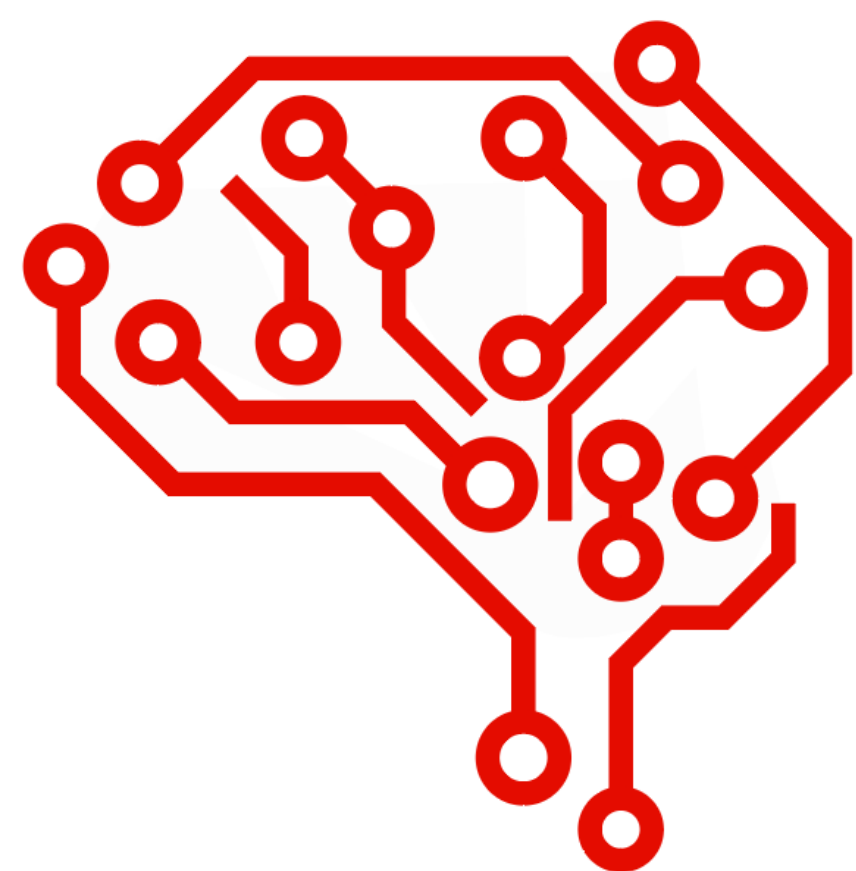


National Strategy for Artificial Intelligence

Strategic Axes



ENIA AXES



Artificial Intelligence

E2: Economic Model

E3: Technological
Infrastructure

E4: Data

E5: Ethics

E6: Collaboration

E1: Training



STRATEGIC AXES



E1 - Training and Talent Attraction:

To train professionals with competencies for research, development and use of AI in the country.

E2 - Economic Model:

