ITU-D Study Groups
Workshop on AI

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(Room K, ITU)

AI for development (AI4D): How can AI be applied to address development challenges?

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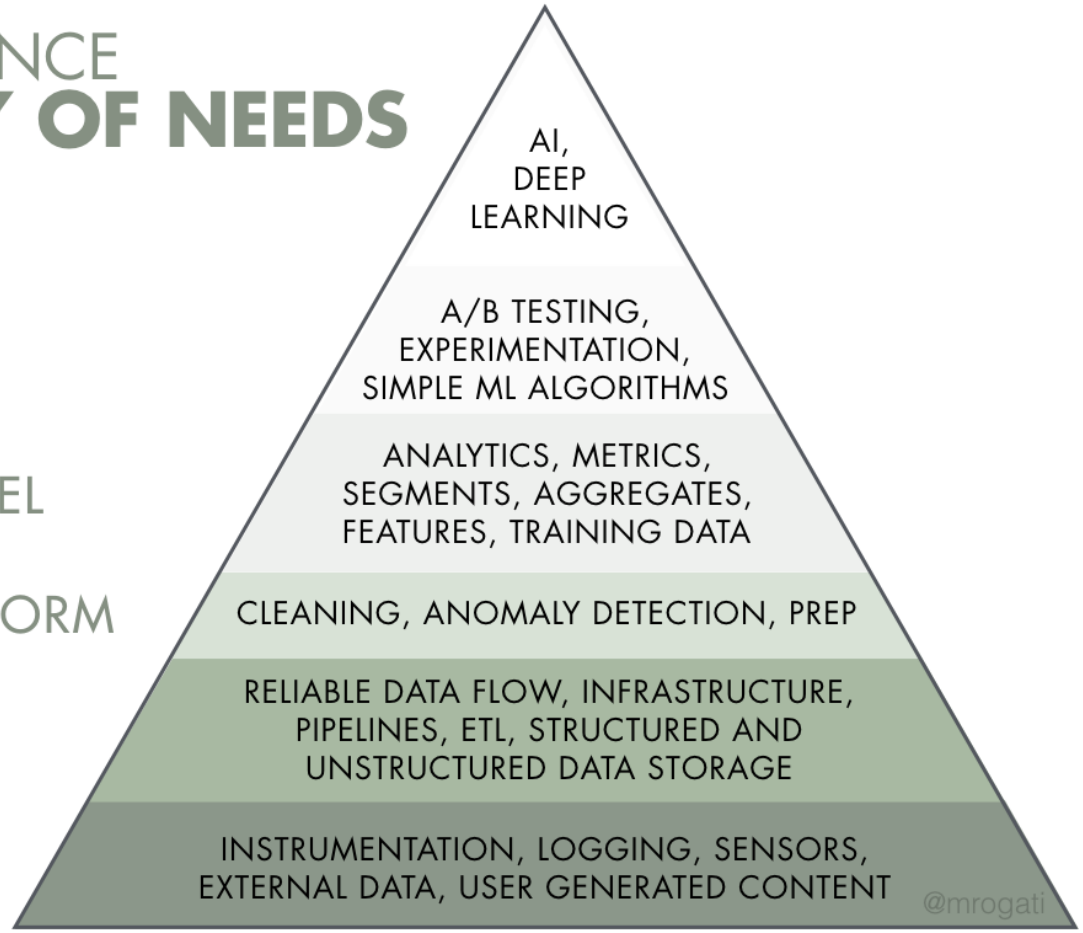
Outline

- Introduction
- Mobile Data for AI
- Use of AI for development
- Challenges/ethics
- AI Readiness
- Conclusion

Introduction

- AI is expected to add 15 Trillion to the industry by 2030
  - It is an opportunity to leapfrog in many sectors
  - To harness this new opportunity, Countries must get prepared
    - AI strategies/ guidelines
    - Data infrastructure, strategies and plans (AI and data are intrinsically linked)
- AI is being explored/used for development to
  - **Improve efficiency of various socio-economic outcomes**
    - Agriculture, Education, Health, Transport, Energy, etc.
  - **Track Poverty, Target interventions/development, measure outcomes**

THE DATA SCIENCE HIERARCHY OF NEEDS



LEARN/OPTIMIZE

AGGREGATE/LABEL

EXPLORE/TRANSFORM

MOVE/STORE

COLLECT

Source: https://hackernoon.com/the-ai-hierarchy-of-needs-18f111fcc007

Sources of Data for AI4D

- Mobile phones data
  - Usage/mobility data
  - Health data (e.g., body area, mhealth)
  - Social interactions
  - Many sensors: GPS, camera, etc.
  - Transactions
    - Consumption (e.g., electricity, water bills)
    - Finance (e.g., transfers, credits, etc.)
- Satellite, drones imaging
  - Cities, streets, houses, farms, etc.
- Social networks
  - Interactions, e.g., twitter/Facebook and social/political movements
  - News
- Government
  - Socio-economic data from various sources e.g., travel, visas, etc.
  - Health data from hospitals, etc.
  - Archives

Source of Data for AI4D

- Text, images, other format (e.g., binary)
  - Transcripts from various sources (e.g., community meetings in India)
  - Speeches
  - Personal Devices: Mobile phone, computer, GPS, cameras, wearable devices e.g., watches
  - Medias: social medias, news medias, Internet (e.g., google)
  - IoT devices, sensors, actuators, (temperature, climate, etc.)

