

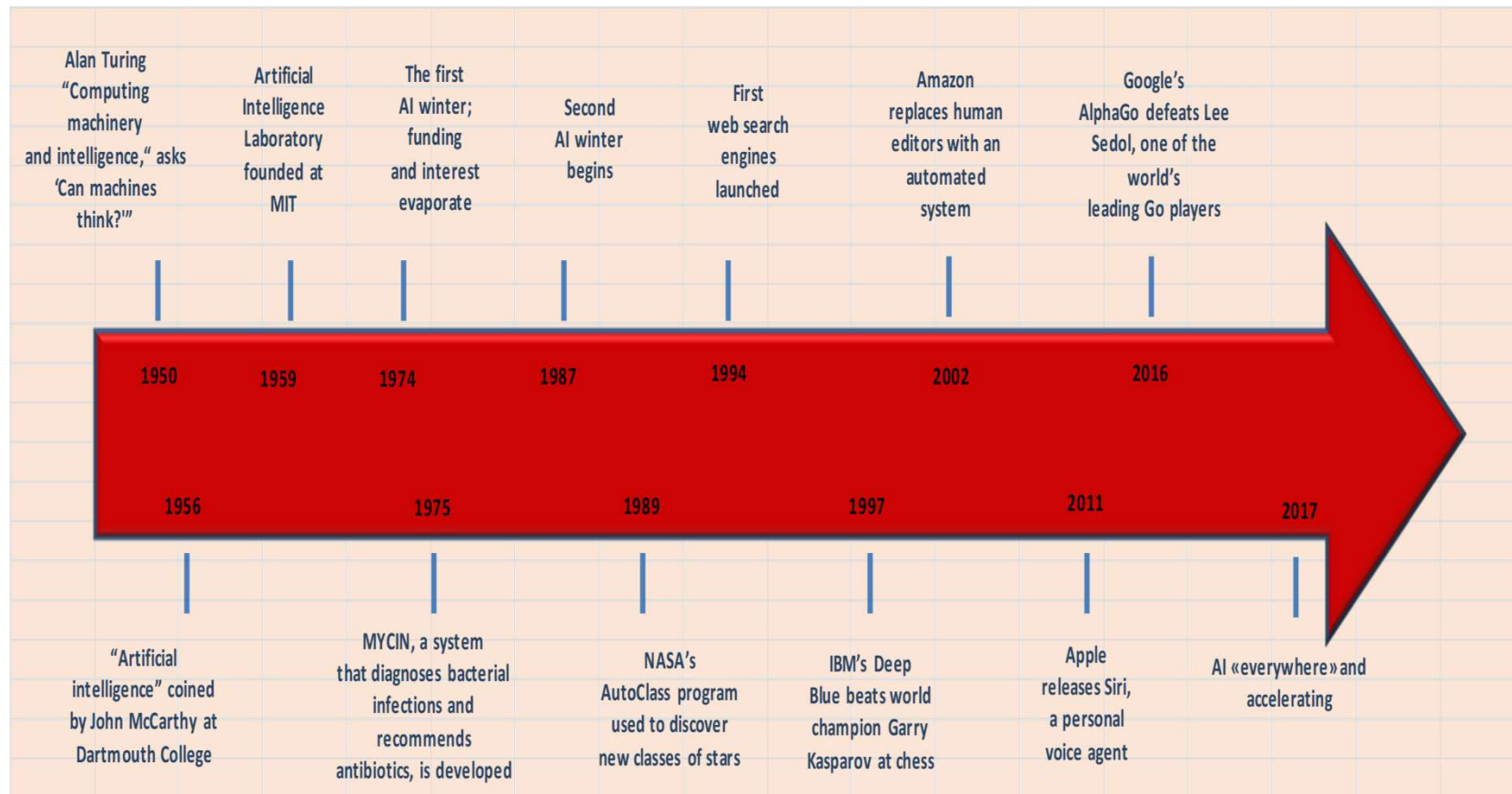
Artificial Intelligence: European Approach and National Implementation

