



**ARTIFICIAL INTELLIGENCE (A.I.)**  
**(DANIELE GROTTI)**

# The Evolution of A.I.

## The 1<sup>st</sup>. Period 1950-1970

Trivial problem solving, no practicality, GOFAI - Good Old Fashioned Artificial Intelligence

1942	The 3 Laws of Robotics by Isaac Asimov. Other sets of laws have been proposed by researchers since then.	1950	The Turing Test - proposed by Alan Turing	1952	The first self learning game program	1956	Dartmouth Conference First Use of the term "Artificial Intelligence/A.I."	1957	General Problem Solver (GPS) (by Newell)	1958	McCarthy developed Lisp programming language	1959	The MIT AI Lab (McCarthy and Minsky)	1959	The term "Machine Learning" by Samuel	1961	First Industrial Robot (Unimate) working at GM	1961	SAINT - the first expert system by Slagle (MIT)	1964	STUDENT The first A.I. program which understands natural language	1965	ELIZA - The first A.I. based chatbot and expert system	1966	Shakey - the first locomotive and intelligent robot (SRI)	1966	MAC HACK chess-playing program (by Greenblatt, MIT)
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1968	SHRDLU, an early natural language understanding robot (Waseda University) computer program	1970	WABOT-1 the first anthropomorphic programming language	1972	Prolog logic	1973	Lighthill Report The poor progress report caused the First A.I. winter (Reduced funding for AI research)	1974	MYCIN - The first rule based AI expert system for medical diagnostics	1974	The first autonomous vehicle, a mechanical "slider" (Stanford)	1980	LISP based machines developed and marketed	1980	INTERNIST-I The first Commercial Expert System	1986	A driverless van by Mercedes-Benz, with cameras and sensors	1988	Bayesian Network (BNs or belief nets) is invented by Pearl	1988	The chatbots, Jabberwocky and Cleverbot invented by Carpenter	1989	The first autonomous vehicle created by CMU using neural network	1993	Polly, the tour guide robot; behavior-based robotics (MIT)
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## The 2<sup>nd</sup>. Period 1980-2000

Researchers feeding machines with labeled data. Projects: ICOT - Japan '82, MCC - US '83, Alvey - UK '84. Algorithms began to appear as parts of larger systems. AI solutions proved to be useful throughout the technology industry, such as data mining, industrial robotics, logistics, speech recognition, banking software, medical diagnosis and search engines

