



Associazione  
Italiana per  
l'Intelligenza  
Artificiale

# Artificial intelligence and its ecosystem

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Gianluigi Greco – President of AIxIA

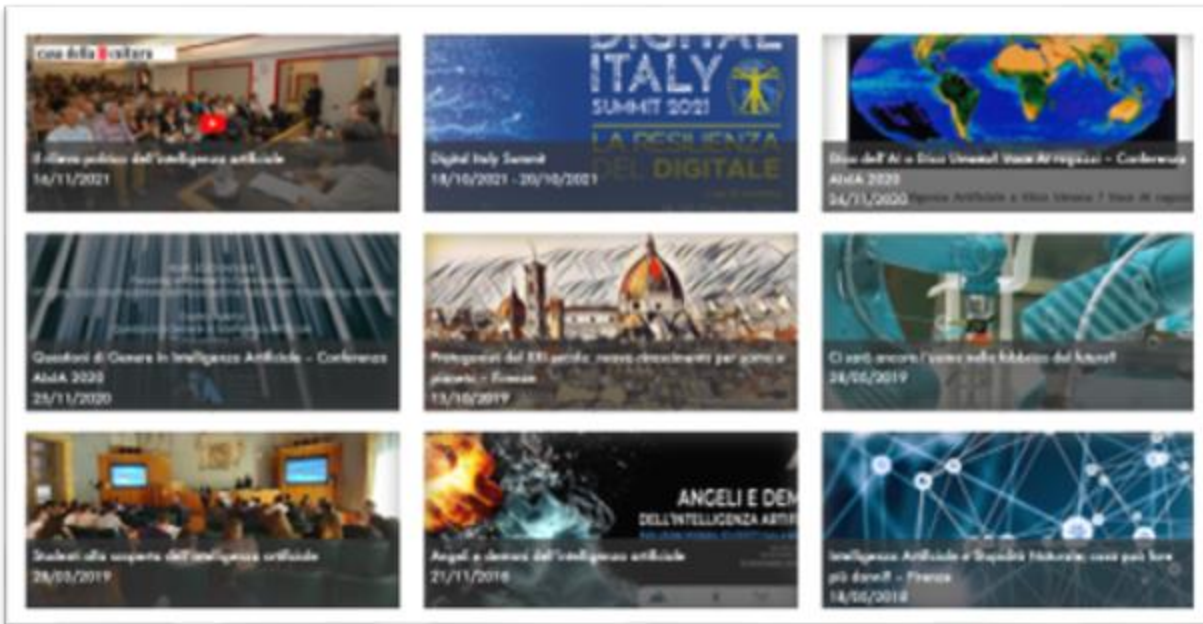
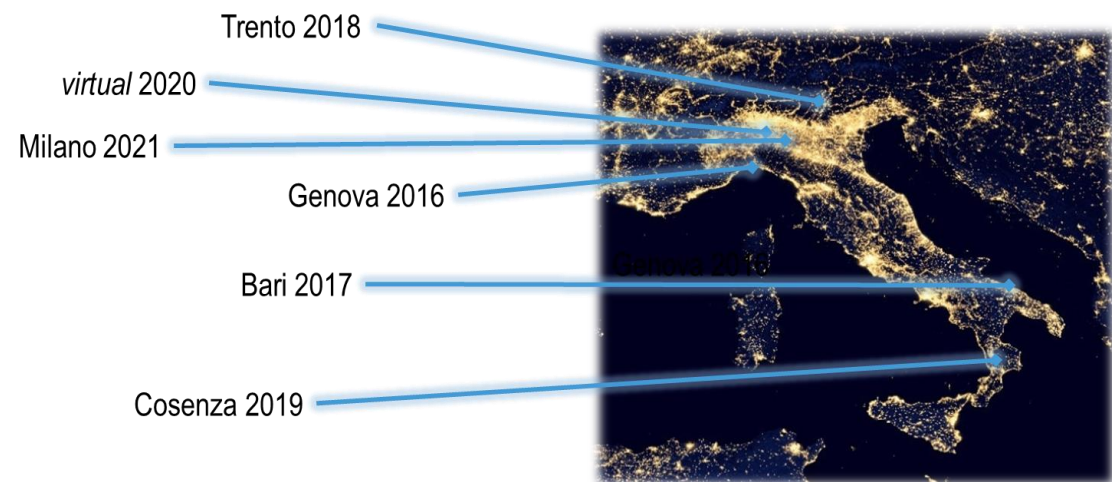


# Italian Association for AI



Born in 1988

- It brings together the Italian AI community
- More than 1.200 members
- 60% academia, 40% industry