General AI applications in the mobile phone

- Phones collects data through many sensors
  - GPS, microphone, cameras, mobility, etc.
- Many AI applications are emerging from the phones, over the Internet
  - Camera of most high-end smartphones
  - Virtual Assistant
    - Some speech recognition now offers better levels of comprehension than a human listener, even in noisy environments
  - AI applications in mobile phone for disease recognition
  - AI in search engines (e.g., Goggle), adapted to applications
- → We are already using various AI applications from the phones, over the Internet
- → Preparedness/ readiness is key to enable
  - AI for development
  - AI for innovation
  - Trusted AI applications/services

AI for Development

- **Increase efficiency/sustainability of socio economic-sectors**
  - Efficiency of agriculture, Transport, energy, health, etc.
    - Precision Agriculture for Development to support smallholder farmers by providing customized information and services aiming to increase productivity, profitability, and environmental sustainability
    - Analyze, monitor and forecast crops, and allow for alerts and insights (In the Middle East and North Africa for wheat)

- Aggregating longitudinal movement data from 15M mobile phones in East Africa, researchers are exploring the implications of human movement on the spread of disease

(Source: Mobile Data for Development)

AI for Development

- **Track Poverty, Target Development**
  - Using mobile phones data and ML algorithm
    - Predict/Map poverty and target development
    - Using mobile call records, predict credits capacities to extend credit
  - Economic variation using Satellite imagery data
    - Identify image features to analyze variation in economic outcomes
      - (e.g., using a convolutional neural network)
  - Food security
    - Predict food security (e.g., in southern Malawi)

AI for Development

- **Target interventions: *when, where, to whom***
  - Remote sensing to detect deforestation
  - Machine learning on VAT tax data (in India) to better target firms for audits
  - Predicting travel demand patterns after disaster to target intervention (hurricanes)
  - Predicting where food insecurity will occur to help target aid interventions
  - Using mobile call records to identify a pool of small businesses that credit can be extended to

AI for Development

- **Measure Outcomes either satellite data or cellphone record data to**
  - Predict data in countries where there are gaps in the basic statistics
  - Reduce costs of surveys/census/mapping
    - Facebook using satellite-based data and government census information to map global population
  - Predict/measure agricultural yields, urbanization, conflict-affected infrastructure
  - Urbanization
    - Use ML on satellite imagery to detect changes in growth of cities
    - Measure the pace of urbanization to improve infrastructure planning (e.g., roads)

Some Challenges of AI4D

- Availability of data
  - Government data
  - Mobile data not available for innovators, researchers, NGO, etc. in many developing countries → do not favor the development of AI
- Accuracy of the data
  - If the training data is unreliable, the result will not be reliable
  - Survey data has errors and biases, which need to be considered when used to train ML models
- Human resources/skills
  - Insufficient human capacity could prevent development of AI
- **Trust:** How to guarantee greater transparency and accountability of algorithms for trustworthy AI?
- **Quantification of harm:** How to identify and quantify potential harms to be able to gauge whether it is a an acceptable level of risk?

Some Ethics of AI

- **Transparency**
  - For many AI companies, AI algorithms are typically proprietary
  - To establish trust, knowing what's in an algorithm could important
  - What type of intervention is needed to establish for transparency
- **Privacy:** AI presents new concerns over personally identified data
  - e.g. demographically identified personal data
- **Liability:** Who is responsible when the AI misconduct?
  - Wrongly predict a disease or a wrong intervention
  - AI injured/attack people

What Can Policy Makers/Regulators Do?

- Open/Share the mobile cellular data to unlock innovations, research and development, development interventions
  - This may require desensitizing
- Open the Government data
  - This may involve creating and implementing digital economy policy and/or open data policy
- Create more reliable data reliable
  - Putting in place a system for data collection, storage and usage
  - Using sensors and smart devices e.g., for smart cities
  - Cleaning and labelling data
  - This may involve digitizing archives

What Can Policy Makers/Regulators Do?