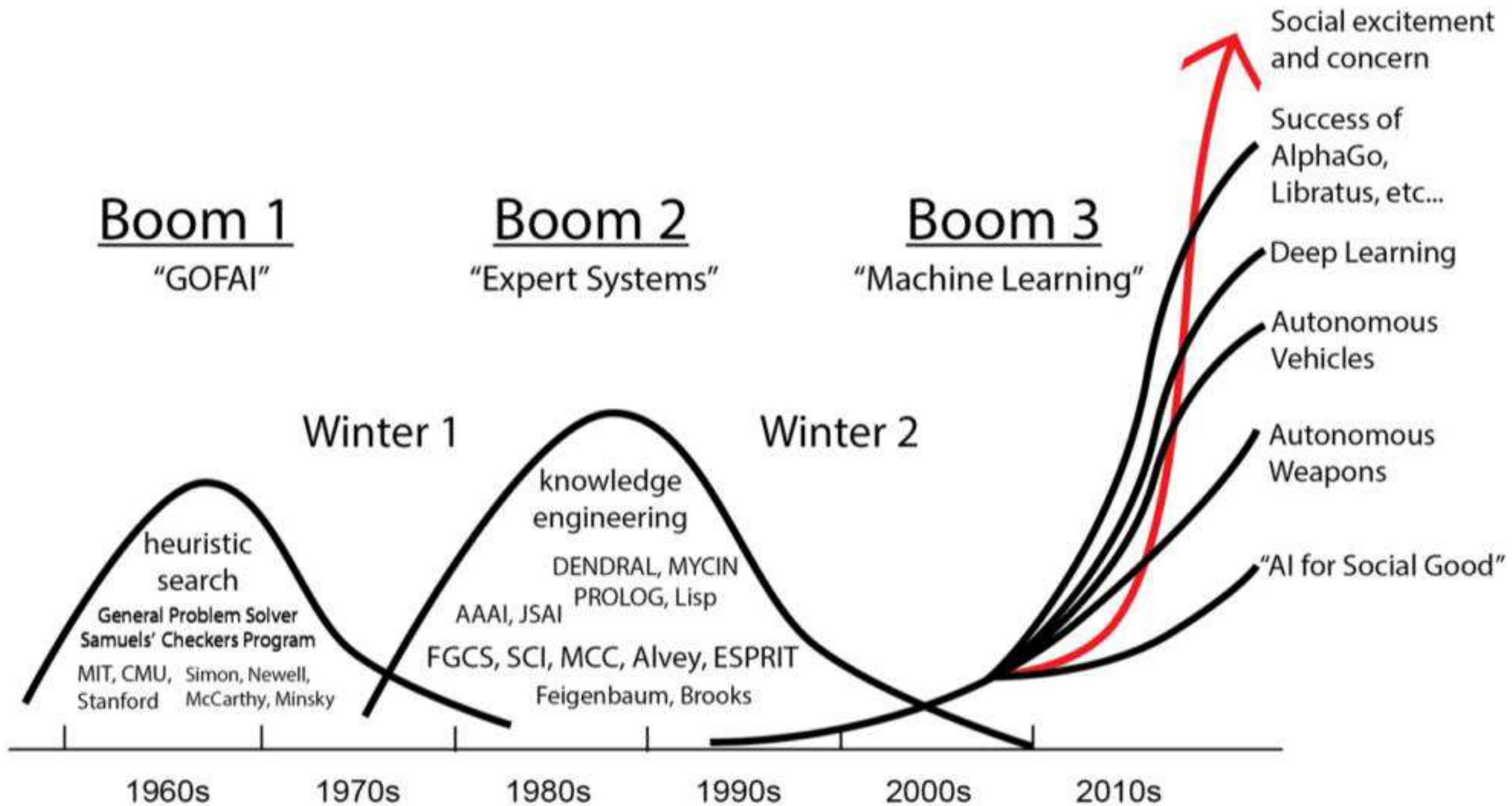
1997	IBM's Deep Blue beats Gary Kasparov in chess	1998	Furby - The first "pet" toy robot for children	1999	Kismet - Emotional AI, introduced The first AI domestic robot by Sony	1999	AIBO	2000	ASIMO, humanoid robot released by Honda	2002	Roomba, autonomous robot vacuum is released by i-Robot	2004	The first challenge for autonomous vehicles by DARPA	2004	NASA rovers Spirit and Opportunity exploring Mars	2005	AI based recommendation engines	2006	"Machine reading" unsupervised autonomous understanding of text	2007	ImageNet – visual database for object recognition software research	2007	NVIDIA launches CUDA, a parallel computing platform and programming interface
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2009	Self Driving Car built by Google. By 2014 it passed Nevada's self-driving test.	