# An AI Society





# Levels of Autonomy

The human defines the plan, the robot executes it



The human takes care of defining and executing a plan



The robot defines and executes the plan

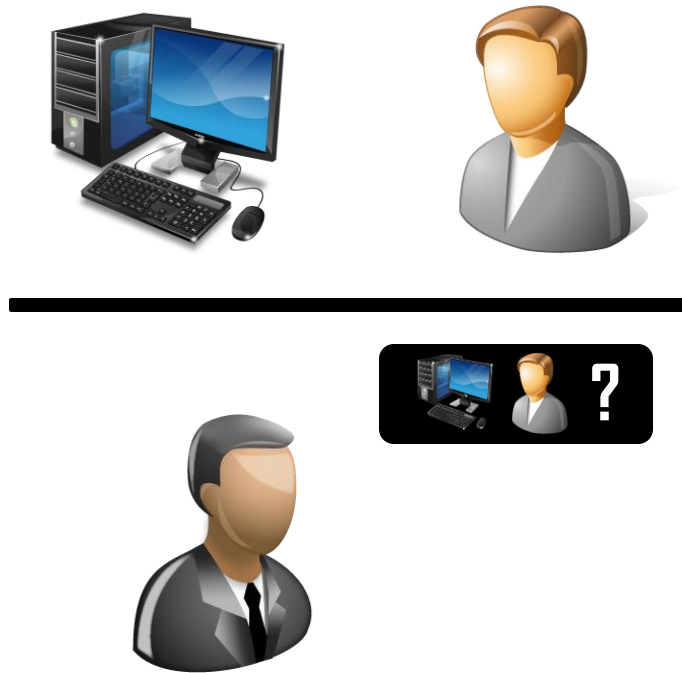
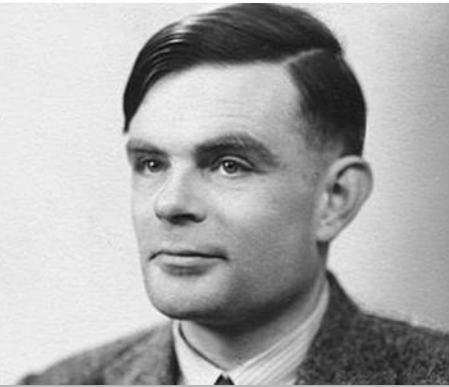




# Intelligence vs Imitation

I propose to consider the question: «Can machines think?»

Computing Machinery and Intelligence, 1950



**Conversation**

**Driving**



**Chess**





# AI Topics

**Conversation** **Driving**



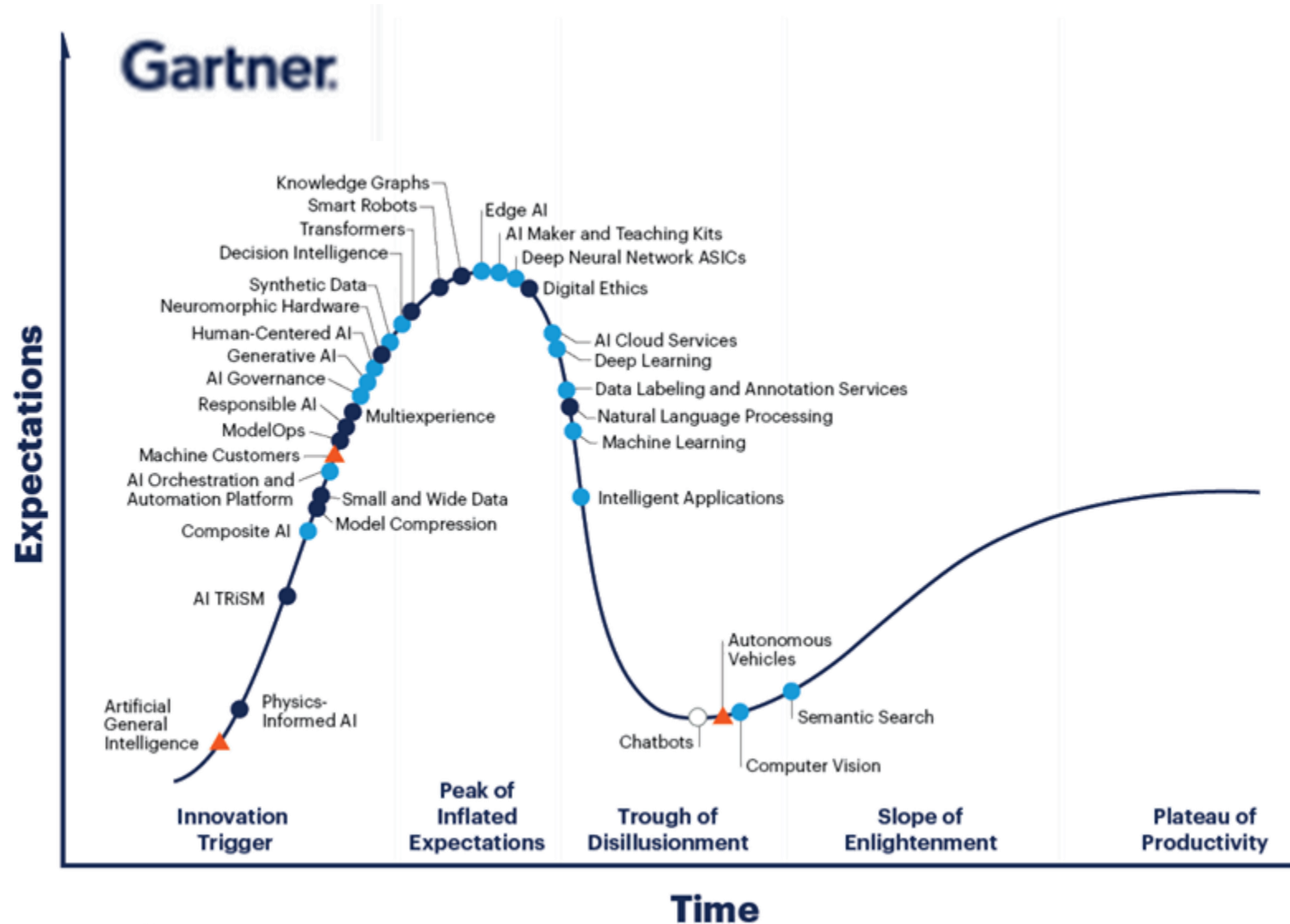
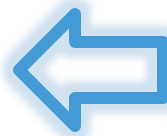
**Chess**

