Artificial intelligence: European and Italian Strategy

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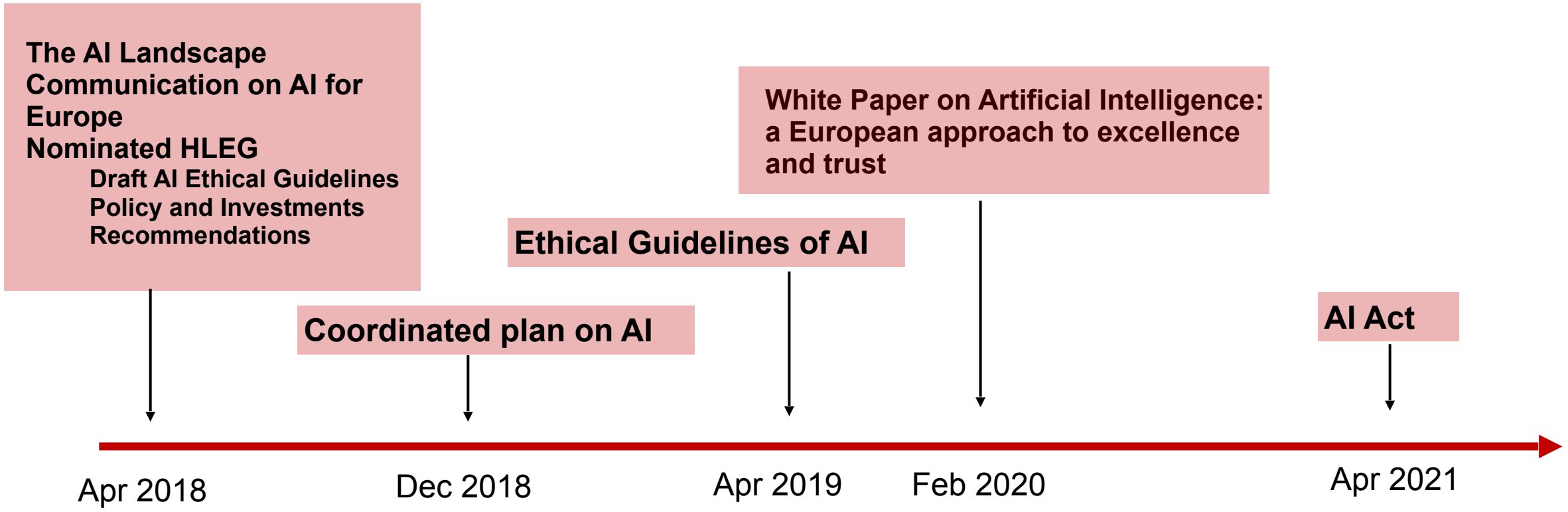
Facts about AI in Europe and in Italy

- AI now reached a **sufficient level of maturity** to be pervasively adopted
- **Research in AI** grows at an unprecedented pace, also in Italy.
- The **economic impact** of AI has grown considerably (15B in 2030 EU2019).
- AI offers enormous **opportunities and challenges**, but high potential **risks and threats**.
- **Industry** in and with AI will change the labor market.
- **Government/public administrations** make use (more and more) of AI.
- AI does not only pertain scientific and technological aspects, but also **social, economic, ethical and legal issues** and human rights.
- **Europe** has a central and strategic role in Artificial Intelligence.
- All member states have set a **National Strategy on AI** defining actions and priorities.

Artificial Intelligence in Europe



Artificial Intelligence in Europe

Artificial intelligence (AI) refers to systems that display intelligent behaviour by analysing their environment and taking actions – with some degree of autonomy – to achieve specific goals

Brussels, 25.4.2018
«Artificial Intelligence for Europe»
European Commission

…the strategy places people at the centre of the development of AI — human-centric AI. It is an approach to boost the EU's technological and industrial capacity and AI uptake across the economy, prepare for socio-economic changes, and ensure an appropriate ethical and legal framework.

Brussels, 8.4.2019
«Building Trust in Human-Centric AI»
European Commission

mobilise resources to achieve an **'ecosystem of excellence'** along the entire value chain, starting in research and innovation, and to create the right incentives to accelerate the adoption of solutions based on AI, including by small and medium-sized enterprises (SMEs).