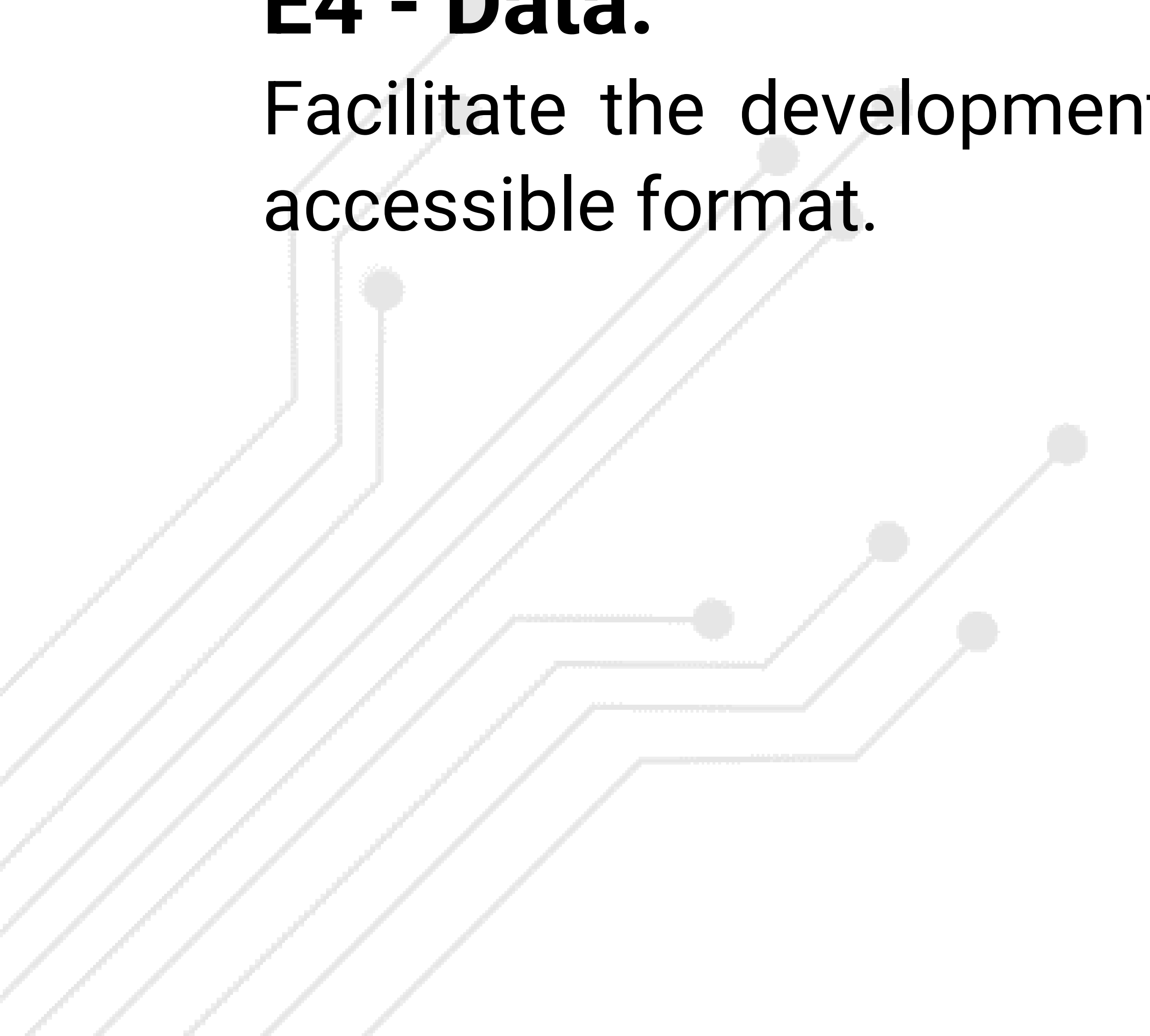
Promote the development of AI and its adoption as a tool to boost the country's development and welfare.

E3 – Technological Infrastructure:

Facilitate the creation and strengthening of digital and telecommunications infrastructure to support the development of AI.

E4 - Data:

Facilitate the development of a data infrastructure to make high quality public data available in an open, reusable and accessible format.



STRATEGIC GUIDELINES



E5 - Ethics:

Adopt ethical guidelines for sustainable, transparent and replicable use of AI with clear definitions of responsibilities and data protection.

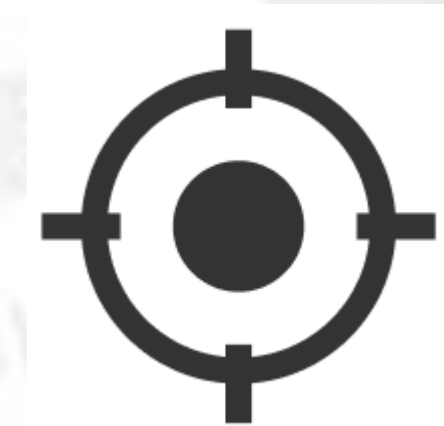
E6 - Collaboration:

Facilitate a collaborative AI ecosystem at the national and international level.