2009	AI researchers discover GPU (Graphics Processing Unit) for DL	2010	Democratize Data Access begins for Image Recognition	2010	Narrative Science's AI demonstrates ability to write reports	2011	Apple released Siri	2011	IBM's Watson wins Jeopardy clash	2013	NEIL by CMU, a semantic image analyzer ML system	1913	"Vicarious" passes first Turing test - CAPTCHA	2014	Microsoft - Cortana Amazon - Alexa	2015	Google Brain releases TensorFlow, ML Library, (TPU)	2015	Open AI- open source initiative to develop AI benefit of all humanity	2016	Google released Google Home	2016	Google's Deepmind AlphaGo has defeated Go's No1. champion	2016	NVIDIA announces supercomputer for DL and AI
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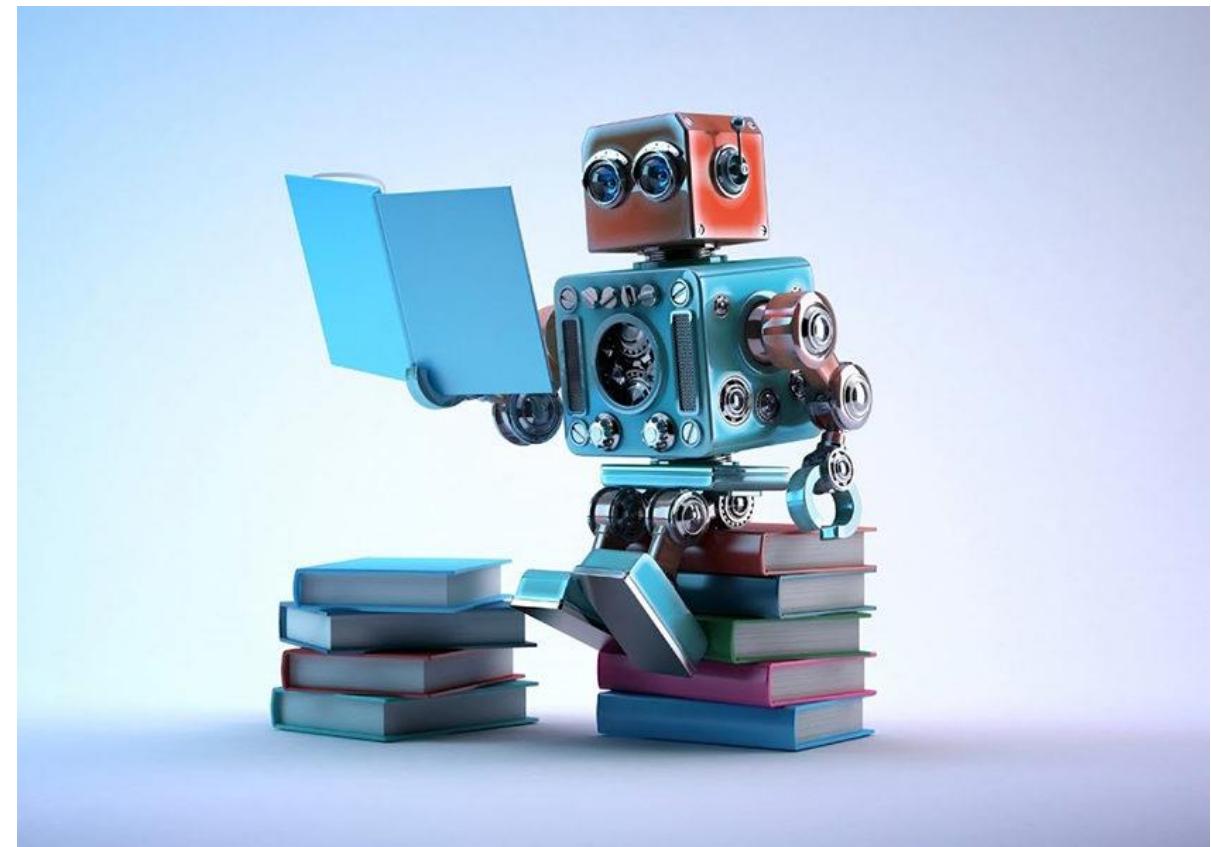
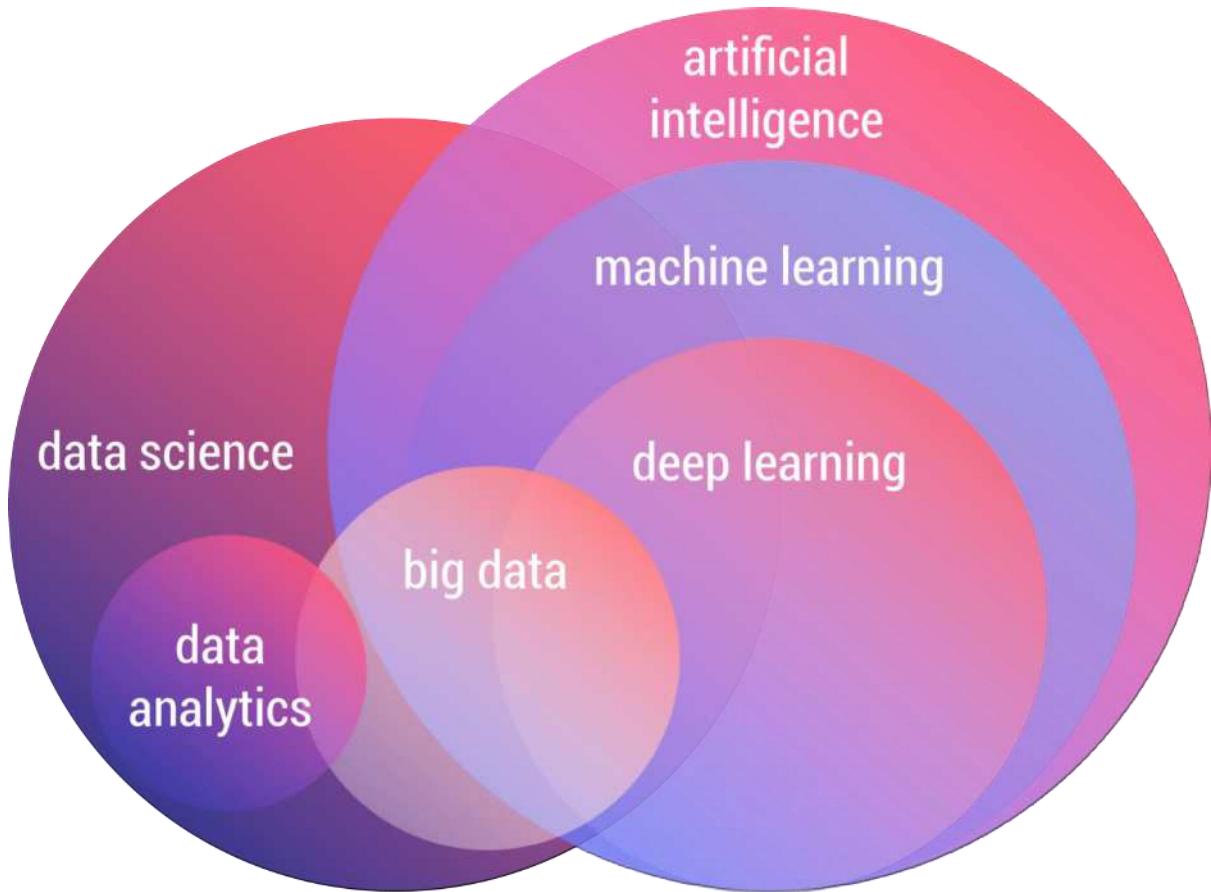
## The 3<sup>rd</sup>. Period 2010-