Università Europea di Roma, 22 April 2020

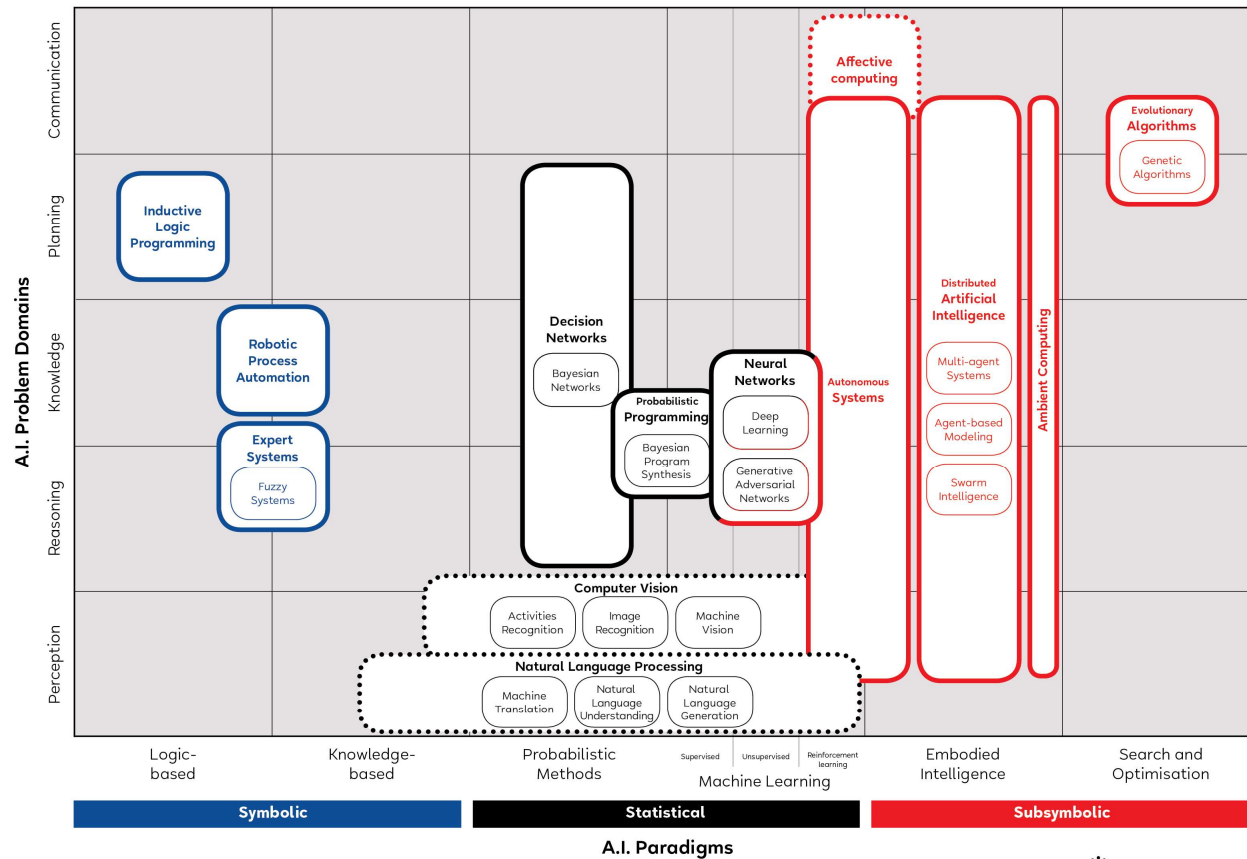


An AI primer

A quite long journey from 1950s to now



A set of different technologies instead of a single technology



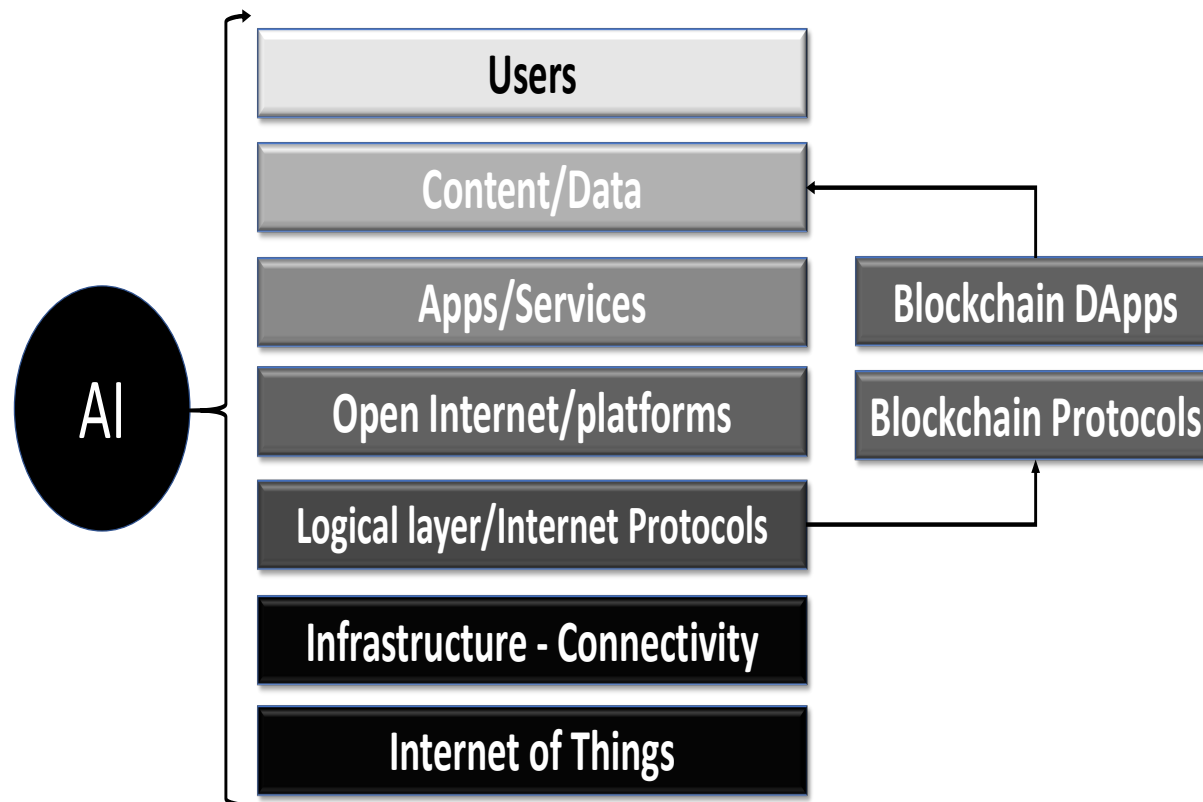
AI examples and areas of application

Products and technologies	Use and potentialities	Relevant areas
Augmented reality	Cross-Channel Insights, Language Translation, 3-D Maps, Virtual Shopping	Tourism and Travel; Retail
Chatbots and intelligent agents	Customer service and Customer Experience, Custom products, Knowledge Management	Consumer electronics; Travel; Retail; B2B sales; Legal services
Self-driving cars and drones	Transport, Delivery, Quality Assurance, Safety	Transportation and logistics; oil and gas; Manufacturing; Safety
Artificial vision (Imaging)	Virtual diagnostic, Trademark management, quality assurance	Medicine; Health management; Manufacturing; Architecture and Urban Planning; Retail; Food and drink; Safety
Machine Learning	Predictive analysis, knowledge management, software development	City planning; Financial and legal services; Travel; Retail; Consumer Electronics; Health; Safety; Public transport
Speech recognition and processing of natural language	Translation of languages, reading and interpretation of texts, transcription of texts	Digital Marketing; Customer Experience; Healthcare; Tourism and travel; Risk Management; Legal services