National Strategy for Artificial Intelligence

Strategic Objectives



STRATEGIC OBJECTIVES

E1 - Training and Talent Attraction

SO.1.1. To position Peru as a country that enhances its human talent at all educational levels for the research, development and uses of Artificial Intelligence in the country.

SO.1.2. To Lead regional research, scientific publication and patent publication in AI in key sectors of the country.

SO.1.3. To be an attractive country for AI research and development.

SO.1.4. Reduce the gap of participation of women and minorities in AI training programs.

SO.1.1. To position Peru as a country that enhances its human talent at all educational levels for the research, development and uses of Artificial Intelligence in the country.

- A.1.1.1. Create a National Center for Innovation and Artificial Intelligence, as an accelerator, promoter and facilitator of the research, development and use of AI in all regions of the country.
- A.1.1.2. Facilitate the creation and increase of the public budget in academic CORE training programs: Computer Science, Software Engineering, Computer Engineering, Statistics, Mathematics and others such as computational neuroscience, computational linguistics and computational social sciences.
- A.1.1.3. Promote courses or diplomas in programming and Artificial Intelligence (AI) and Machine Learning (ML) for officials of public organizations, police and army personnel, academia and civil society.
- A.1.1.4. Implementing compulsory programming courses in public and private schools from the first grade of secondary school in all schools in the country. Additionally, include an ethics course for children.
- A.1.1.5. Include AI / ML courses in different undergraduate and graduate careers in the country (in branches of engineering, medicine, economics, statistics and others). Also promote the inclusion of these courses in technical careers in computer science and computing.

SO.1.1. To position Peru as a country that enhances its human talent in Artificial Intelligence at all educational levels for research, development and use of AI in the country.

- A.1.1.6. Create master's and doctorate programs in AI / ML in universities in the country with the formation of CORE programs on Artificial Intelligence.
- A.1.1.7. Create scholarship programs for Doctoral students from IA and ML programs.
- A.1.1.8. Promote massive up-skilling and re-skilling programs in digital skills, and in ethical issues of data processing.
- A.1.1.9. Create courses or diplomas for the training of talent in the installation, administration and infrastructure support of high-performance supercomputers.
- A.1.1.10. Create courses in parallel computing, signal processing and other courses related to high performance computing within the undergraduate and graduate programs of computer science, ing. software, ing. systems, ing. Computer science and other related.

SO.2.1. To Lead regional research, scientific publication and patent publication in AI in key sectors of the country.

- A.1.2.1. Increase the number of publications in IA / ML according to RENACYT standards (in international conferences).
- A.1.2.2. Encourage the creation of patents resulting from competitive funds and / or alliances with the private sector.
- A.1.2.3. Facilitate international AI conferences that are held in different regions of the country on the following topics: AI applications in agro-industry, health, mining, forestry protection, energy, fishing and government, and in other sectors that the National Center for Innovation and Artificial Intelligence recommends it.
- A.1.2.4. Facilitate visiting professor programs between local and foreign universities (including professors who teach remotely at provincial universities).

SO.1.3. To be an attractive country for AI research and development.

- A.1.3.1. Create programs to attract Peruvian or foreign talent with Doctorate degrees in AI/ML from the academy, private or public sector, implementing incentive programs; for example, tax incentives for the private sector, or research funds for academia.
- A.1.3.2. Create programs to retain talent such as PhD in AI/ML graduated in Peru or abroad, in research centers and universities in the country. These policies could consider better salaries, education and training opportunities, job stability and appointments, infrastructure improvements and others.
- A.1.3.3. Facilitate the National Center for Innovation and Artificial Intelligence to repatriate national or foreign talent for its research and development projects in AI.
- A.1.3.4. Facilitate public Peruvian universities to enter into agreements with top universities in Europe or USA in their AI/ML master and doctorate programs.
- A.1.3.5. Facilitate the processes of validation of professional Master's or Doctorate degrees carried out abroad.

SO.1.4. Reduce the participation gap of women and minorities in IA CORE training programs.