## Symbolic Approaches

- Knowledge Representation and Reasoning
- Constraint and declarative programming
- Planning

## Sub-Symbolic Approaches

- Genetic Algorithms
- Neural Networks
- Deep Learning

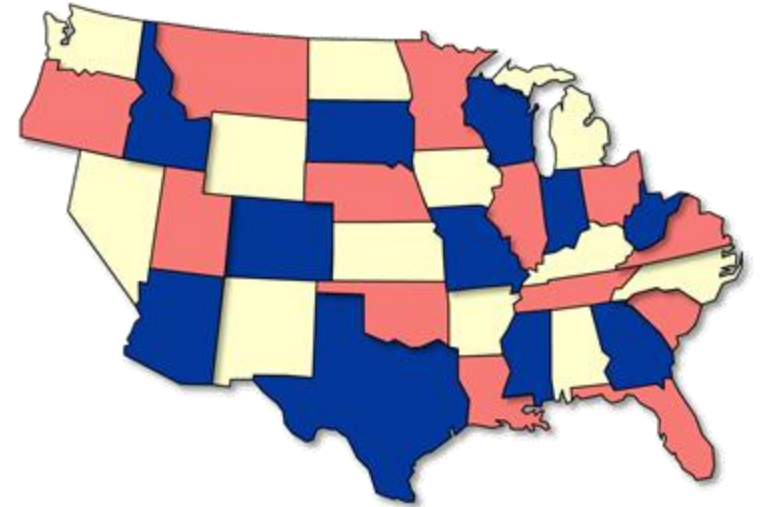
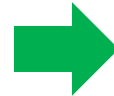
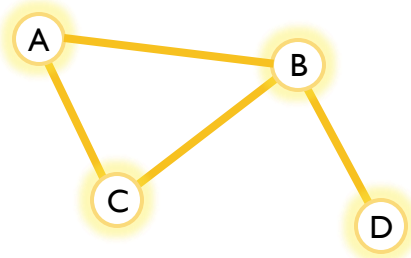
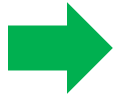




# Symbolic Approaches



PREMISE 1  
IF A = B  
PREMISE 2  
AND B = C  
CONCLUSION  
THEN A = C



$\text{col}(X, \text{red}) \vee \text{col}(X, \text{yellow}) \vee \text{col}(X, \text{blue}) \text{ :- node}(X).$

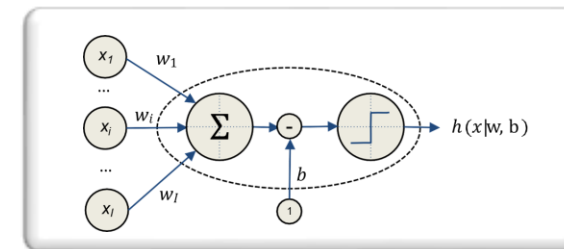
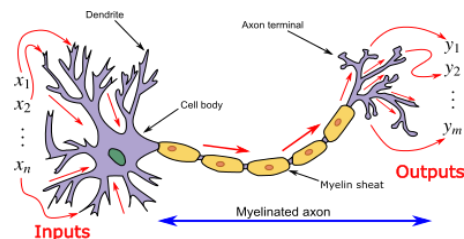
$\text{:- edge}(X, Y), \text{col}(X, C), \text{col}(Y, C).$