The age of machine learning. Computers acquire knowledge from data, not humans. Large tech companies invest in commercial applications of AI/ML.

2016	Sophia humanoid robot by Hanson Robotics, the first "robot citizen"	2016	PyTorch Open source ML Library	2017	The Facebook AI Research Lab trained two chatbots to communicate with each other in order to learn how to negotiate. The chatbots diverged from human language and invented their own language to communicate with one another	2017	Caffe Open source DL framework	2018	BERT (Google), the first bidirectional, unsupervised language representation	2018	Samsung introduces Bixby	2018	Facebook detects faces and shares photos with friends to whom those photos belong	2018	Alibaba language processing AI outscored human intellect at a Stanford reading and comprehension test	2020	DeepMind team uses DL algorithms (Agent57) that outperforms humans at Atari games with deep reinforcement learning	2020	Widespread 5G network deployments worldwide
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# Cosa e' il machine learning

"E' il settore dell'intelligenza artificiale che studia come dare ai computer l'abilità di imparare senza essere esplicitamente programmati" - 1959



**ARTHUR SAMUEL**

Pioniere dell'AI  
Inventore del termine "Machine learning"

## Programmazione classica

Hard coding delle regole



Dati di input



Risultato

## Machine learning

Input data

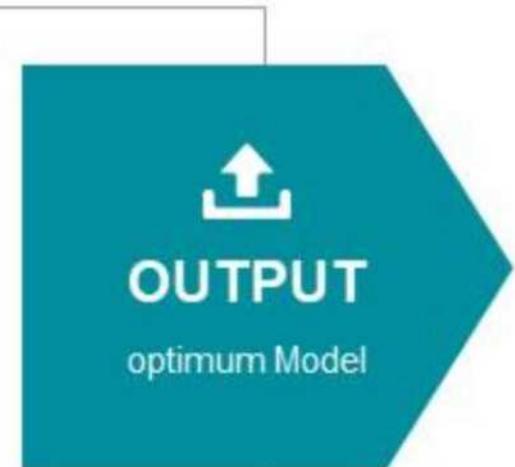
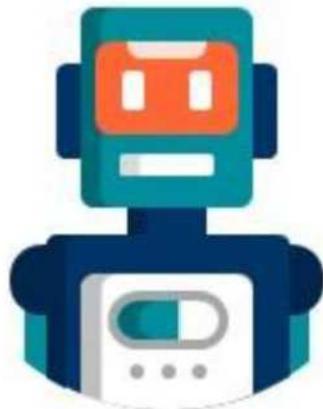
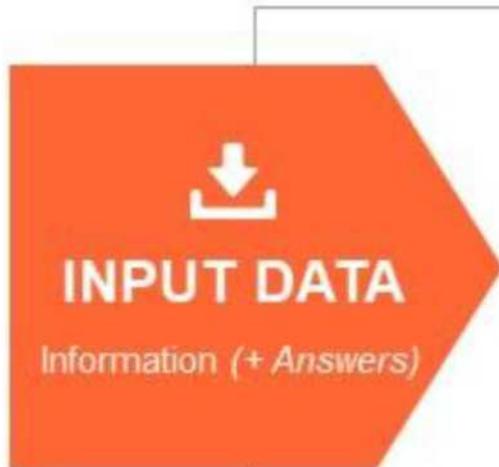


L'algoritmo impara le  
regole



Risultato

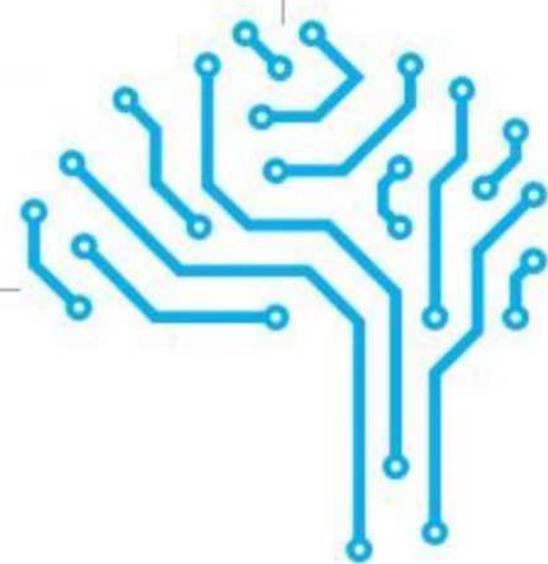
# MACHINE LEARNING



*Relationships*      *Patterns*

*Dependencies*      *Hidden Structures*

**Algorithms + Techniques**



# PERCHE' OGGI ?



MAGGIORE POTENZA DI CALCOLO DISPONIBILE



DISPONIBILITA' DI ENORMI QUANTITA' DI DATI

## **Energy, Feedstock & Utilities**

- › Power usage analytics
- › Seismic data processing
- › Smart grid management
- › Energy demand & supply optimization