European initiatives on AI

- AI-on-demand platform: one stop shop for AI:
  - Catalogue of assets
  - Experimentation platform
- Follow up projects ICT49
- Network of excellence
- PPP on AI, Data and Robotics

- Now CSA on Horizon Europe
- Preparatory action on Digital Europe
- European Lighthouse project
- Many calls in Cluster4
- Important connections with related fields:
  - HPC, IoT, Cybersecurity, Data Analytics, 5G

Cluster 4 -vWorkprogram 2023-24

D1 - Climate neutral, circular and digitized production **TWIN-TRANSITION (KSO C)**

- Manufacturing Industry -MiE (8)
- A New Way to Build, accelerating disruptive change in construction (2)
- Energy Intensive Process Industries (18)

D2 - Increased autonomy in key strategic value chains for resilient industry **RESILIENCE (KSO A)**

- Raw Materials for strategic autonomy and circular economy (10)
- Safe and Sustainable by Design (SSbD) Chemicals and Materials (4)
- Strategic Innovation Markets Driven by Advanced Materials (6)
- Improving the resilience of EU businesses, especially SMEs and Startups (3)

D3 - World leading data and computing technologies **DATA (KSO A)**

- Data sharing and analytics capacity (2)
- From Cloud to Edge to IoT (5)

D4 - Digital and emerging technologies for competitiveness and fir for the Green Deal **DIGITAL-EMERGING (KSO A)**

- Open Source for Cloud/ Edge Digital Autonomy (2)
- Photonics (8)
- AI, data and robotics (4)
- Graphene (4)
- Quantum (8)
- Emerging Techs (2)

D5 - Open strategic autonomy in developing, deploying and using global space-based infrastructures, services, applications and data **SPACE (KSO A)**

- Competitiveness (5)
- Access to Space (3)
- Egnoss upstream (3 Oth Act)
- Copernicus service (9)
- EGNSS and Copernicus Downstream (6)
- SSA, GOVSATCOM , Quantum (11)
- CASSINI (3) & Space entrepreneurship (2)

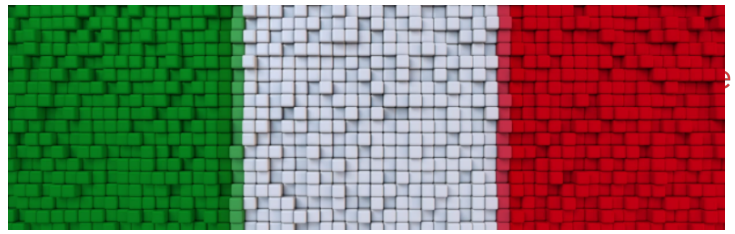
D6 - A human-centred and ethical development of digital and industrial technologies **HUMAN (KSO D)**

- AI based on trust (4)
- Internet of Trust (3)
- Extended Reality (2)
- Accelerating uptake of tech & innovation (3)
- Industry 5.0 (2)
- Standardization (4)
- Cross-cutting: Bauhaus; decentralised social economy platforms

Energy efficiency and climate neutral process industries (6 P4P)
Circularity and Zero Pollution in process industry (6 P4P)
Clean Steel (6 CS)

Other Actions: NGI commons; Critical Raw Materials Exploration Investment Facility; UNECE resource management system; JRC & Action Plan on Critical Raw Materials; Raw Materials events; Support to Hydrogen

AI research in Italy



Since 1975 historically- *Many Italian Scientific Associations.* (*AIxIA*, *GULP*, *SIREN*. *IEEE Italian Chapter)*
Now

- **Strong foundational research in AI** in Universities and National Research Centers (CNR , IIT..)
- Growing **Education Courses in AI** in computer science and computer engineering BSc,MSc, Phds
- **Strong research dissemination and schools**: summer schools (e.g: ICVSS since 2007), scientific competitions, international conferences (ECAI 2006, ICCV2017, ICPR2020, IJCAI2024, ECCV2024…)
- **Strong applied research** in AI of research centers with industries combining human-centric approaches, human-AI-machine interaction for intelligent production

2018: - June, institution of **National Lab CINI AIIS** (Artificial Intelligence and Intelligent Systems)
endorsed by Dept. Information and Security -Presidency of the Ministry Council.