Robotics	Automation of manual processes	Safety; Manufacturing; Smart Home; Transportation; Healthcare
Virtual reality	Teleconference, gaming, entertainment, virtual experiences	Retail; Games; Media and Entertainment; Healthcare; Manufacturing

Humans & Robots: competition or collaboration?

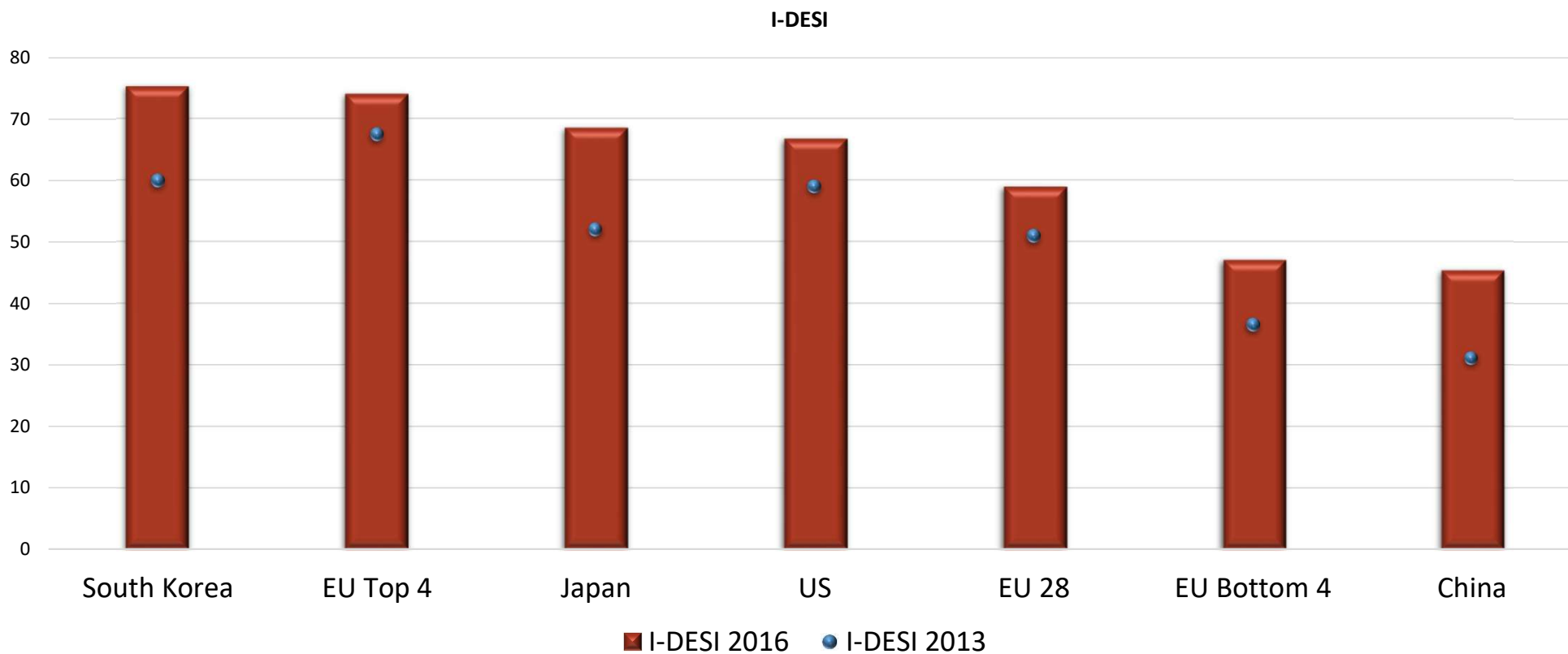
	Strengths	Limitations
Humans	Judgment is excellent	Prone to fatigue and interaction
	Excellent hand-eye coordination	Tremor limits fine motion
	Dexterity is excellent	Outside natural scale it has limited ability and dexterity
	Having capability of integration of multiple information sources	Not possible to see by tissue
	Trained by easily	Bulky end effectors, hence accuracy decreases
	Able and versatile to improvise	Geometrically less accurate
		Sterility is not easy
		Quickly infected and not protest against radiation
Robots	Higher geometric accuracy	Poor decision
	Untiring and stable	Adoption is not fast
	Fight against radiation	Limited dexterity
	Having many degree of freedom in motion analysis	Problems in hand-eye coordination
	Able to integrate multiple sources of numerical and sensor data	Not up to mark haptic sense
		Problem occurs when complexity