- A.1.4.1. Promote the largest number of female students in undergraduate and graduate CORE Artificial Intelligence (AI) training programs at Peruvian universities.
- A.1.4.2. Promote the decentralization of AI/ML master's and doctorate programs to different regions of the country, promoting in regions where there is great potential as part of the country's key sectors, such as agro-industry, cattle raising , mining, forestry protection, health, fishing.
- A.1.4.3. Create programming teaching programs for the unemployed and adults through regional or municipal centers in the different regions of the country.

SO.2.1. Leading the research and development of Artificial Intelligence at the regional level.

SO.2.2. Promote in public bodies, the incorporation of artificial intelligence in their operation and services to citizens.

SO.2.3. Promote the integration of AI in the value chain to promote business development in the country's key economic sectors.

SO.2.4. Minimize the effect of job displacement due to the adoption of AI.

SO.2.1. To lead the research and development of Artificial Intelligence at the regional level.

- A.2.1.1. Increase research funds in AI through the different programs financed with public resources.
- A.2.1.2. Improve the evaluation of research and innovation projects with public funds with AI components by convening more experts in the area.
- A.2.1.3. The winners of projects financed with public resources must upload their data and codes (models) to the open data platform of the government of Peru to be shared.
- A.2.1.4. Promote scientific dissemination initiatives in coordination with the different research centers and universities.
- A.2.1.5. Monitor the index development and adoption of AI (*) and act where necessary to be in the first place at the regional level.

(*) <https://vibrancy.aiindex.org/>

SO.2.2. Promote in public bodies, the incorporation of artificial intelligence in their operation and services to citizens.

- A.2.2.1 Develop online courses for public officials in the adoption, use and benefits of Artificial Intelligence.
- A.2.2.2. Promote the use of technologies such as chatbots or virtual assistants in public administration, prioritizing libraries and open source software.
- A.2.2.3. Through the National Center for Innovation and Artificial Intelligence, prioritize the development of use cases where Artificial Intelligence can generate concrete solutions such as those proposed in various investigations aligned to the United Nations 2030 sustainable development goals, such as the elimination of poverty, zero hunger, quality education, clean and accessible energy, clean water and sustainable cities, good health, better qualified jobs, the reduction of social gaps and others.
- A.2.2.4 Promote citizen participation in IAckathon, Datathon or Hackathon events organized by public bodies to create new services or improvements in citizen care, or to solve some problems in our country such as the detection of corruption in the public sector.
- A.2.2.5. Promote the use of open source technologies in the public sector for the development of use cases based on Artificial Intelligence.

SO.2.3. Promote the integration of AI in the value chain to promote business development in the country's key economic sectors.

- A.2.3.1. Create public funds and increase those that currently exist, for startups and basic or applied research programs that have some AI component, prioritizing the applications and areas of knowledge that the National Center for Innovation and Artificial Intelligence considers key.
- A.2.3.2. Promote collaboration between academia and industry (micro, small and medium enterprises), also integrating CITEs from all regions of the country.
- A.2.3.3. Promote initiatives to generate local use cases based on Artificial Intelligence with open data from the private, public and academic sectors of the country.
- A.2.3.4. Promote a labelling industry through financial incentives for new ventures as part of publicly funded startup financing programs.
- A.2.3.5. Prioritize and promote the adoption of AI in strategic economic sectors for the country, where we have comparative and competitive advantages.

SO.2.3. Promote the integration of AI in the value chain to promote business development in the country's key economic sectors.

- A.2.3.6. Incorporate in each project financed with public resources the use of the infrastructure of the existing local data centers in the country, or in cloud platforms of private providers but where their technological infrastructure is installed in the country.
- A.2.3.7. Promote research on Natural Language Processing algorithms in Spanish and other native languages.
- A.2.3.8. Promote incentives for the private sector to publish open data on the country's national open data platform.
- A.2.3.9. Promote regulatory sandboxes for key economic sectors of the country as environments for business development (small, medium, large companies, as well as startups) with few regulations in use cases with AI components, promoting their development and innovation in the country.

SO 2.4. Minimize the effect of job displacement due to the adoption of AI.

- A.2.4.1. Create an observatory for the labor market to obtain timely evidence on the effects of AI.
- A.2.4.2. Promote policies for upskilling / reskilling of the population that will be affected by the adoption of AI.