- Create an AI ecosystem to foster the deployment of trustworthy AI systems
  - Foster accessible AI ecosystems
    - digital infrastructure
    - technologies and mechanisms to share data and knowledge
- Define guidelines, strategies and policies for data and AI
  - Design policy frameworks that both stimulate AI innovation, while minimize potential harms
  - Transparency/trust, e.g., algorithms
  - Security and privacy
  - Ethics, e.g., Liability and enforcement
- Empower people with the skills for AI
  - Capacity building for professionals
  - Changing/Adding AI in curricula
- Facilitate public and private investment in research & innovation in AI
  - Include AI in the early phase of development project

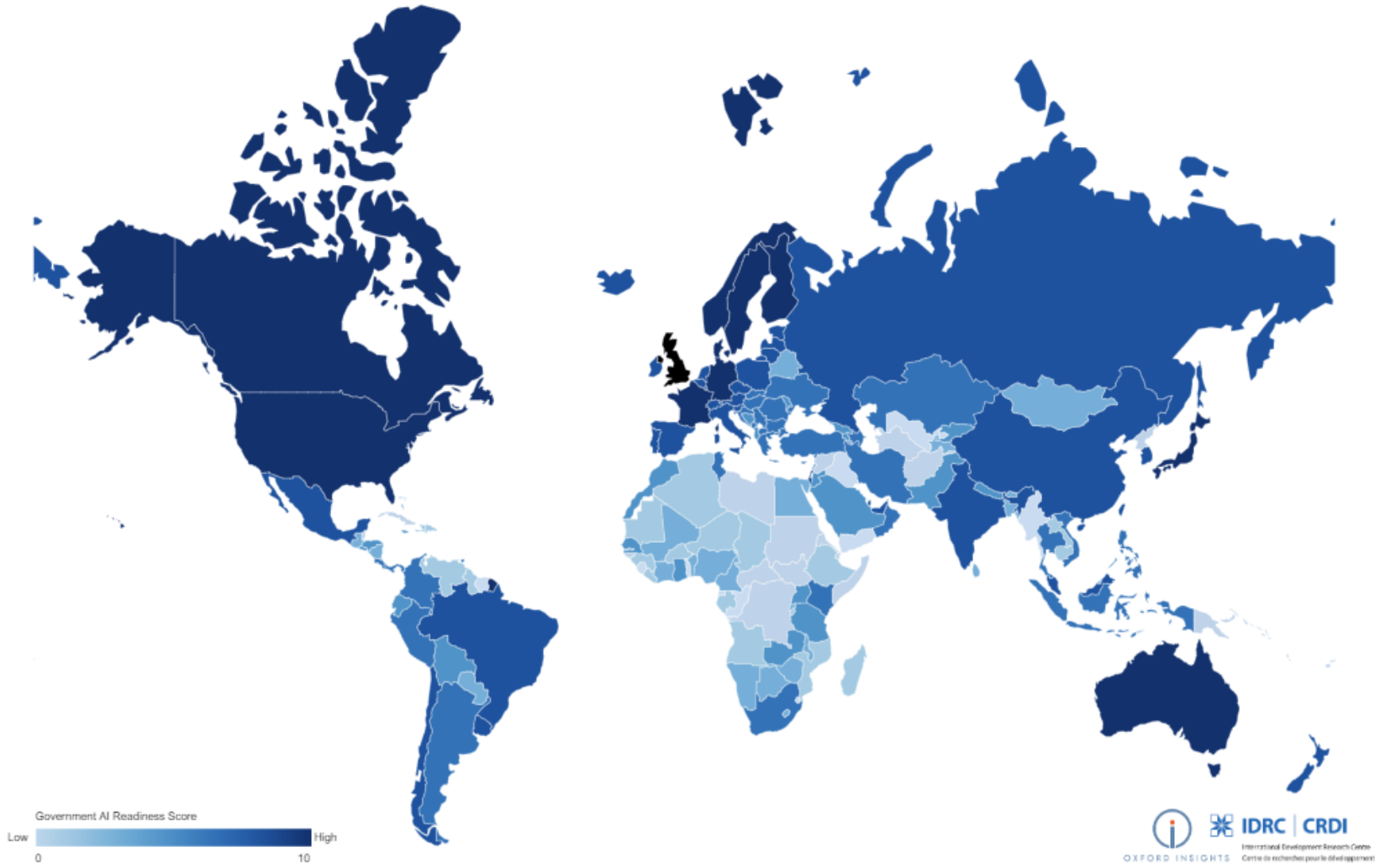
Countries Readiness Index

Cluster	Indicators
Governance	Data protection/privacy laws
	National AI strategy
Infrastructure and data	Data availability
	Government procurement of advanced technology
	Data/AI capability (in government)
Skills and education	Technology skills
	Private sector innovation capability
	Number of AI startups
Government and public services	Digital public services
	Effectiveness of government
	Importance of IT to government's vision of the future