AI is based on many enabling technologies/factors



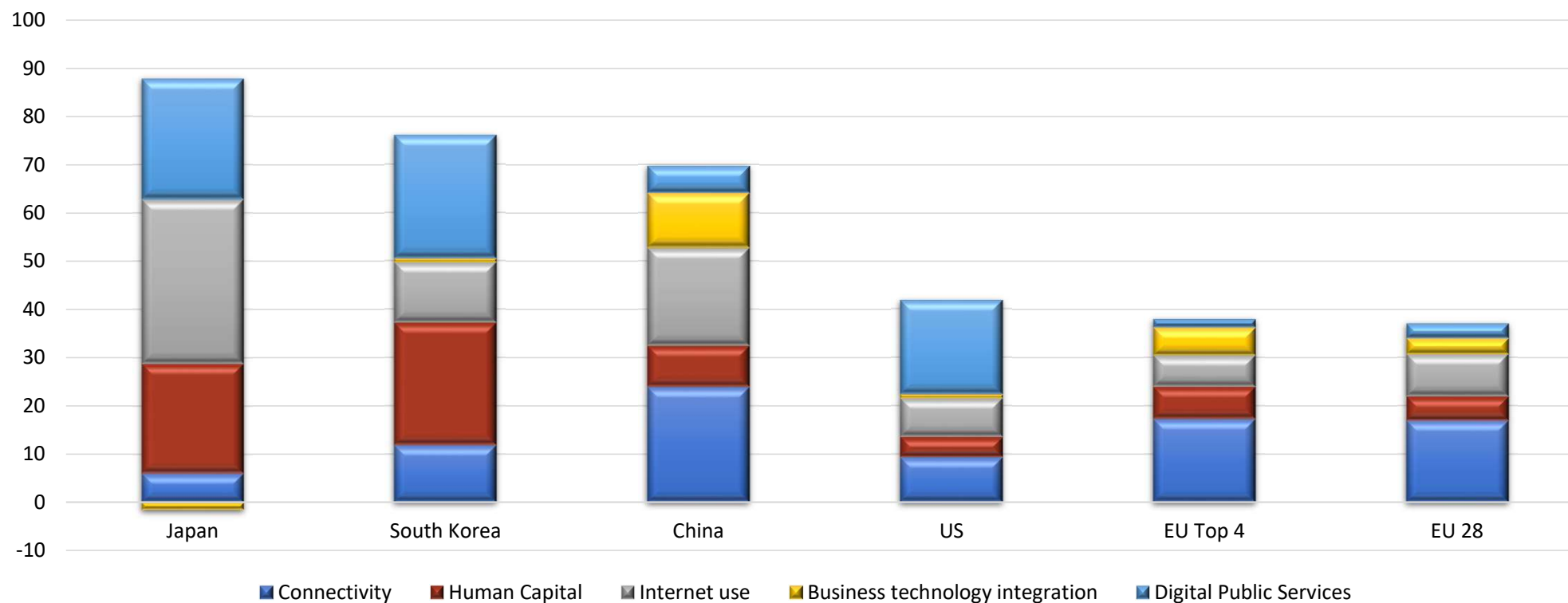
AI global race: EU vs. US and China/East Asia

EU lags behind other world areas in digital technologies

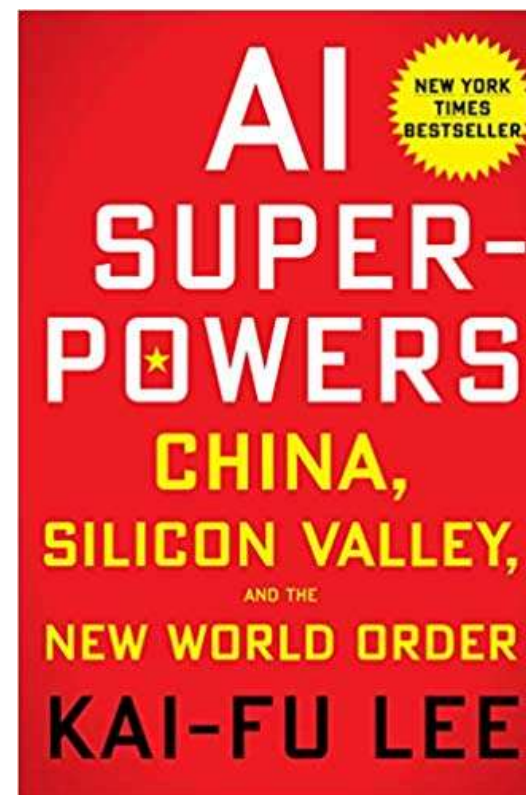
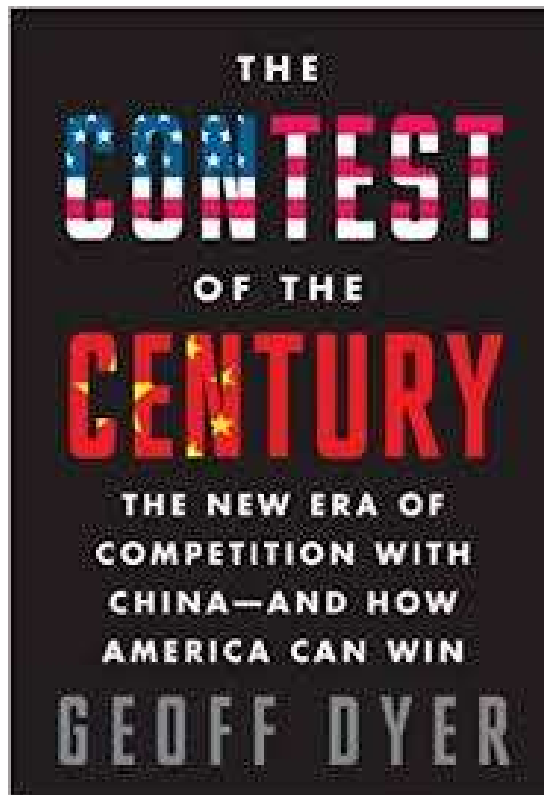