2019: - January, "High-level working group of AI" from Ministry of Economic Development (MISE).
- June, first document on "**Proposals for an Italian Strategy on AI**"

The National Research Plan 2021-2027

The big field « Digital, industry and Aerospace»

1. The digital transformation
2. HPC and Big Data
3. Artificial intelligence
4. Robotics
5. Quantum Computing
6. Innovation for Manufacturing Industry
7. Aerospace

Programma Nazionale per la Ricerca 2021-2027

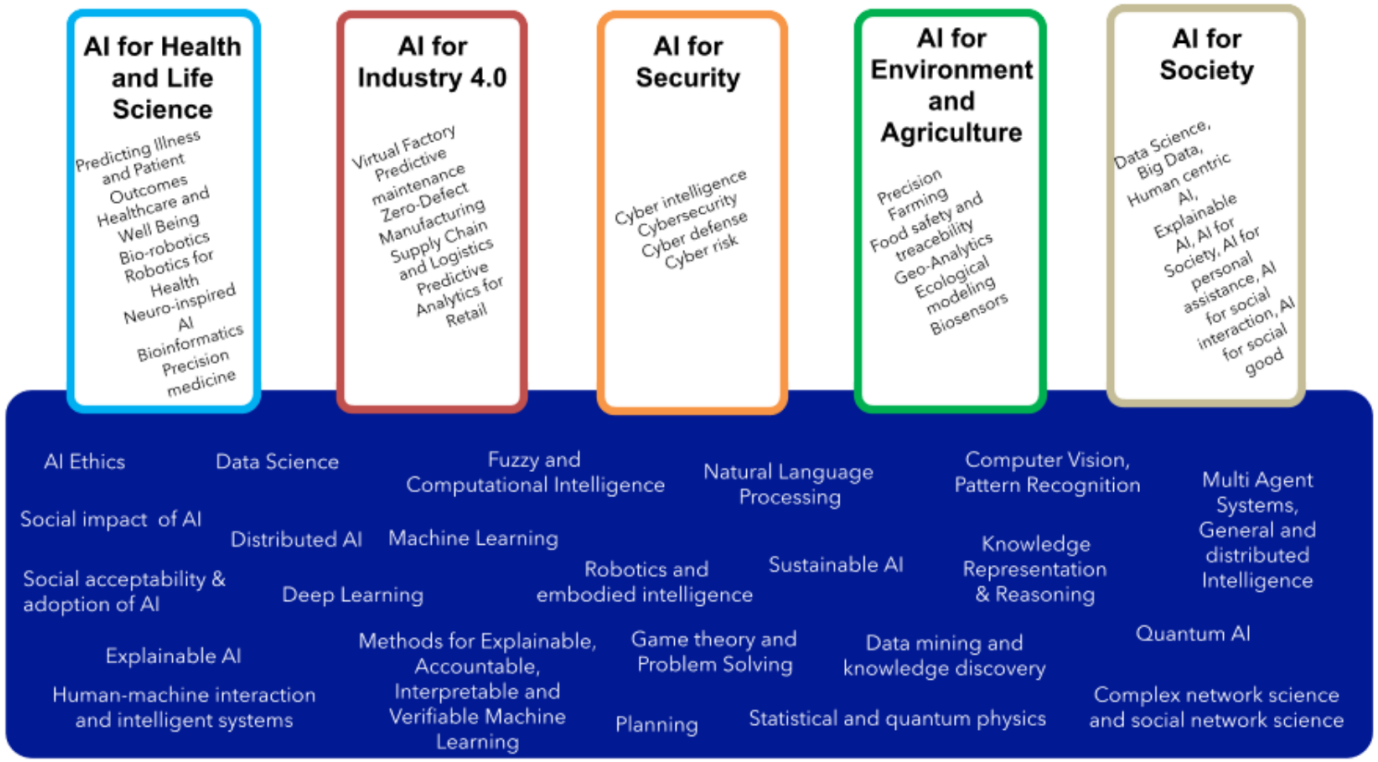
I GRANDI AMBITI DI RICERCA E INNOVAZIONE