(Ref: Oxford's Insights)

Government Artificial Intelligence Readiness Index 2019

Compiled by Oxford Insights and the International Development Research Centre



EGDI is a weighted average of three normalized scores on three most important dimensions of e-government

(1) scope and quality of online services (**Online Service Index, OSI**)

(2) development status of telecommunication infrastructure (**Telecommunication Infrastructure Index, TII**)

(3) inherent human capital (**Human Capital Index, HCI**

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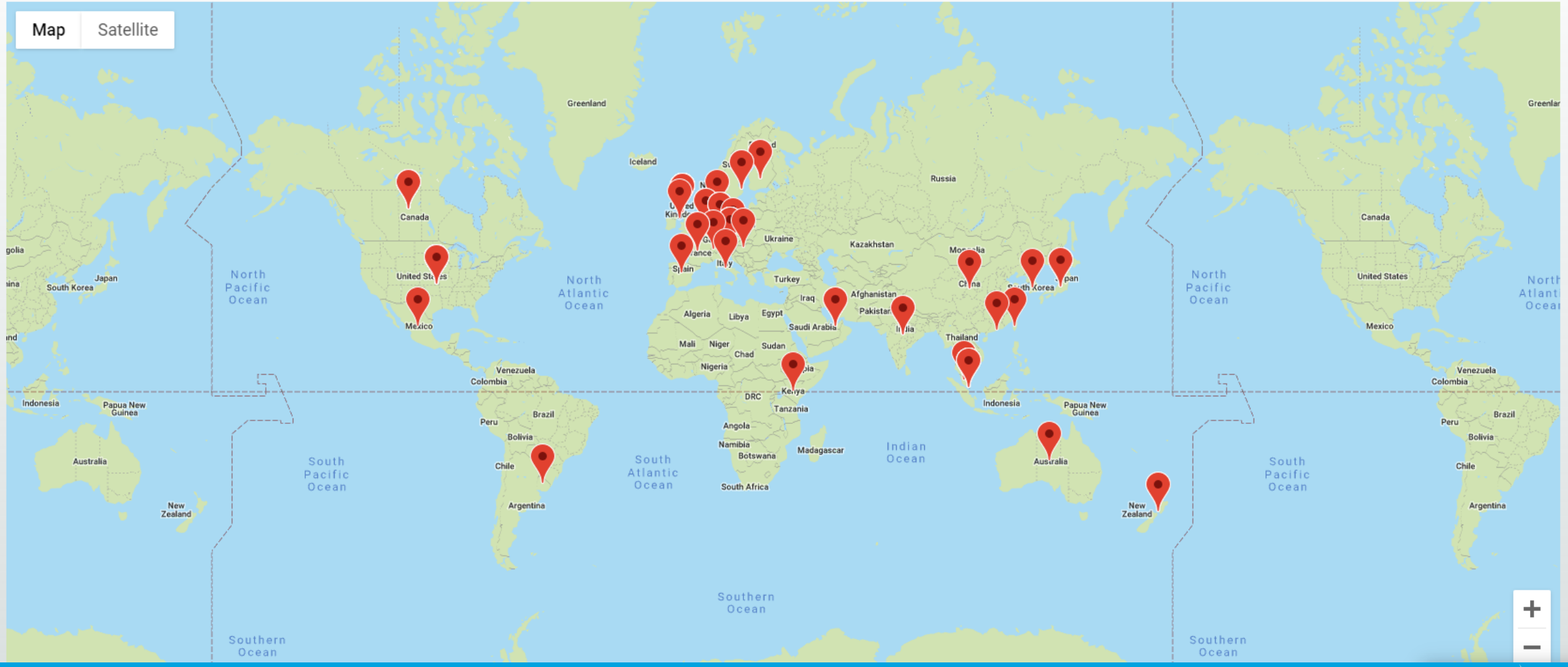
Mapping AI Governance

Database Map Timeline Contact



Examples of Countries' AI strategies

- **Canada**: probably the first country to release a national AI strategy in 2017
  - (1) increase the number of AI researchers and graduates
  - (2) establish three clusters of scientific excellence
  - (3) develop thought leadership on the economic, ethical, policy, and legal implications of AI
  - (4) support the national research community on AI.
- **China** AI plan: a comprehensive strategy
  - Initiatives and goals for R&D, industrialization, talent development, education and skills acquisition, standard setting and regulations, ethical norms, and security.
- **France** plan (1.5 B) aims to "to transform France into a global leader in AI research, training, and industry"
  - The plan is based on the report: *For a Meaningful Artificial Intelligence: Towards a French and European Strategy*