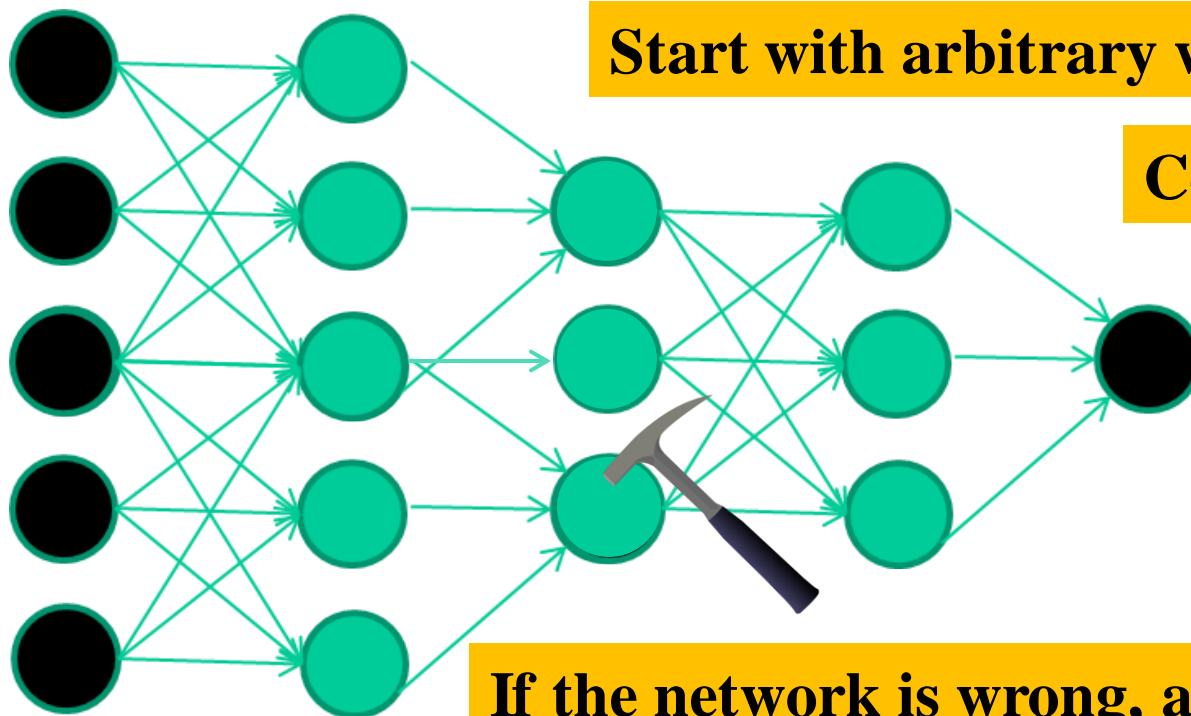
# Sub-Symbolic Approaches



PREMISE 1 IF A = B  
PREMISE 2 AND B = C  
CONCLUSION THEN A = C



Yes



Start with arbitrary weights

Compute the output

No

If the network is wrong, adjust the weights, and repeat





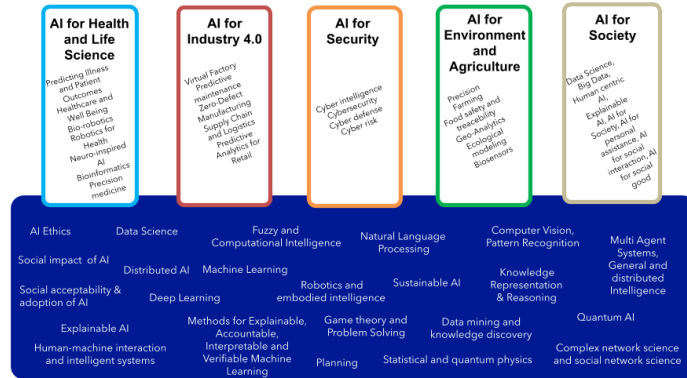
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# Artificial intelligence and **its ecosystem**

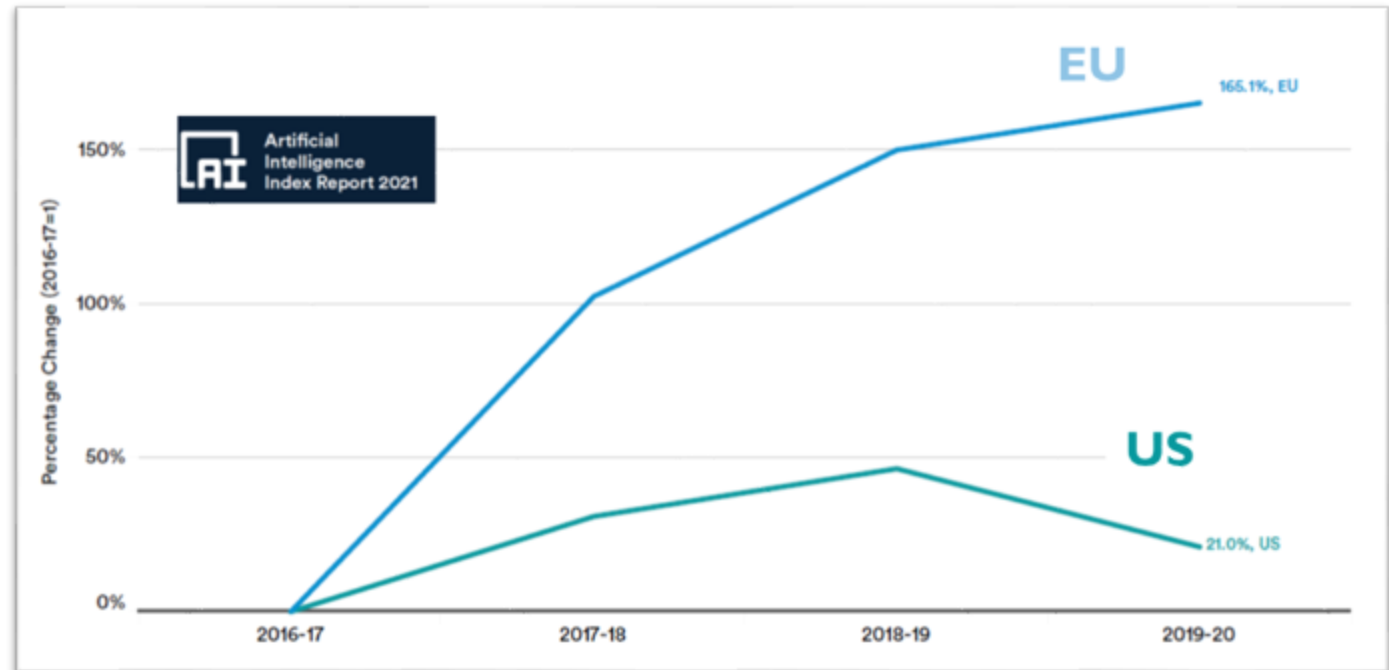
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# Università