Six themes in Artificial intelligence

1. AI for AI: Foundational Research
2. Human-centric AI
3. AI for health
4. AI for society
5. AI for Environment and infrastructure
6. Ai for industrial production

National PhD in AI

- 5 phd programs
- First year (XXXVII cycle):
  - 560 applications
  - 150 selected students (16 in the PhD-AI progam+34 added grants)
- Next XXXVIII cycle : 82 grants already available + added grants and PNRR grants
- 61 universities and research bodies (19 institutes of CNR)



DOTTORATO NAZIONALE IN INTELLIGENZA ARTIFICIALE

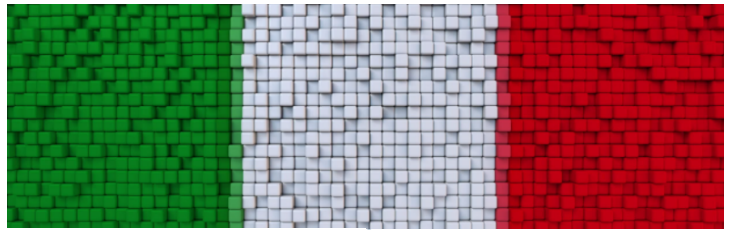
Italian Strategy

Italian Government

Jointly developed by the The Ministry of Education, University and Research, the Ministry of Economic Development, and the Minister of Technological Innovation and Digital Transition

https://assets.innovazione.gov.it/1637777513-strategic-program-aiweb.pdf

Italian AI strategic program



Guiding principles

- Italy's AI is a **European AI**
- Italy will be a **global research and innovation hub of AI**
- Italy's AI will be **human-centred, trustworthy and sustainable**
- Italian companies will become **leaders of AI based research, development and innovation**
- Italy's **public administrations will govern with AI and will govern AI**

Objectives

- Advance frontier research AI
- Reduce AI research's fragmentation
- Develop and adopt human-centred and trustworthy AI
- Increase AI-based innovation and the development of AI technology
- Develop AI-driven policies and services in the public sector
- Create, retain and attract AI talent in Italy

Strategic Areas of Intervention and policies

- **Talent and Skills**
- **Research**
- **Applications**

Priorities of the IT strategy

11 priorities

- Industry
- Education system
- Agri-food
- Culture and tourism
- Health
- Environment
- Banking, Finance
- Public administration
- Smart cities
- National security
- IT

Priority sectors

Industry and Manufacturing. AI will enable the Italian manufacturing sector, the second largest in Europe and seventh largest in the world, to introduce innovative processes, products and business models to the market while maintaining (or increasing) its global competitive edge.

Education system. As artificial intelligence is transforming every aspect of our lives we need to educate all people to this technology through a new education and training plan to understand, reinforce, integrate and disseminate AI technology. AI should be an important topic at all education levels. At the same time, it can constitute a powerful instrument for a fruitful transformation of the national education system to develop personalized learning plans while ensuring fairness and trustworthiness.

Agri-food. Through AI, Italy's thriving agri-food sector has the potential to increase further its competitive position by developing precision agriculture, thus avoiding overproduction and waste, increasing food safety and reducing emissions from land and agriculture.

Culture and tourism. Advanced technologies will further increase Italy's touristic attractiveness by creating new synergies between cultural and creative industries, producers, managers and users of Italy's vast cultural heritage. These technologies enable, for instance, continuous monitoring and preventive restoration of cultural heritage, monitoring and alert system for landscape heritage, customisation of services to better meet demand, virtual tours of tourist destinations to allow for better informed choices of travel destination, simultaneous translators for the description of places and monuments visited, geolocalised services for tourists.

Health and wellbeing. In the field of healthcare, AI applications boost product and process innovation by exchanging and aggregating information that is currently scattered in a multitude of public and largely underused databases. AI applications will help meet the new needs arising from an ageing Italian population. Moreover, they will have a significant impact on the population at risk of severe diseases such as degenerative, oncological, and viral diseases, and increase social inclusion of disadvantaged groups.
A few application examples are medical devices and services in screening and diagnostic areas such as omics and medical imaging, new drugs and vaccines, tracking and treating people, supporting patient care (diagnosis and prognosis), and predictive models of healthcare needs.