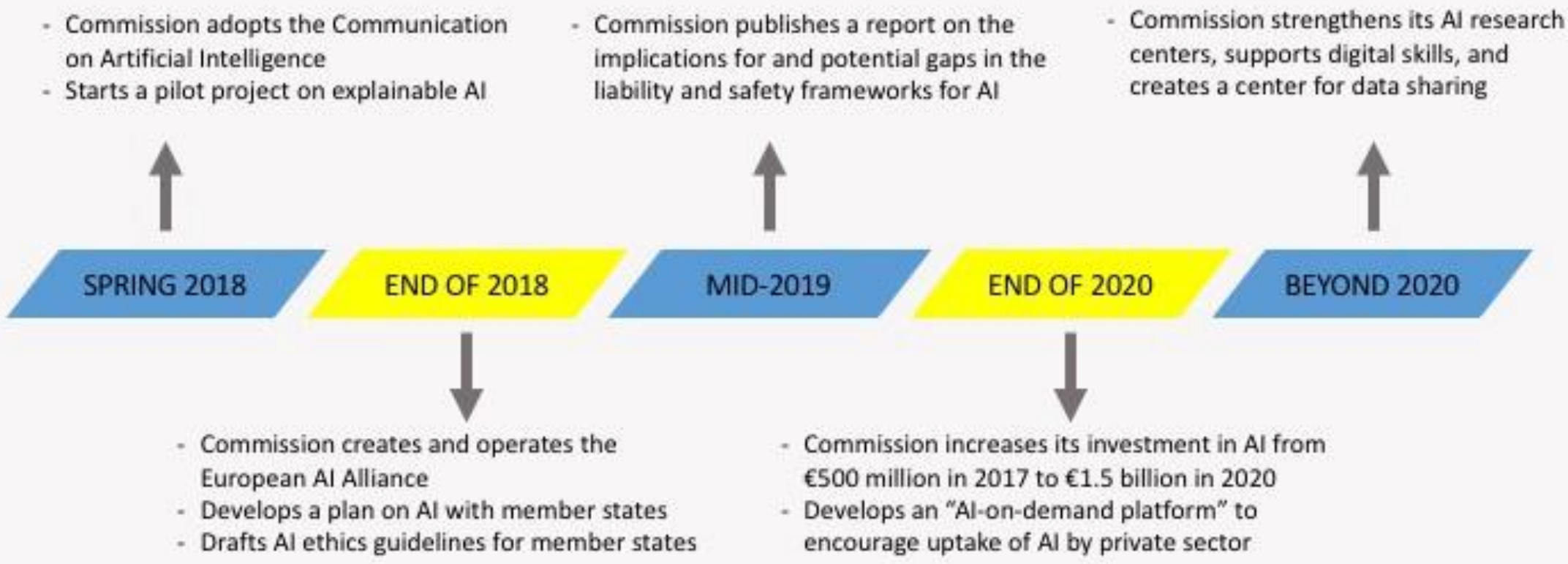
Examples of Countries' AI strategies

- **India's** national AI strategy
  - focuses on how India can leverage AI not only for economic growth, but also for social inclusion. NITI Aayog, the government think tank that wrote the report, #AIforAll.
    - (1) enhance and empower Indians with the skills to find quality jobs;
    - (2) invest in research and sectors that can maximize economic growth *and* social impact;
    - (3) scale Indian-made AI solutions to the rest of the developing world.
- **Kenya's** government created a new task force to create a strategy that encourages the development/adoption of new technologies
  - Provide recommendations on how the government can leverage new technologies in the next five years
  - Situate the strategy in the areas of financial inclusion, cybersecurity, land tilting, election process, single digital identity, and overall public service delivery.

Examples of Countries' AI strategies

- **Tunisia's** Secretary of State for Research has created a task force and a steering committee to develop a national stratey
  - The primary goal will be to facilitate the emergence of an AI ecosystem that acts as a strong lever for equitable and sustainable development and job creation.
- *Towards an AI Strategy in **Mexico**: Harnessing the AI Revolution*
  - White paper that lays out the foundations for a national AI strategy in **Mexico**
  - (1) government and public services, (2) data and digital infrastructure, (3) research and development, (4) capacity, skills and education, and (5) ethics.
- The **UAE** AI strategy
  - First country in the Middle East to create an AI strategy and first in the world to create a Ministry of Artificial Intelligence
  - Primary goal is to use AI to enhance government performance and efficiency.
  - The government will invest in AI technologies in nine sectors: transport, health, space, renewable energy, water, technology, education, environment, and traffic.
- Reference Medium (https://medium.com/politics-ai/an-overview-of-national-ai-strategies-2a70ec6edfd)