## **Manufacturing**

- › Predictive maintenance or condition monitoring
- › Demand forecasting
- › Process optimization
- › Telematics



## **Financial Services**

- › Risk analytics & regulation
- › Customer segmentation
- › Your text here
- › Credit worthiness evaluation



## **Retail**

- › Predictive inventory planning
- › Recommendation engines
- › Your text here
- › Customer ROI & lifetime value



## **Travel & Hospitality**

- › Aircraft scheduling
- › Dynamic pricing
- › Your text here
- › Traffic patterns & congestion management

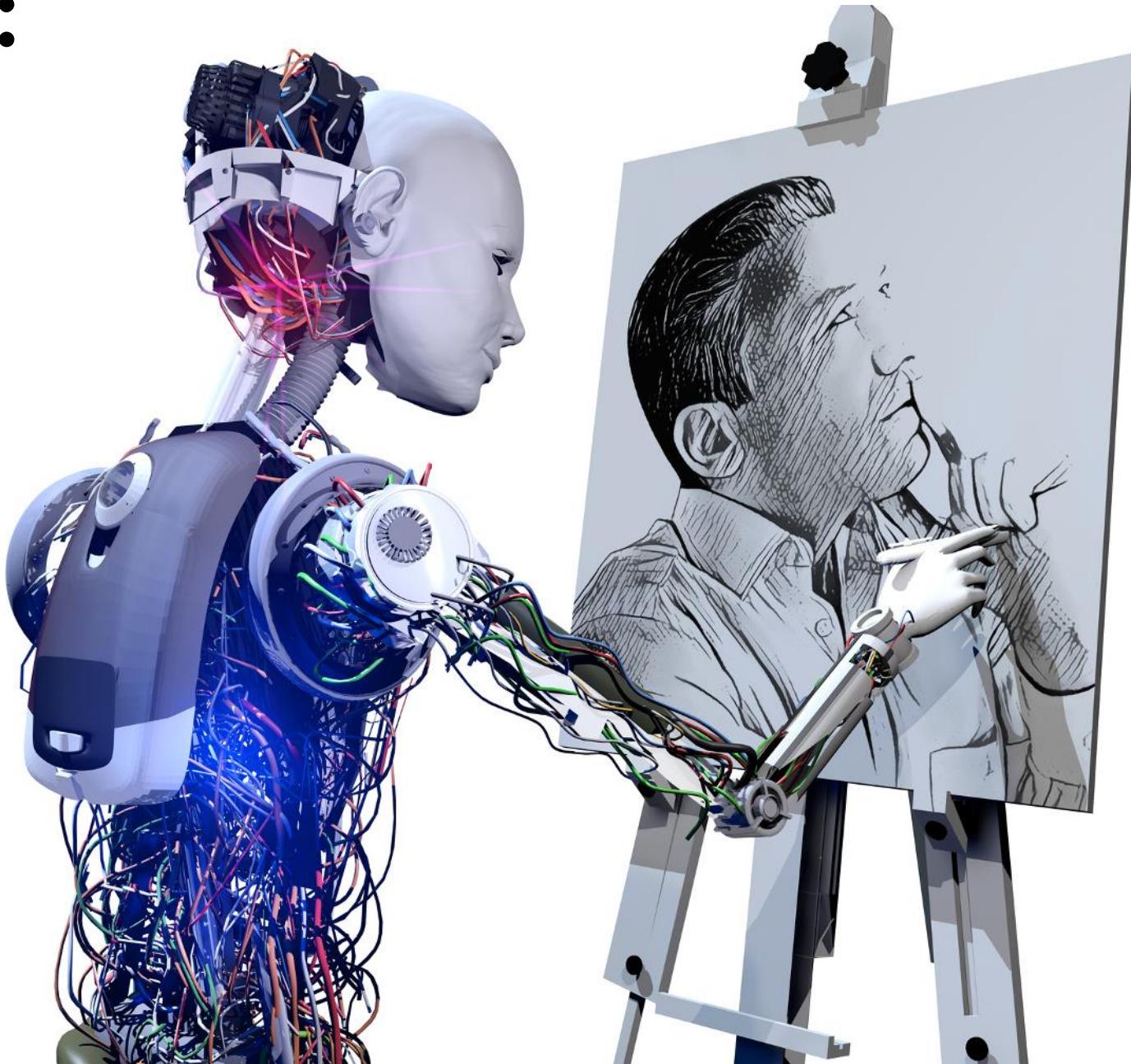


## **Healthcare & Life Sciences**

- › Alerts & diagnostics from real-time patient data
- › Your text here
- › Proactive health management
- › Healthcare provider sentiment analysis