The EU has been improving but too slowly

Variation in I-DESI score between 2013 and 2016, by country and component

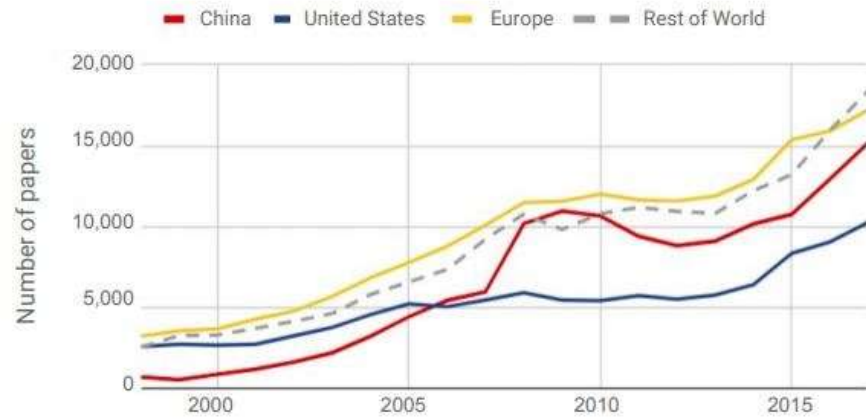


Is Europe too late to enter the AI race?



Artificial intelligence in Europe /A lot of potential (in theory...)

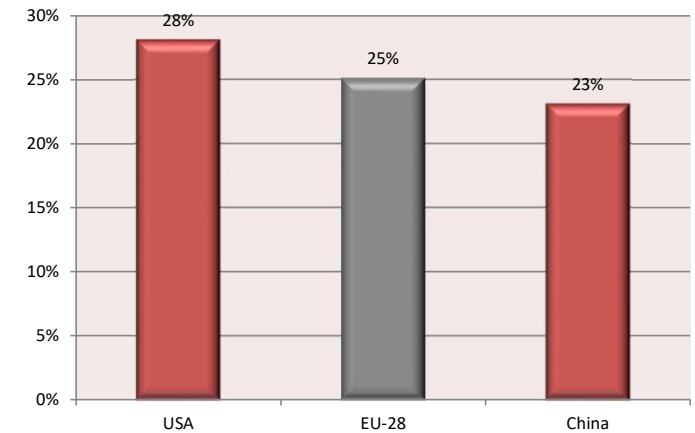
Annually published AI papers on Scopus by region (1998–2017)
Source: Elsevier



THE GOOD NEWS...



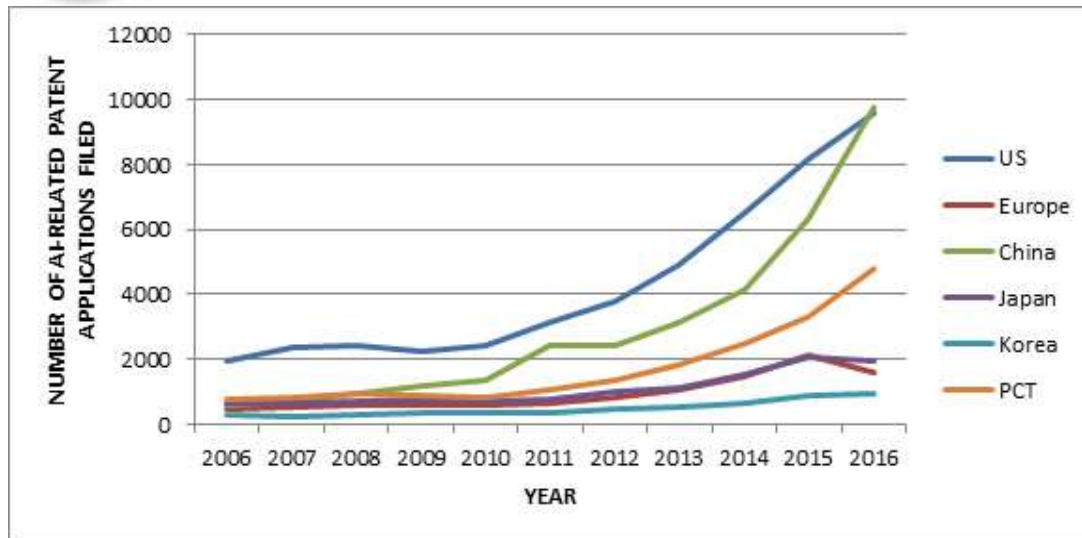
AI Players (% of world total; 2009-2018)



Source: EU Commission, ARTIFICIAL INTELLIGENCE. A EUROPEAN PERSPECTIVE

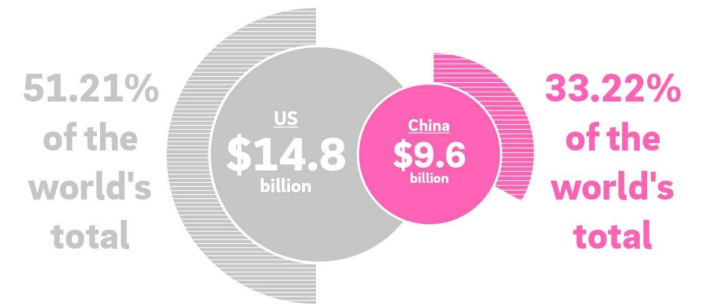
Artificial intelligence in Europe / but results are not up to the challenge

THE BAD NEWS...