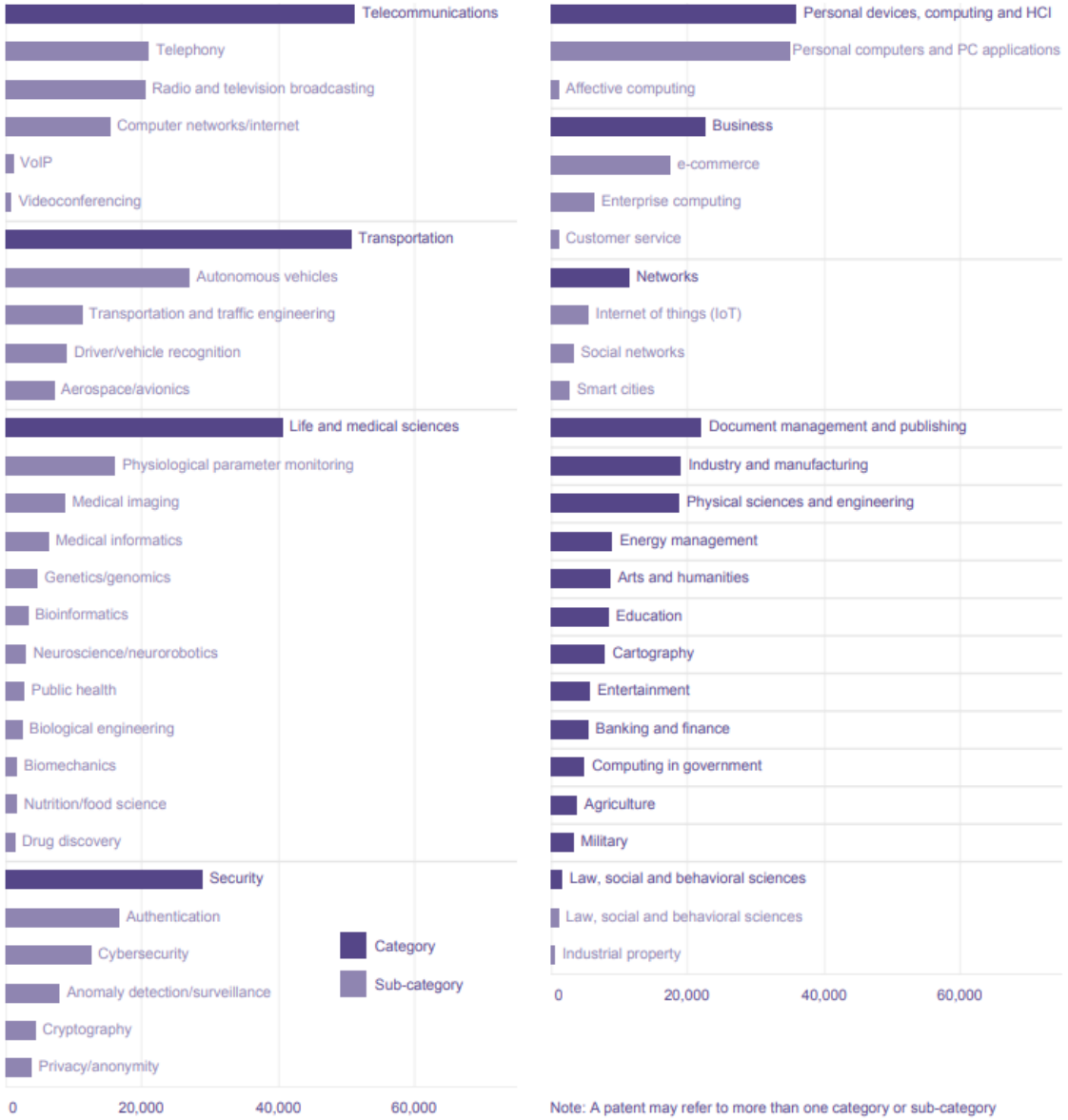
A TIMELINE FOR EUROPE'S AI STRATEGY



Source: WIPO

Figure 3.17. Patent families for application field categories and sub-categories

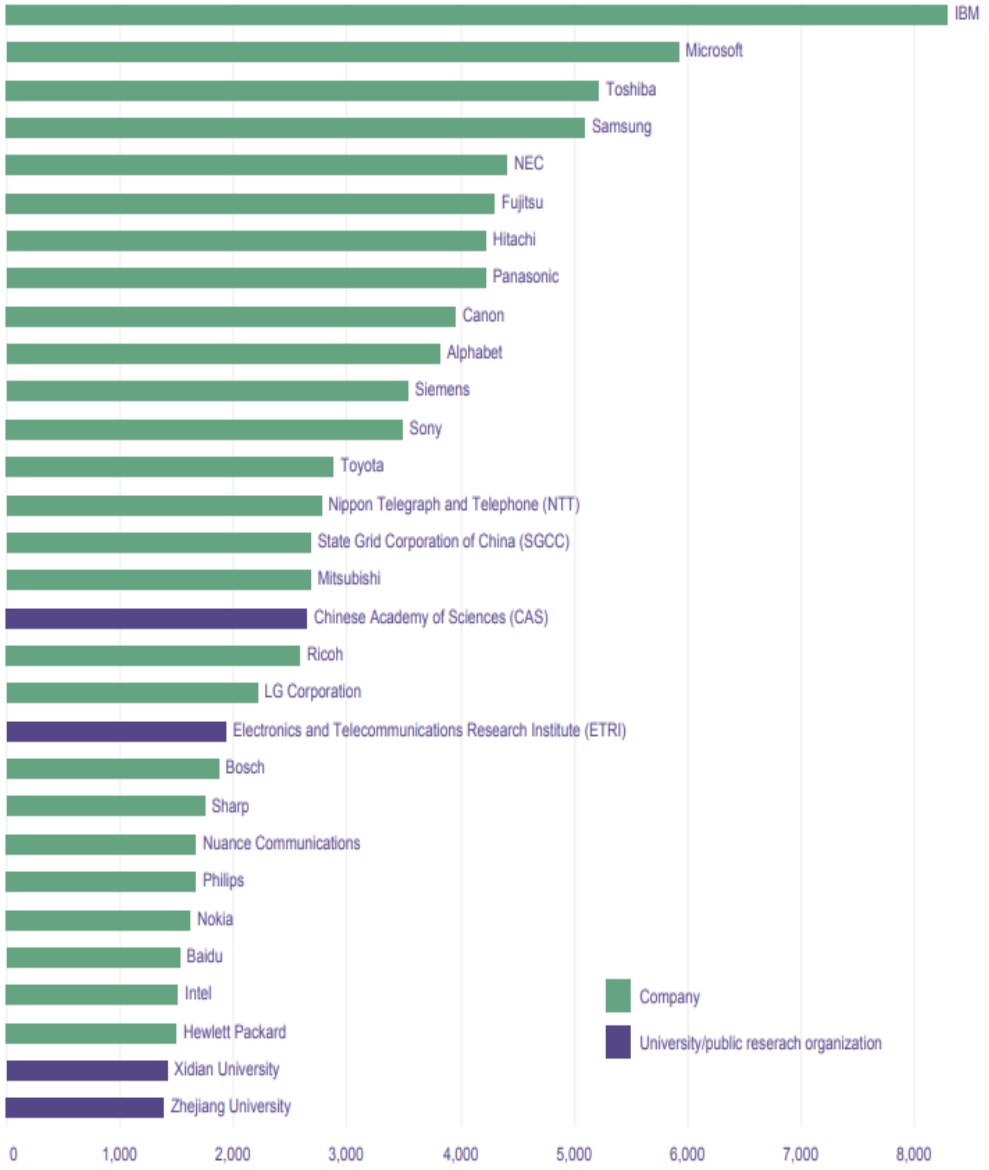
Telecommunications, transportation, life and medical sciences, and personal devices, computing and HCI are the top four application fields mentioned in patent