are di specializzazione  
area fondamentale



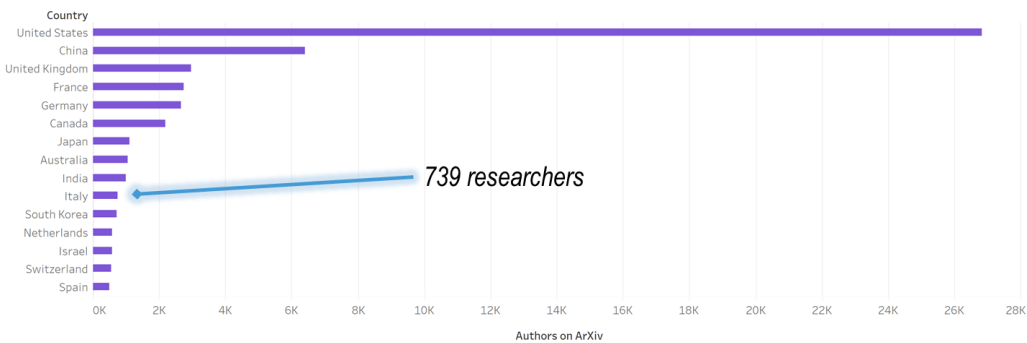


# Ricerca



## Top Countries: Total AI Authors on arXiv

57,654 Total Authors End of 2019  
52.69% Average Growth since 2007



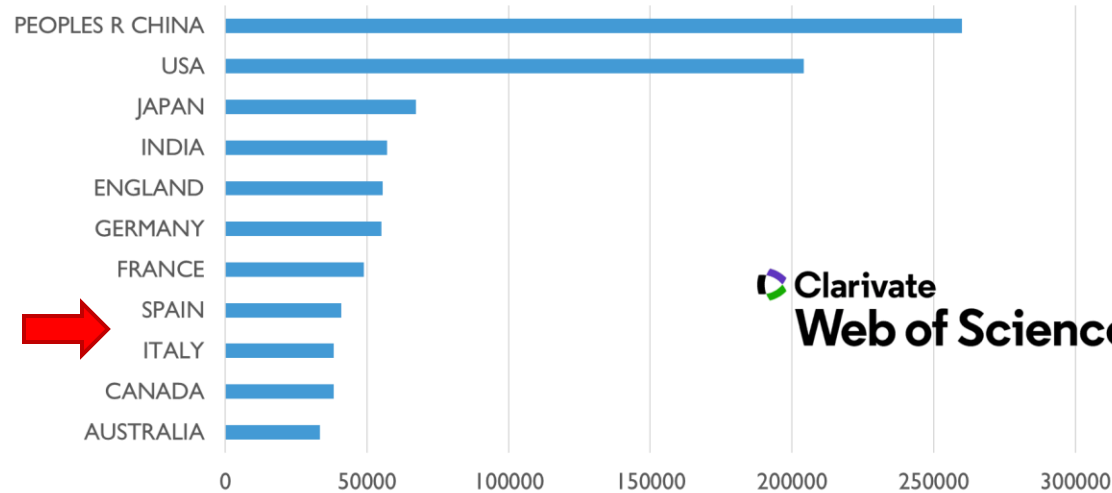
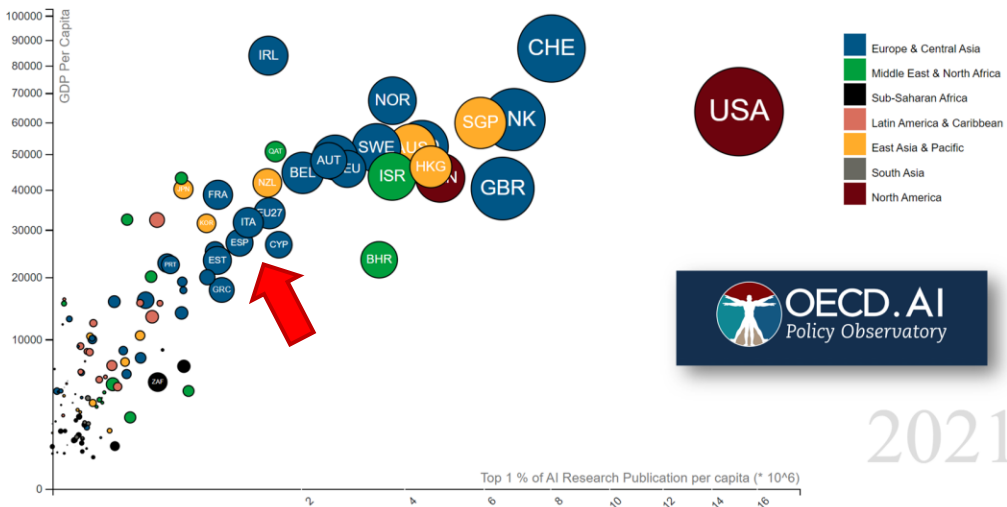
## Global AI Talent Report 2020