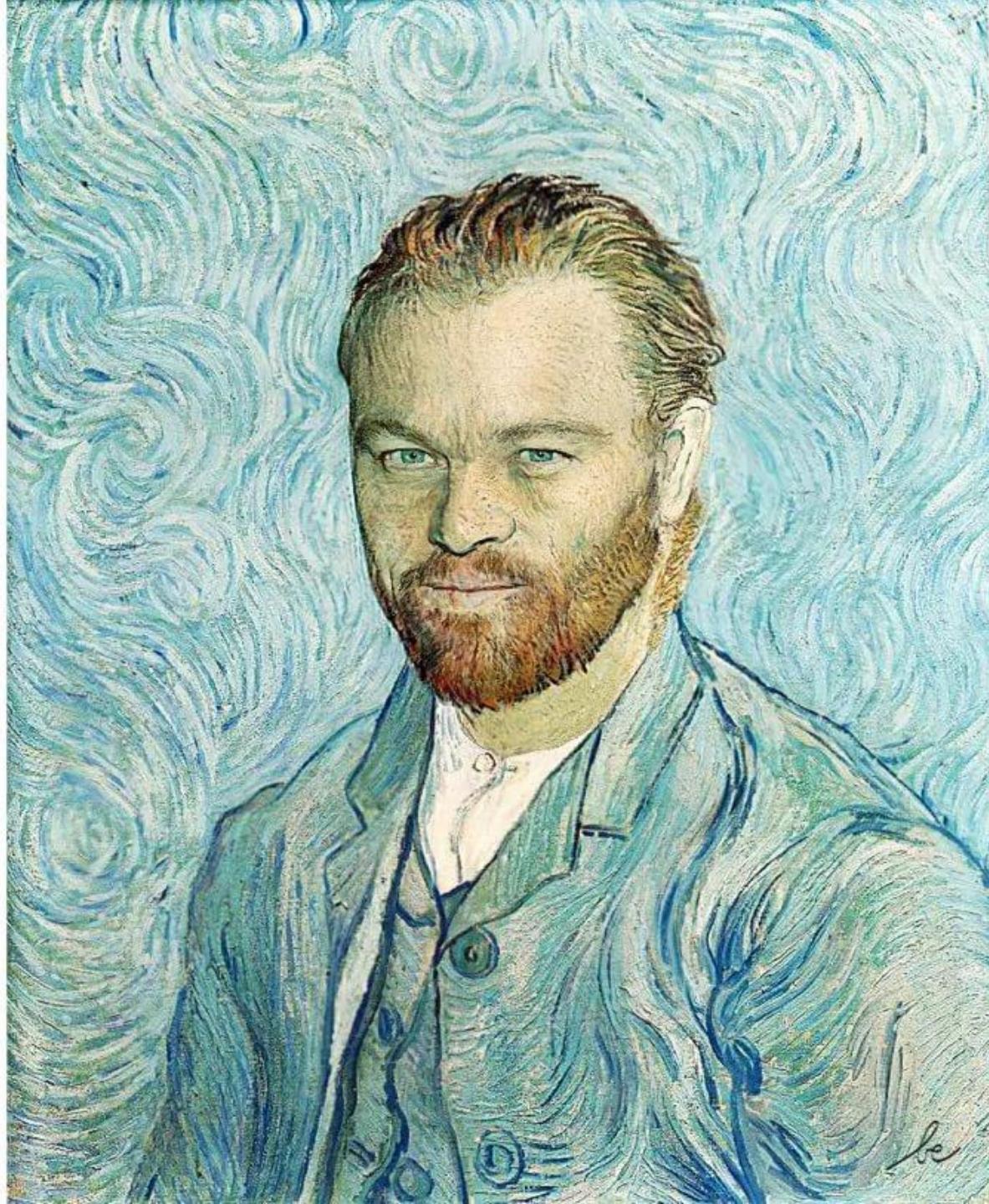


# AI FOR ARTS:



# STYLE TRANSFER



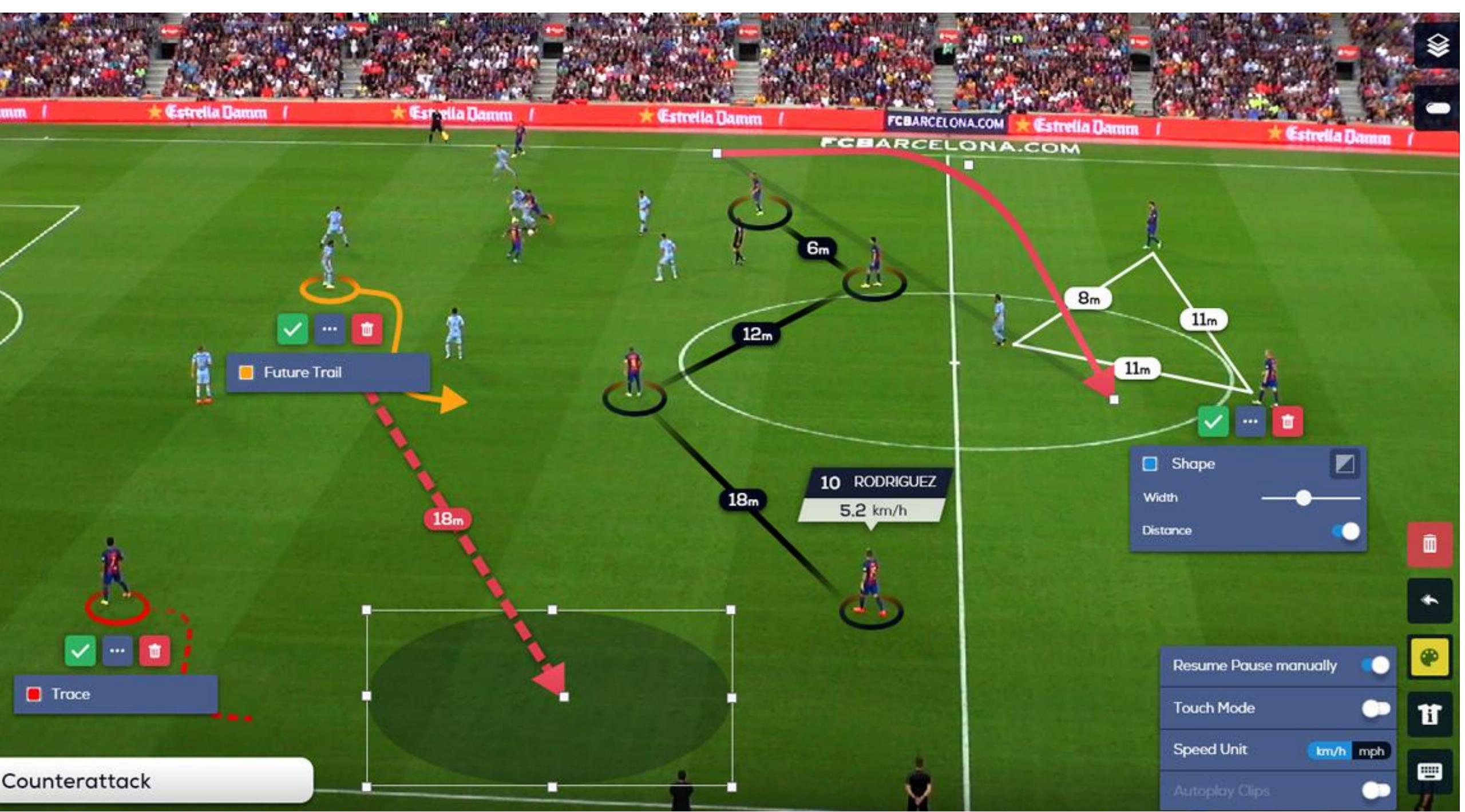






# AI FOR SPORT:





71:56 RMA 1 1 BAR

Partidazo

Directo



# AI FOR RETAIL:



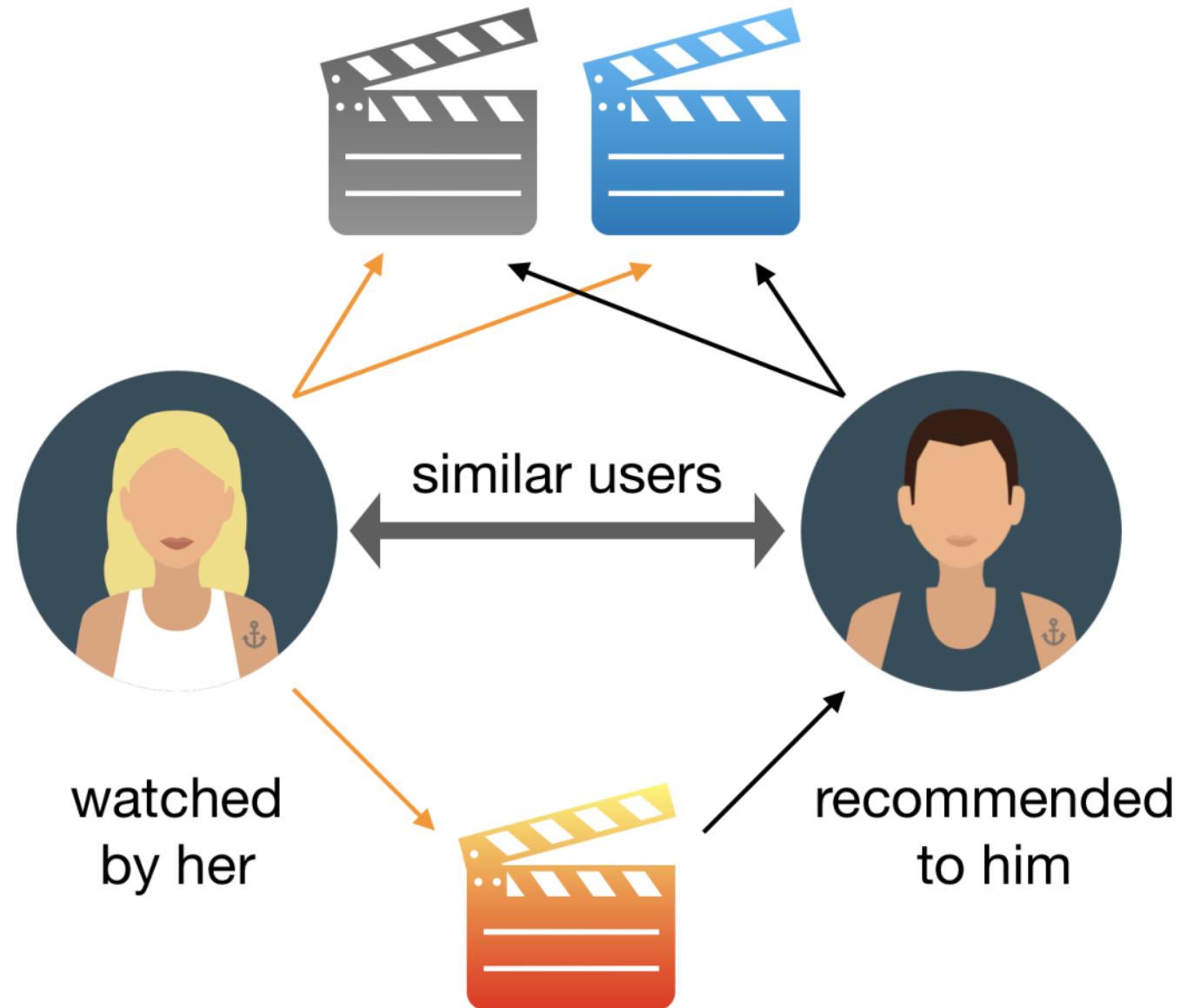