Environment, infrastructures and networks. AI solutions will have a significant impact on preserving resources, reducing emissions, better managing traffic flows and related risks, strengthening the circular economy and better preventing natural disasters. More generally, AI will be a fundamental ally in accelerating the ecological transition, a pillar of Italy's recovery and resilience plan and European Union's recovery efforts. In addition, AI may have an enabling role also in the highly strategic development of 5G networks as it can help improve network performance as well as reduce capital expenditures associated with its infrastructure deployment/management[33]. A few application examples are monitoring and intelligent management of networks and consumption, monitoring and predictive management of the waste cycle, situational and predictive analysis of hydrogeological instability.

Banking, Finance, and Insurance. Modern AI technologies will allow banks and insurers to improve in at least two ways. First, they will increase the quality of services offered to customers and reduce their costs through a higher level of personalisation and security of transactions. Second, AI applications will strengthen fraud prevention systems and simplify the fulfilment of intermediary obligations through the adoption of mechanisms for detecting suspicious behaviour and analysing data and documents.

Public Administration. In the near future, AI will optimise bureaucratic processes, offering better services to citizens and businesses and reducing costs for better services and performance[34]. Furthermore, with its databases and innovative tools for purchasing, investment and regulation, the PA is called upon to play an active role in the AI revolution in the private sector for the benefit of the community (e.g. open data, geolocation tools, purchase of AI products and services, funds for AI, experimentation of AI solutions). The PA could benefit from AI solutions concerning flow management, virtual assistants and chatbots, predictive analysis of business risks and support for the examination of incentive applications, support in the fight against tax evasion and other forms of illegality, evaluation of past policies and impact analysis of experiments.

Smart cities, areas and communities. The COVID -19 pandemic has shown that the digital ecosystem is essential to support all citizens, whether they live in cities or rural areas. AI will enable Italian residents, wherever they live, to gain access to communities and services, while reducing costs. Finally, AI technologies will enable Italy to reduce traffic and limit congestion thus also contributing to reining in the effects of one of the most polluting activities in the country. A few examples are smart parking, traffic management and signage control, self-driving vehicle management systems, lighting management and optimisation of public transport, as well as monitoring of bridges and buildings, home automation for buildings.

National Security. The importance of AI for the National Security of a country has been growing steadily in the last five years. Hence, Italy is fully committed to investing in AI applications that ensure the security of its citizens. This includes individual and national cybersecurity, where AI has been contributing to the development of new-generation detection and resolution software.

Information Technologies. The success of applications of AI in the sectors described above strongly depends on a high level of innovations in IT crucial fields impacting AI, such as Sensing, Reasoning and Search, Natural Language Processing, Computer Vision, Human-AI interaction, and Edge Computing. The broad field of IT[35] has a crucial role in ensuring a high level of innovation for implementing competitive AI in all different applications. For this reason, a special effort will be devoted to supporting the birth and growth of Italian IT companies.

Strategic Areas

1 Talent and Skills

Development of human resources with AI skills.

a. AI Training and Skills
invest holistically in AI training and skills development for citizens with a view to retaining/increasing technological readiness and preparing the workforce for the new opportunities.

2 Research

Research initiatives focused on both fundamental and challenge-driven AI.

b. Fundamental research
invest in fundamental AI methods, algorithms and research on human-centred AI.

c. Challenge-driven AI research
invest in key areas relevant for the priority sectors.

3 Applications

Innovation initiatives, aimed at accelerating AI adoption in priority sectors and at strengthening the AI technology production ecosystem.

d. AI for more competitive enterprises.

e. AI for a more modern public administration.