## SJR

Scimago Journal & Country Rank

Country	↓ Documents				
China	203245				
United States	159979				
India	65643				
Japan	56095	54855	414502	113324	7.39
United Kingdom	49418	47161	886502	169271	17.94
Germany	41692	40163	581817	126039	13.96
France	32388	31264	462863	95770	14.29
Italy	29555	27911	359098	92419	12.15





# Trasferimento Tecnologico



Indice di intensità della strategia di brevettazione (%brevetti mondiali/%pubblicazioni mondiali)



0,79



0,34



0,29



0,07



Domande di brevetto

178.184

67.294

54.762

32.001

70 «Punti Impresa Digitale» - Camere di Commercio  
20 Digital Innovation Hub (DIH) - Confindustria

8 Competence Centers - MISE  
European-DIH initiative



**DIH**

Digital Innovation Hub

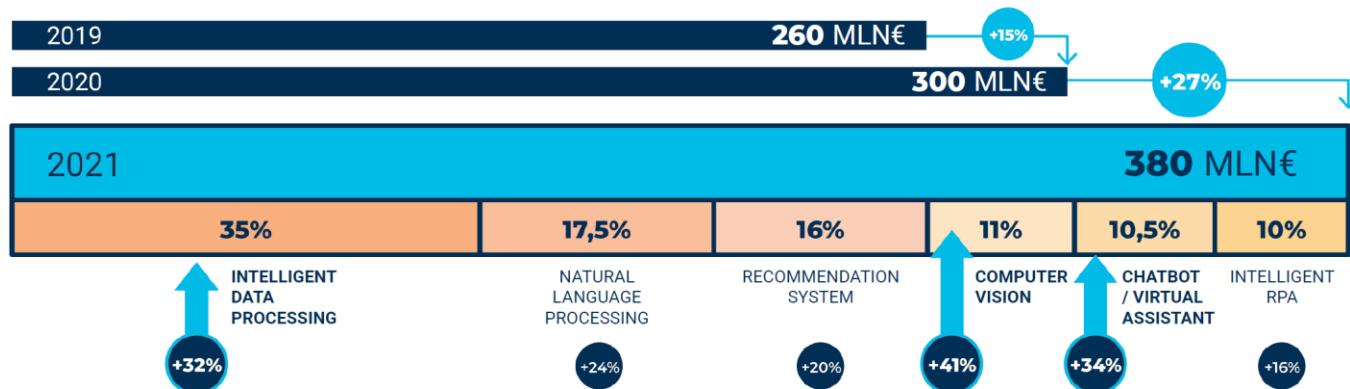


punto  
impresa  
digitale





# Industria



## Investimenti aziendali e risultati sull'IA

R&S industriale (€Mln, 2018)	74.162 €	33.809 €	28.926 €	14.691 €
R&S industriale (% del PIL, 2018) <sup>18</sup>	2,23%	1,45%	1,22%	0,84%
Numero di campioni digitali globali <sup>19</sup>	8	7	33	0

At least one AI-project in 2021



No AI-project in 2021



SCHOOL OF MANAGEMENT  
DIPARTIMENTO DI ELETTRONICA,  
INFORMAZIONE E BIOINGEGNERIA



Osservatorio Artificial Intelligence

Ricerca 2021



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and a few final warnings...