STRATEGIC OBJECTIVES

E3 - Technological infrastructure

SO.3.1. Improve local infrastructure for AI research and development.

SO.3.2. Promote the integration of local infrastructure.



SO.3.1. Improve local infrastructure for AI research and development

- A.3.1.1. Consolidate the National Fiber Optic Backbone Network project, in addition to installing a high-speed fiber optic connection between research centers.
- A.3.1.2. Promote the Implementation of 5G technology by spreading its benefits.
- A.3.1.3. Create a National Center for High Performance Computing for research from academia, public institutions and industry in different areas of knowledge.
- A.3.1.4. Promote the public-private partnership for the installation of the infrastructure of data centers in the cloud in the country with services for the academy, public sector, private sector and the citizenship in general of the country.
- A.3.1.5. The government will promote contracting for the public sector, academia, local small and medium businesses, cloud services but with a provider that has local infrastructure and at a low cost. The government could guarantee a minimum monthly demand to be able to incentivize the installation of local cloud infrastructure in the country.
- A.3.1.6. Increase investment in educational infrastructure for the training of new talents in AI that includes implementation of IA / ML laboratories in the different universities of the country.

S0.3.2. Promote the integration of local infrastructure.

- A.3.2.1. Through the National Center for High Performance Computing to govern all high performance computing centers and those created in recent years with public funding. The supercomputers have to be connected with a high speed optical fiber.
- A.3.2.2. Rationalize the use of public funds for the acquisition of infrastructure equipment for research by facilitating the use of high-performance computing centers or local data centers once implemented.
- A.3.2.3. Train local talent in the installation and administration of high performance centers in different regions of the country.
- A.3.2.4. Create incentives to promote the use of high performance computing centers and local data centers in the country in research and development programs with public funds.

SO.4.1. To be a regional leader in the publication of open data.

SO.4.2. To be a regional leader in the publication of data on biodiversity, native languages and other minorities in the country.



SO.4.1. To be a regional leader in the publication of open data.

- A.4.1.1. Create a rewards or penalties program for public and/or private organizations to publish high-quality open data in an open, reusable format on the country's government's open data platform (datosabierto.gob.pe).
- A.4.1.2. In the datosabiertos.gob.pe platform include a module for communities to store codes and AI models based on the datasets published.
- A.4.1.3. Create APIs to extract information from the single platform gob.pe and datosabiertos.gob.pe.
- A.4.1.4. Monitor existing open data barometers (*) and act if necessary to keep the country in the top positions at the regional level.
- A.4.1.5. Promote the monetization and benefits of data produced by the country's private sector, and its publication on the national open data platform.
- A.4.1.6. Create a communication channel so that the academic sector, private sector, public or civil society in general, can request the publication of new open data, propose the publication of their data on the platform, and provide feedback on the quality of the published data.

(*) https://barometrolac.org/country-detail/?_year=2020&indicator=ODB&lang=en&detail=PER

SO.4.2. To be a regional leader in the publication of data on biodiversity, native languages and other minorities in the country.

- A.4.2.1. Create a bank of native languages, sign language and images to guarantee access for all citizens to public services (web, office, etc.) using translation and subtitling.
- A.4.2.2. Create a database contextualized to each region of the country, for example: agro-industry, information on natural disasters, climate change, information on local industries, socioeconomic information, etc. This database will be published on the national open data platform.
- A.4.2.3. Promote the creation of a database of the biodiversity of our natural and cultural wealth, in addition to promoting the investigations of these databases. These databases will be published on the government's open data platform.

SO.5.1. To be a regional leader in the responsible use of data and AI algorithms.



S0.5.1. To be a regional leader in the responsible use of data and AI algorithms.

- A.5.1.1. Adapt the recommendations of the OECD "Principles on AI" (*), which Peru has signed, to the national reality, and start their implementation prioritizing research and development that stimulates the innovation of a reliable and accessible AI, prioritizing the sectors that the country considers key.
- A.5.1.2. Through the different regulatory bodies of public services and national superintendencies, evaluate an impact study on the less biased use of algorithms for the classification of people in the private sector.
- A.5.1.3. Create an observatory to monitor, report on rankings indicators for the responsible use of AI such as the Oxford Insight Responsible AI ranking (**) and others.
- A.5.1.4. Create a unit to monitor and promote the responsible and ethical use of AI in the country.