documents and represent 24, 24, 19 and 17 percent of all patent families related to AI application fields, respectively



Note: A patent may refer to more than one category or sub-category

Figure 4.1. Top 30 patent applicants by number of patent families

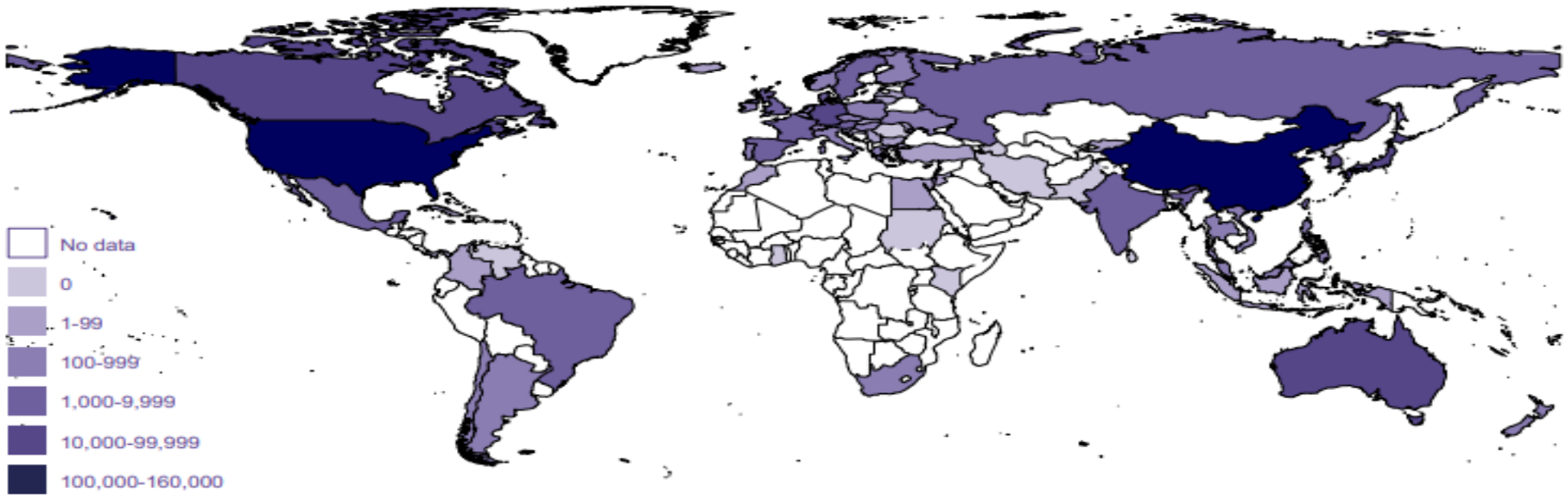
Companies represent 26 of the top 30 AI patent applicants worldwide