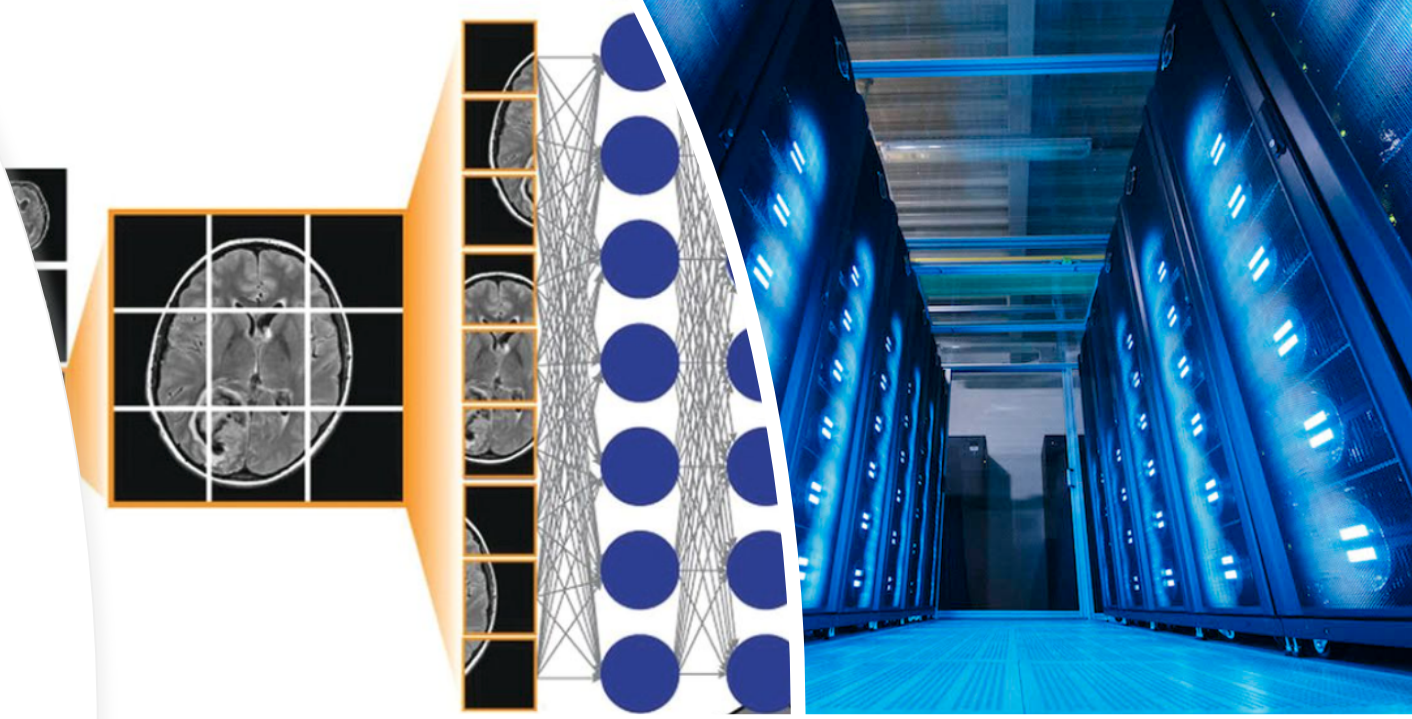
What we need now and in the future for AI…

1. AI architectures and models
2. Computational power and connectivity
3. Data, applications

   and…experts

- Still limited uptake in industry (SMEs in particular) and public sector

- Main reasons:
  - AI is accessible only to AI experts
  - Lack of trust



How to make AI accessible

- Ease of use:
  - Explain user needs in **natural language**
  - **Which AI** matches user needs
  - How/where to **find resources** (including data)
  - How/where to **find experts/consultants**
  - **Which hardware** is needed
  - We need mechanisms for **training-on-the-job**

- Some research directions:
  - **Human-machine interface**
  - **Matchmaking**: user-needs toward resources/people
  - **Hardware dimensioning**

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How to make AI trustworthy

Explainability, Safety, Fairness, Robustness, Accountability, Privacy, and Sustainability are the dimensions of **Trustworthy AI**

- Some research questions:
  - How to formulate **explanation** as Machine-Human conversation depending on context and user expertise
  - How to bridge the gap from **safety** engineering, formal methods, verification?
  - How to deal with bias-related issues to ensure **fairness**?
  - How to design systems that are **robust** from technical and social perspectives that do not cause unintentional harm?
  - How to uncover **accountability** gaps with regard to the attribution of AI-related harming of humans?
  - How to guarantee **privacy** while preserving the desired utility functions?
  - How to reduce energy consumption for a more sustainable AI and how can AI contribute to face **sustainability** problems

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Research needed to translate these dimensions in practical requirements
Methods to assess these dimensions
Methods for repairing non compliant AI systems
Trustworthy-by-design guideliness

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Thanks