VENTURE CAPITAL INVESTMENT INTO AI

The difference between China and the US in AI investment is big. The US has already invested heavily, while China is now catching up. Since the first US investment into AI in 1999, AI development has accelerated globally. In 18 years, total venture capital invested into AI has reached \$28.9 billion.



European competitive gap in AI is first of all an investment gap

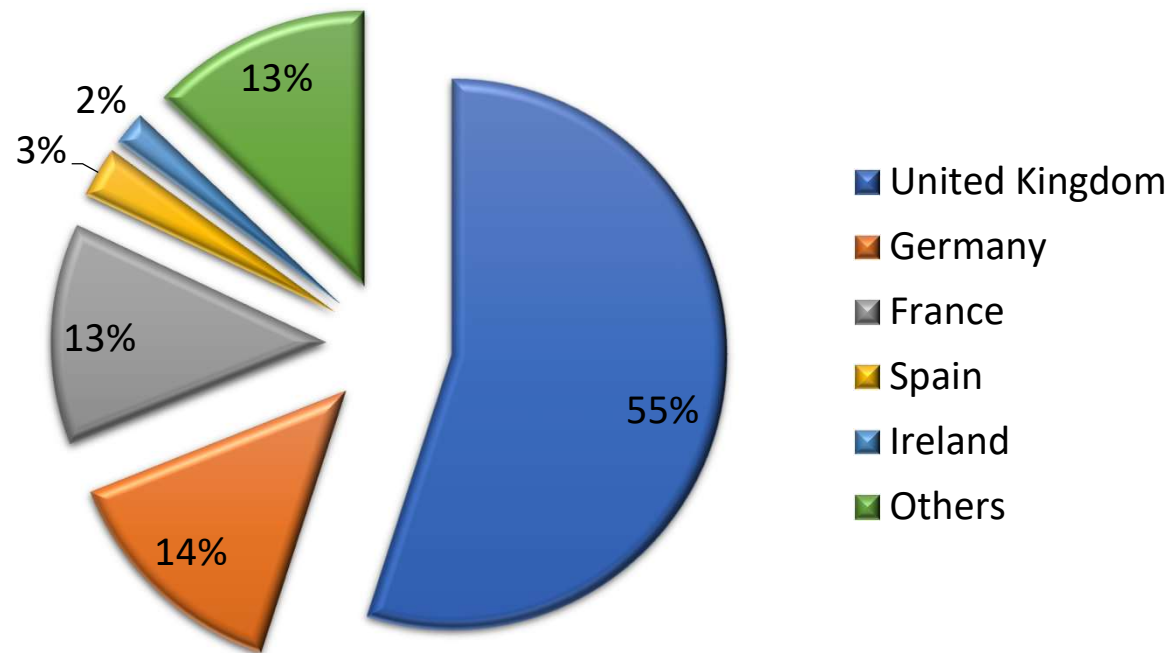
1) In 2018, US companies invested \$18.7 billion in AI, compared to China's \$14.35 billion. The largest 5 EU Member States were not even able to attain together the level of UK investment (\$1.255 bn vs. \$1.27 bn), and only slightly surpassing the much less populated Israel (\$ 1.044 bn). However, also in terms of public investments, the US is allocating large resources, as well as China.

- *Source: Artificial Intelligence Index Report 2019, Stanford University*

2) Investments are fragmented among many Member States, companies and other organizations