Note: Fujitsu includes PFU; Panasonic includes Sanyo; Alphabet includes Google, Deepmind Technologies, Waymo and X Development; Toyota includes Denso; and Nokia includes Alcatel

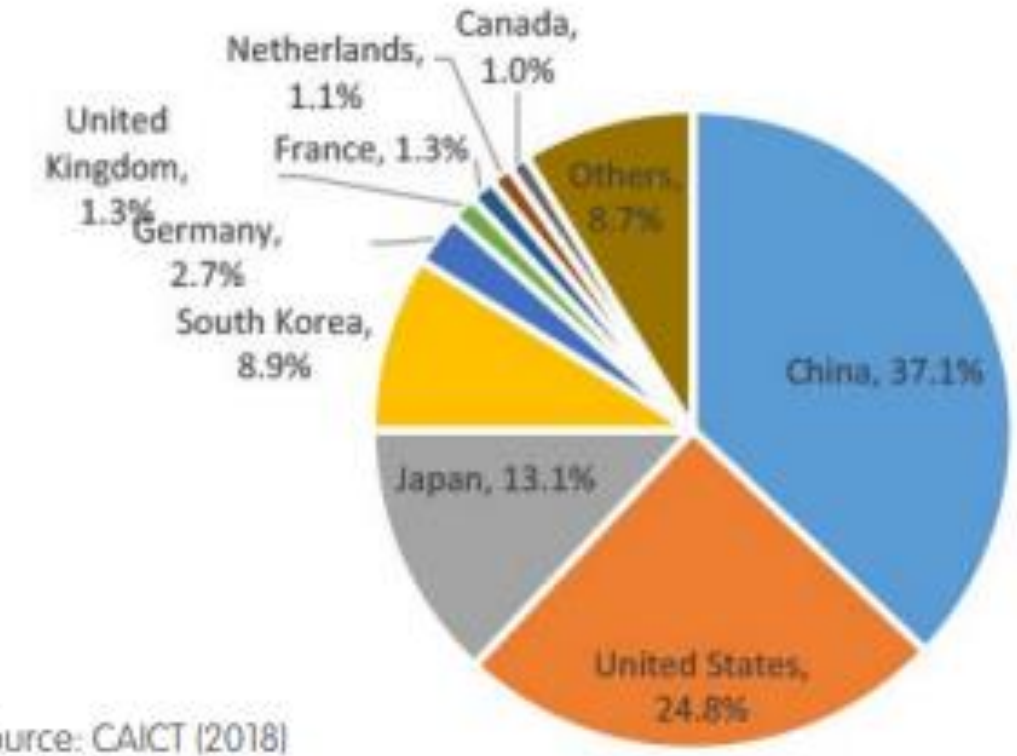
Figure 5.1. Number of patent applications by patent office (top) and number of scientific publications by geographical affiliation (bottom)

AI research and patent protection for AI-related inventions occurs around the world



Note: The color is based on the number of patent applications filed at patent offices

Fig. 3-2 Geographical Distribution of Global AI Patent Applications



Source: CAICT (2018)

Conclusion

- AI will impact societies
  - Positively or negatively?
  - Is the risk worthtaking?
  - How can we develop trust in AI?
- AI requires an environment that enables
  - Innovations
  - Trust→ assessing risks
  - Data
- Policy makers can shape foundations for
  - Ethical AI
  - Local skills in AI
  - Data availability, security and privacy
  - Infrastructure
- Applications: Support development driven applications for the public interest
  - Define synergies between the interventions
- AI should complement, not substitute for, development practitioners
  - Practitioners are critical for identifying the problem to solve, providing local expertise, contextualizing analysis