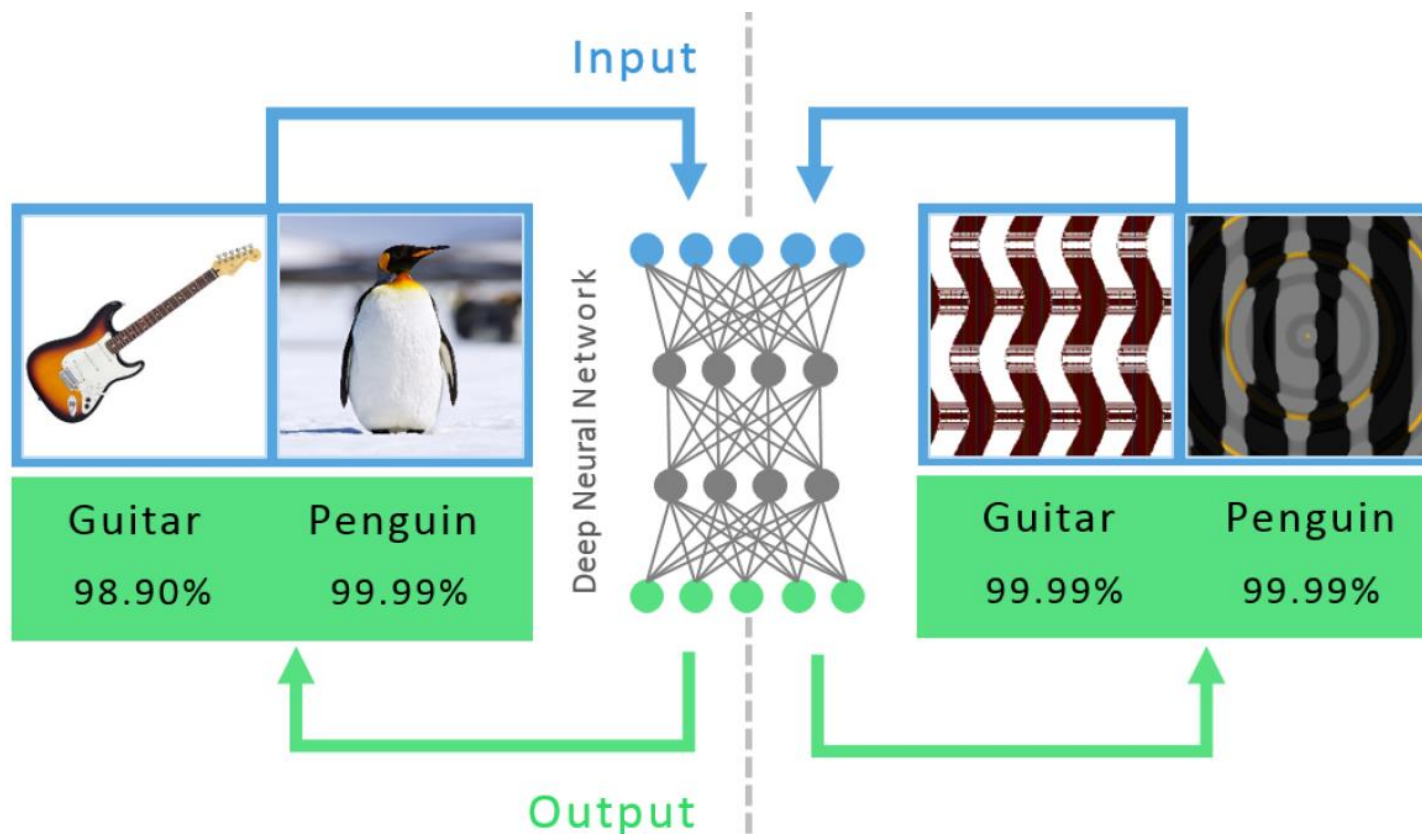
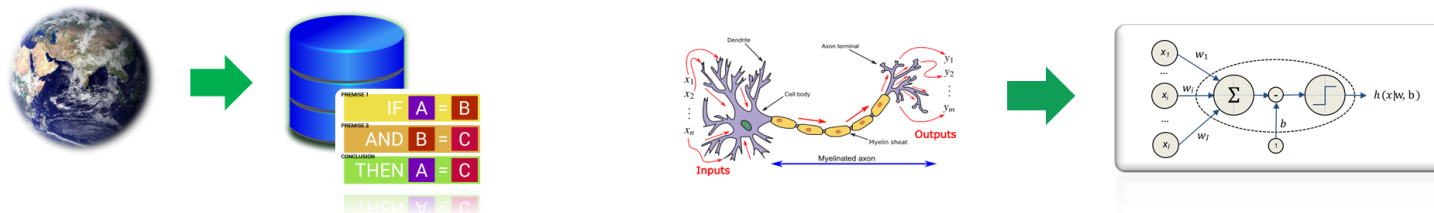
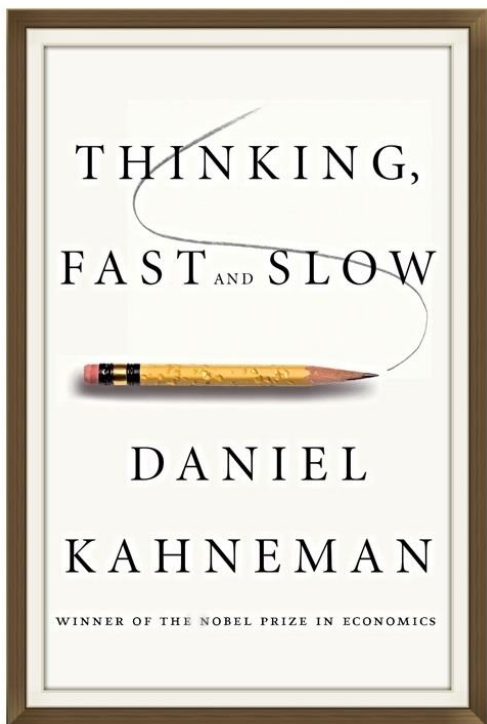
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# Trustworthy AI





# Ai Act



**Article 17 Quality management systems**  
1. Providers of high-risk AI systems shall put a quality management system in place that ensures compliance with this Regulation. [...]