# E-COMMERCE DROP SHIPPING



# RECOMMENDER SYSTEM



watched by both users



# AI FOR COMPUTER VISION:



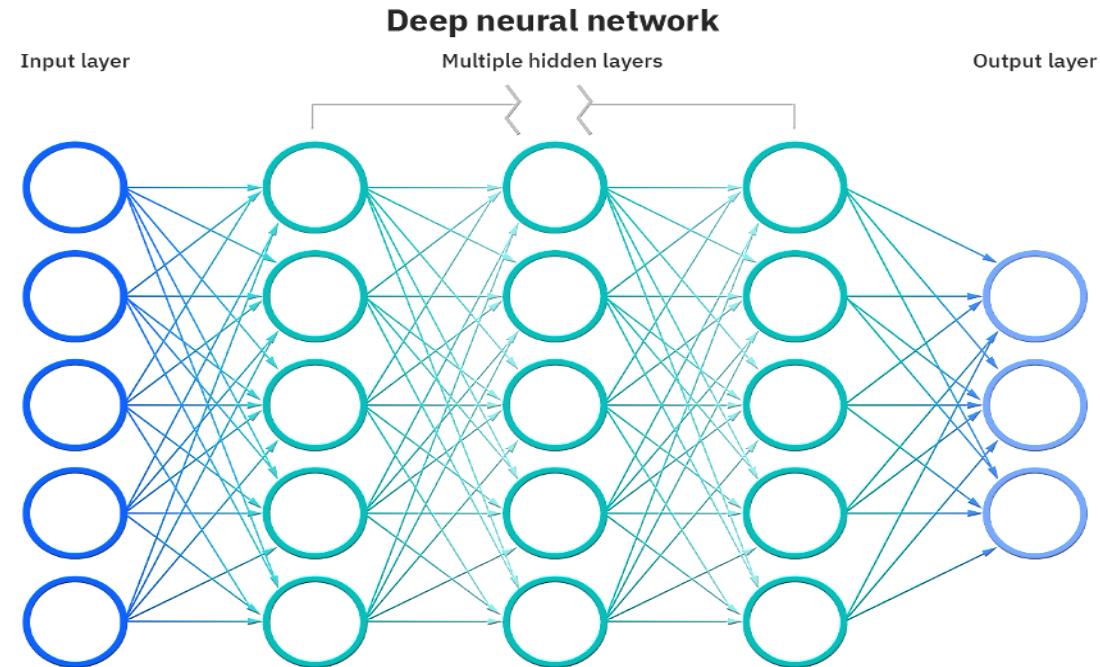
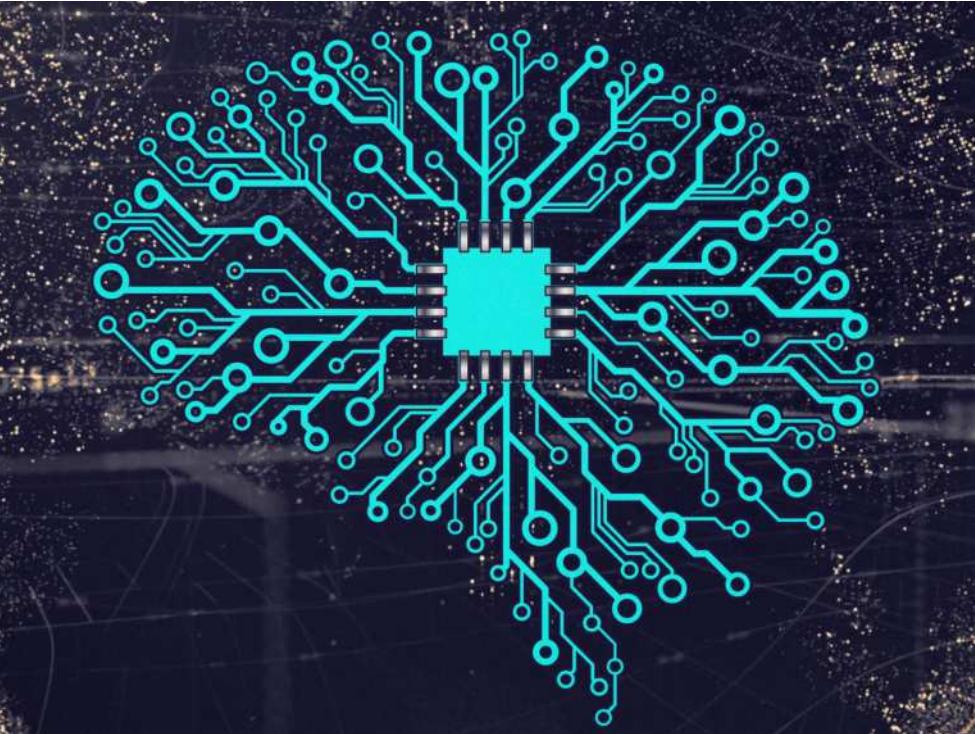
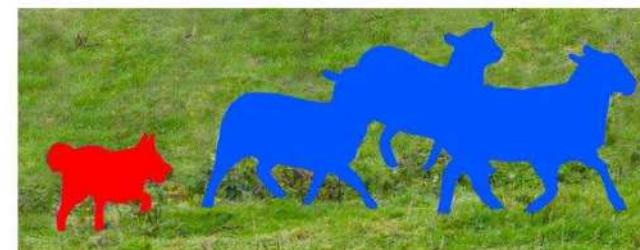
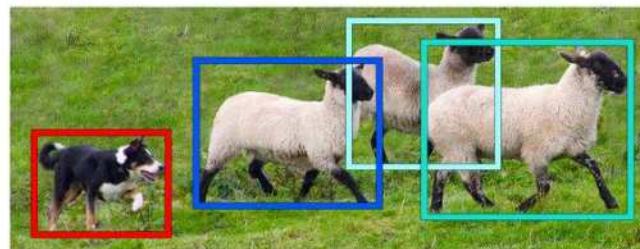