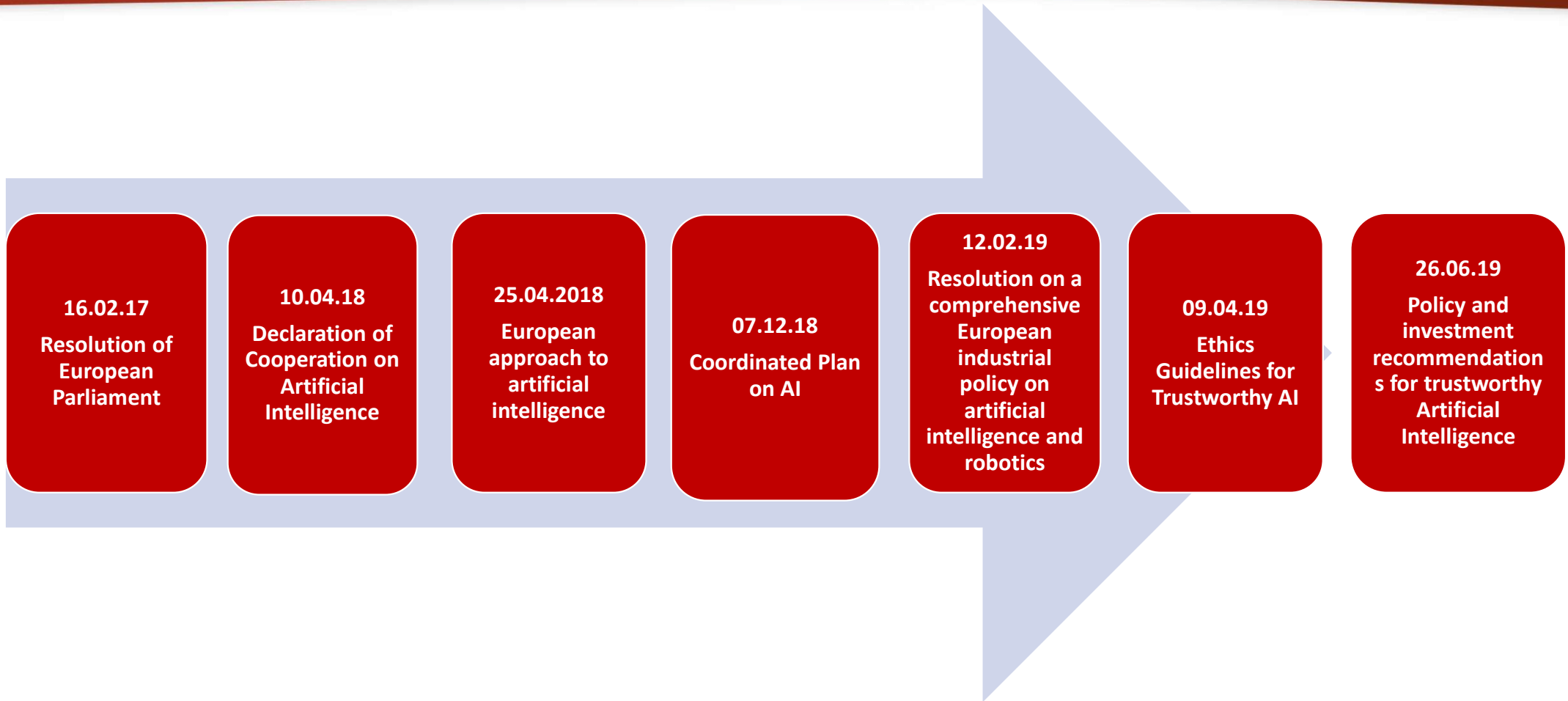
Brexit represents an additional problem for EU competitiveness in AI

Private equity investments in AI startups based in the EU,
2011 to mid-2018



EU AND NATIONAL STRATEGIES

EU AI main milestones (Juncker Commission)



The EC communication presented a European approach to AI based on **three pillars**:

- 1) being at the cutting-edge of technological developments and encouraging uptake by the public and private sectors with the Commission increasing its annual **investments** in AI by 70% under the Horizon 2020 Research and Innovation Programme, reaching €1.5 bn for the period 2018-2020, to connect and strengthen AI research centers across Europe and support the development of AI applications in key sectors and an "AI-on-demand platform" that will provide access to relevant AI resources in the EU for all users;
- 2) preparing for **socio-economic changes** brought about by AI, supporting business-education partnerships to attract and keep more AI talent in Europe and training and retraining schemes for professionals, also encouraging the modernization of Member State education and training systems and foreseeing changes in the labor market and skills mismatching;
- 3) ensuring an **appropriate ethical and legal framework**.

Coordinated plan on AI (7 December 2018)

The European Commission published **the Coordinated Plan on AI** resulting from the work of the 25 Member States which signed the Declaration of Cooperation on Artificial Intelligence in April 2018. It details actions to be started in 2019-2020 and prepares the ground for activities in the following years. It will be reviewed and updated annually. Considering that only five Member States had already adopted a national AI strategy with a specific budget (France, Finland, Sweden, the UK and Germany) while others (Denmark, Luxembourg, the Netherlands, Ireland and Norway) include AI related actions in their broader digitization strategies, the document has provided a strategic framework for national AI strategies encouraging the adoption of them by mid-2019.

This Plan identifies some goals and actions:

- 1) reinforcing **cooperation with the private sector**;
- 2) strengthening **excellence in trustworthy AI technologies** and broader dissemination;
- 3) adapting **learning and training** programs and systems to better prepare society for AI;
- 4) building up the **European data space** essential for AI in Europe, including for the public sector;
- 5) developing **ethics guidelines** with a global perspective and ensuring an innovation-friendly legal framework;
- 6) better understanding **security-related aspects** of AI applications and infrastructure.

The document, written by the AI High-Level Expert Group set up by the European Commission, provides a **framework for achieving trustworthy AI** aiming to offer guidance to all stakeholders identifying a list of **ethical principles**, by providing guidance on how such principles can be operationalized in socio-technical systems.

It underlines that trustworthy AI is made up of three main elements, to be:

- ✓ **lawful**, complying with all applicable laws and regulations;
- ✓ **ethical**, ensuring adherence to ethical principles and values;
- ✓ **robust**, both from a technical and social perspective, since, even with good intentions, AI systems can cause unintentional harm.

Three chapters:

- a) **Foundations of Trustworthy AI**
- b) **Realizing Trustworthy AI**
- c) **Assessing Trustworthy AI**

A big question looms behind: is the EU ethical approach to AI a factor of competitiveness or a limit to the AI growth in Europe?

New Commission, new AI initiatives

AI white paper (19 February 2020) /1

The AI White Paper, published by the European Commission, aims at setting a framework for trustworthy Artificial Intelligence, based on excellence and trust.

In the so called “**ecosystem of excellence**”, among several planned actions, the Commission aims at proposing to the Member States a revision of the 2018 Coordination Plan, facilitating the creation of excellence and testing centers that can combine European, national and private investments. This involves working with MSs to ensure that at least one digital innovation hub per MS has a high degree of specialization in AI, setting up a new public-private partnership in AI, data and robotics in the context of the Horizon Europe Programme.

For the other ecosystem (“**ecosystem of trust**”), the Commission assesses the main risks associated with AI in order to ensure a European regulatory framework for a trustworthy AI.