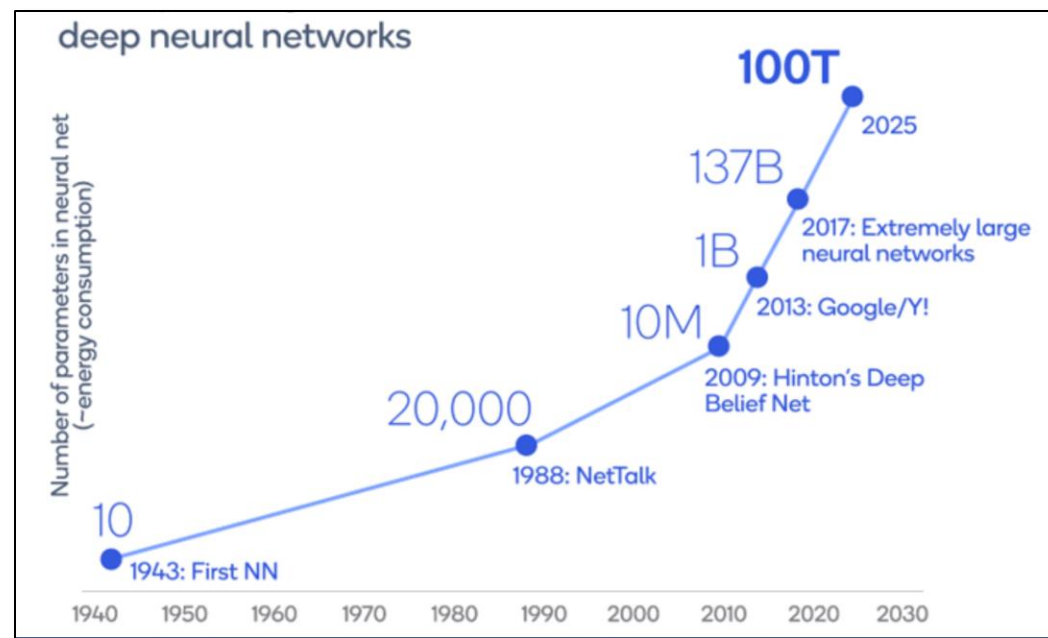
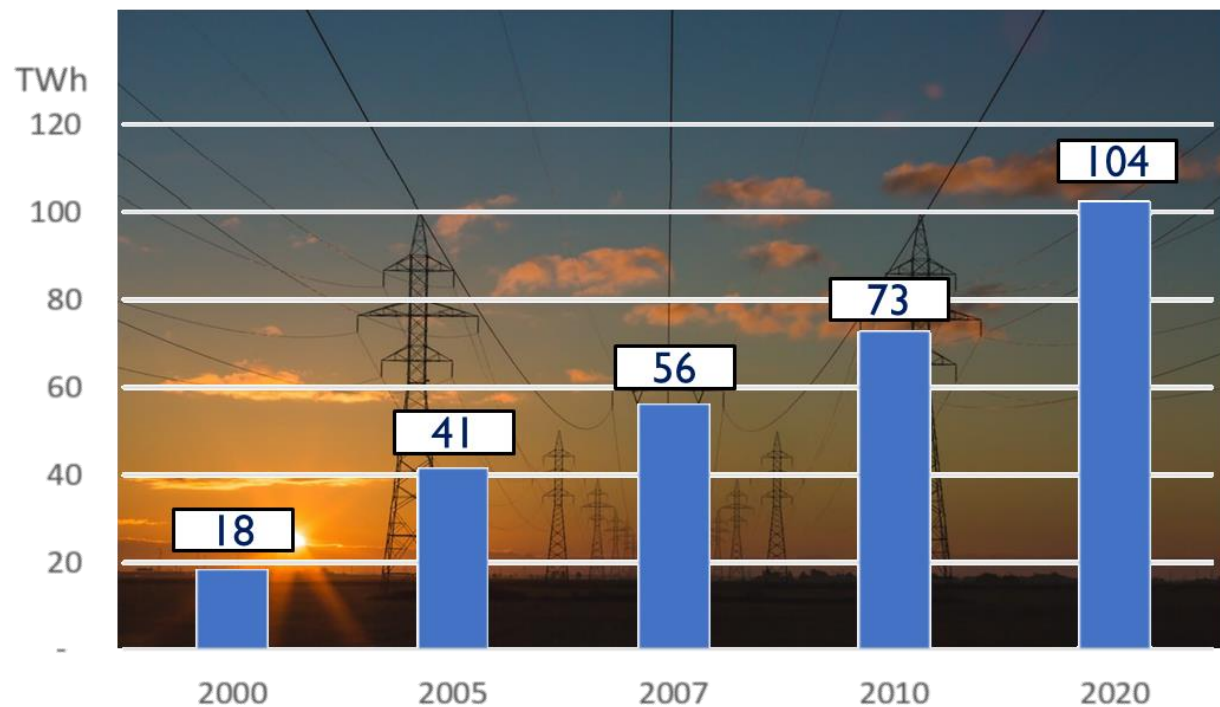
**Article 10 Data and data governance**  
3. Training, validation and testing data sets shall be relevant, representative, free of errors and complete. They shall have the appropriate statistical properties, including, where applicable, as regards the persons or groups of persons on which the high-risk AI system is intended to be used. These characteristics of the data sets may be met at the level of individual data sets or a combination thereof.





# Green AI

Power consumptions of the data centers in the EU



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**Thank you!**