(*) <https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0449>

(**) <https://www.oxfordinsights.com/government-ai-readiness-index-2020>

S0.5.1. To be a regional leader in the responsible use of data and AI algorithms.

- A.5.1.5. Implement a platform to be a registry of AI algorithms used in public sector. In addition to algorithms, the datasets used in use cases will be included.
- A.5.1.6. In regulatory sandboxes created as a controlled environment where AI-based ventures can be promoted, promoting the ethical and responsible use of AI.
- A.5.1.7. In the public sector, in all cases of use of AI to classify people (to provide benefits, opportunities or sanctions to citizens), they must have a socioeconomic impact study to guarantee equity.
- A.5.1.8. Promote Ethics courses in all undergraduate and graduate programs in Computer Science, Software Engineering, and in all programs that contain AI courses.

SO.6.1. Facilitate the exploitation of synergies between universities and research centers through inter-university cooperation, the private sector, public organizations and international organizations.



SO.6.1. Facilitate the exploitation of synergies between universities and research centers through inter-university cooperation, the private sector, public organizations and international organizations.

- A.6.1.1. Research projects presented to public funds such as Fondecyt, Concytec and others, must include as evaluation criteria, the participation of at least two universities, one from Lima and the other from the provinces.
- A.6.1.2. Promote collaboration with foreign universities, and include some criteria for the delivery of public funds to universities in CORE training programs, promoting the participation of prestigious universities in the US and Europe in master's and doctorates training programs.
- A.6.1.3. Through a National Center for Innovation and Artificial Intelligence to promote collaboration in training, research, development and innovation of AI between the public and private sectors, academia, and alliances with prestigious foreign institutions.
- A.6.1.4. Create and maintain a public registry of public, private and academic entities with AI/ML capabilities and conducting AI/ML research and development in the country.
- A.6.1.5. Promote an alliance between countries in the region for the research and development of artificial intelligence. For example, explore a Pacific Alliance for Artificial Intelligence.

National Strategy for Artificial Intelligence

National Center for Innovation and Artificial
Intelligence



NATIONAL CENTER FOR INNOVATION AND ARTIFICIAL INTELLIGENCE

Purpose

It is a national center of excellence in artificial intelligence, in response to the need for human talent and with the aim of accelerating the development and adoption of AI, which will carry out research, development, socialization and innovation by adopting Artificial Intelligence, coordinating its activities with the national and international academic sector, the private and public sectors, considering the sectors where Peru has competitive advantages, whether due to biodiversity, key economic sectors or criteria that are considered important for the country; inserting the country into a global value chain and promoting its integration into a globalized and digital world.

It will prioritize the use cases where Artificial Intelligence generates solutions to the country's objectives such as the elimination of poverty, zero hunger, justice, quality education, health, clean and accessible energy, clean water and sustainable cities, the reduction of social gaps and others. use cases.

NATIONAL CENTER FOR INNOVATION AND ARTIFICIAL INTELLIGENCE

Functions

- Carry out Research in Artificial Intelligence, as own projects or in collaboration with the academic, public and private sectors.
- Carry out and promote the training of talent and skills at the national level in the research, development and adoption of AI framed within the ENIA.
- Recommend and prioritize areas and cases of use of AI in coordination with the public, private and academic sectors of the country.
- Carry out and facilitate AI job postings.
- Sponsor national and international academic AI events.

NATIONAL HIGH PERFORMANCE COMPUTER CENTER

Purpose

The National Center for High Performance Computing is the national center specialized in high performance computing (HPC) that will manage the country's super computers.

This center will provide high-performance computing services to academia, the private sector, the public sector, and industry, and will also provide advanced training in high-performance computing, promoting their participation.

The main players in this center will be universities and national research centers that will be connected to the centers through a national high-speed fiber optic network.