The risk-based approach allows for a proportionate regulatory intervention, heavier for high-risk AI applications than for other lower-risk applications.

An AI application should be considered high-risk when it meets the following two cumulative criteria:

- 1) it is employed in a sector where, given the characteristics of the activities typically undertaken, significant risks can be expected to occur (for instance, healthcare, transport, energy and parts of the public sector);
- 2) the AI application in the sensitive sector is used in such a manner that significant risks are likely to arise (based on the kind of impact on presumably affected parties). Moreover, the use of AI applications for employment processes, biometric identification and other intrusive surveillance purposes would always be considered as high-risk.

New Commission, new AI initiatives

AI white paper (19 February 2020) /2

Mandatory requirements for **high-risk applications** would cover the following areas:

- 1) training data;
- 2) data and record-keeping;
- 3) information to be provided;
- 4) robustness and accuracy;
- 5) human oversight;
- 6) specific requirements for certain specific applications, such as biometric identification.

These requirements would be at least in part verified under prior conformity assessments, in line with already existing mechanisms for a large number of products being placed on the EU's internal market.

Of course, ex post controls could be still enforced by competent national authorities.

For **non-high risk applications**, the Commission envisages a voluntary labelling scheme, allowing the economic operators to signal the trustworthiness of their products or services.

New Commission, new AI initiatives

EU Data Strategy (19 February 2020)

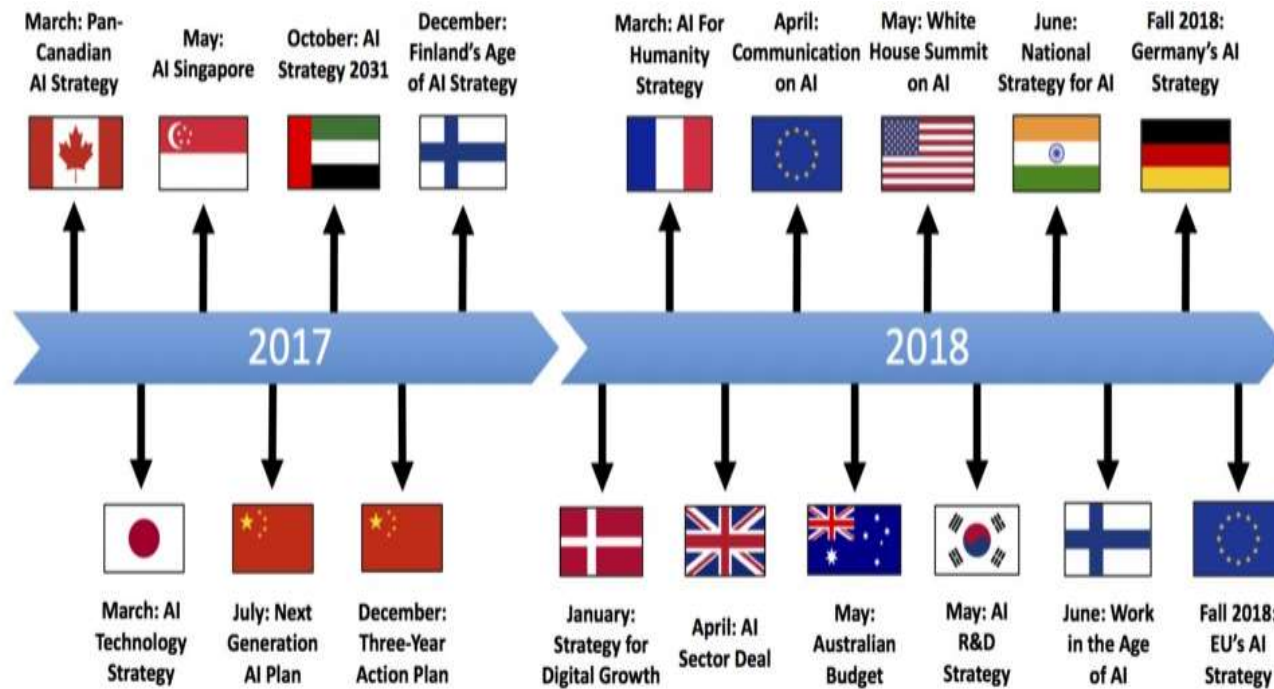
The *European Data Strategy* aims at Europe emerging as a leader in the data economy, providing for a single market for data and a larger role for European companies.

The Commission starts from acknowledging that the EU has the potential to be successful in the data-agile economy, thanks to its technology, its know-how and its highly-skilled workforce. However, several issues are holding the EU back from realising its potential in the data economy, mainly due to the fragmentation between Member States (compared to the small number of US and China-based Big Tech firms).

Among the most important issues, the strategy lists: 1) availability of data; 2) imbalances of market power; 3) data interoperability and quality; 4) data governance; 5) data infrastructures and technologies; 6) empowering individuals to exercise their rights; 7) skills and data literacy; 8) cybersecurity.

Included in the actions envisaged by the strategy, the Commission aims at supporting business-to-business data sharing, investing in a High Impact Project on European data spaces and federated cloud infrastructures, by the establishment of EU-wide common, interoperable data spaces (in manufacturing, environment, mobility, health, finance, energy, agriculture, public administration and skills) and the setting up of a cloud service marketplace, empowering individuals regarding their data and investing in skills and general data literacy.

The state of the art of national strategies when Italy started its own strategy



Italian AI Strategy: structure and contents