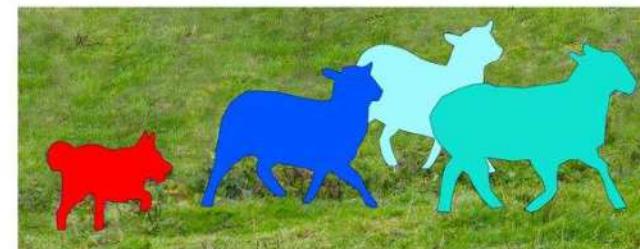
Image Recognition



Semantic Segmentation



Object Detection



Instance Segmentation

a man wearing a white shirt and blue shorts riding a surfboard

a yellowish surfboard carrying a man with long brown hair





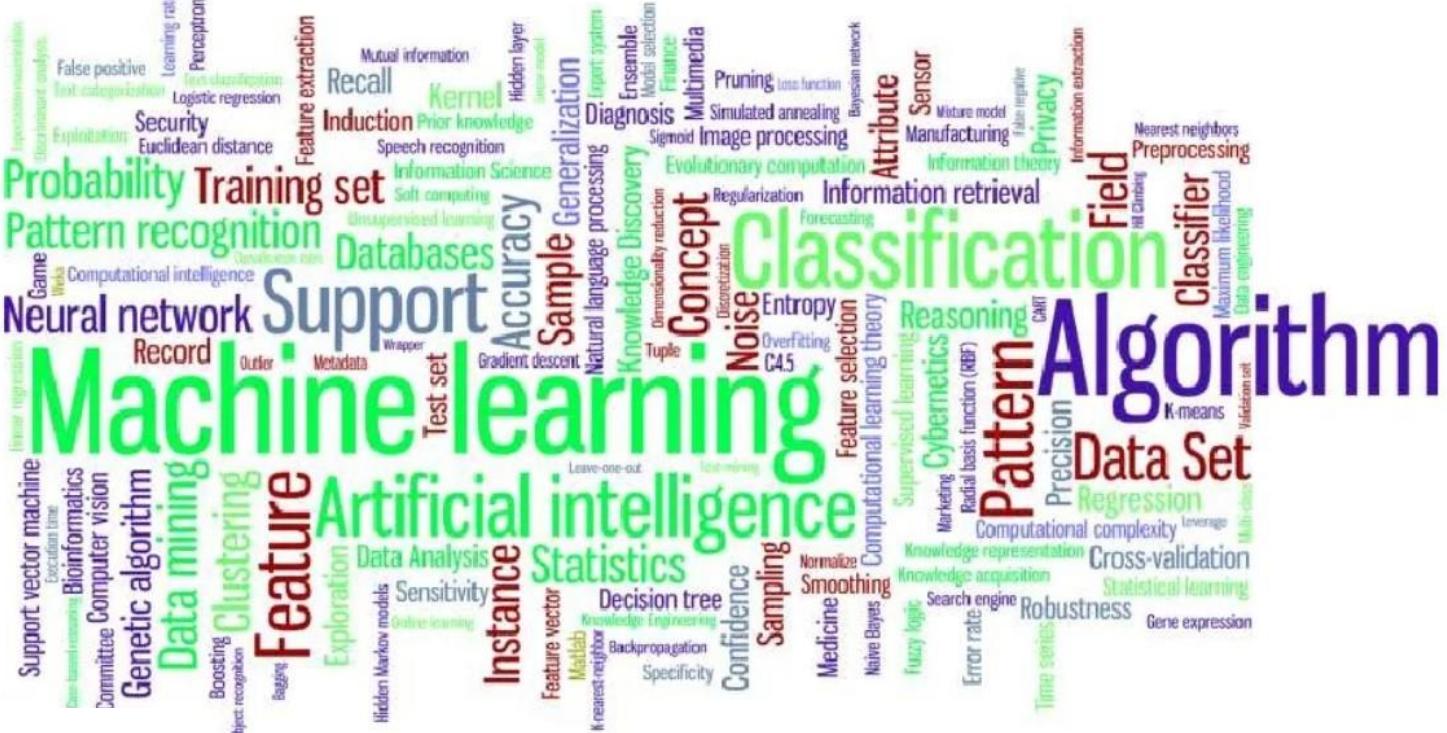


# AI FOR NATURAL LANGUAGE:





# COME FUNZIONA GOOGLE TRADUTTORE





Powered by Synthesia

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Synthesia

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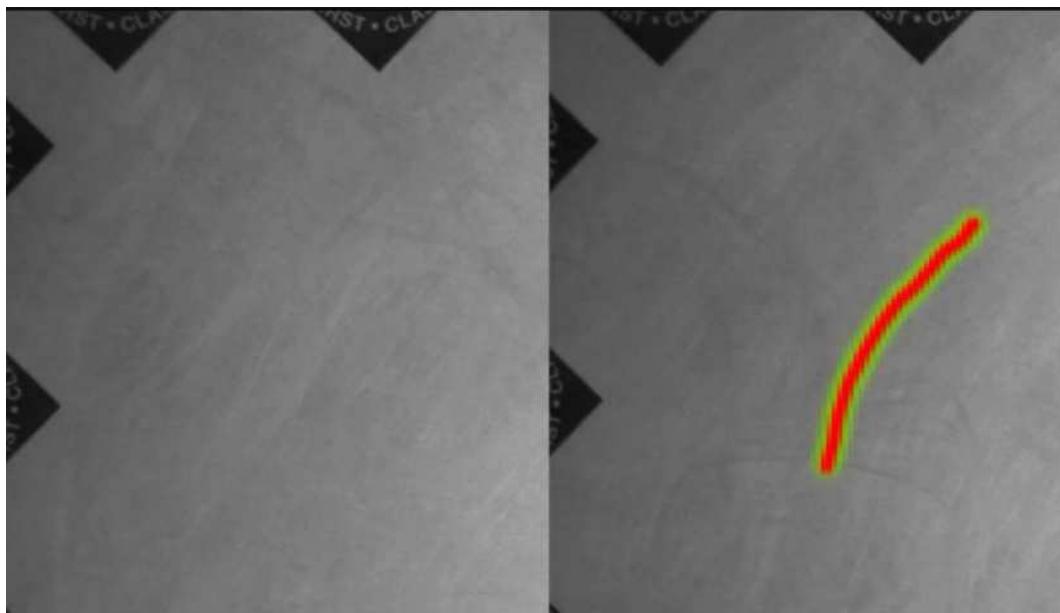
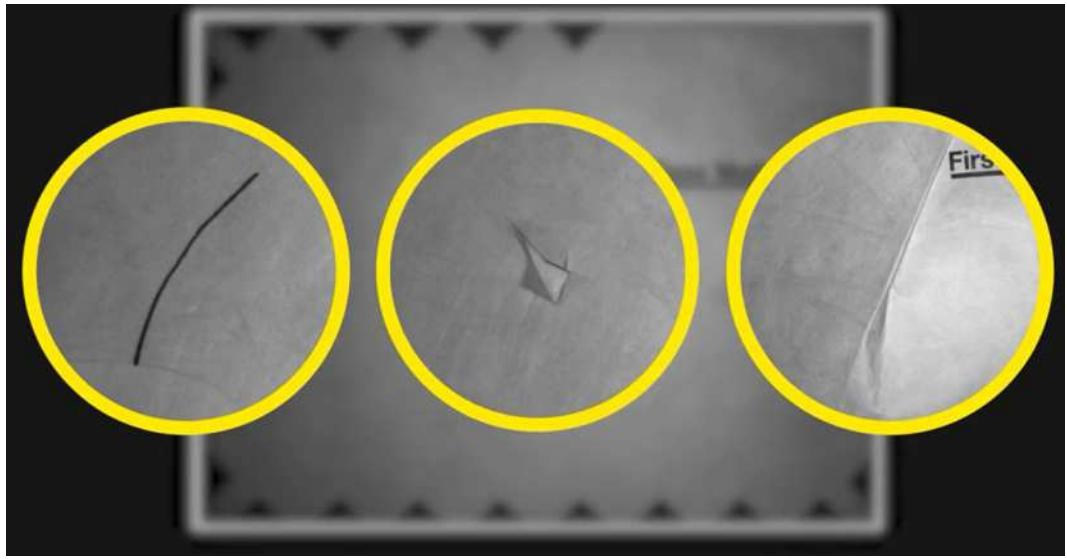
Synthesia

# AI FOR INDUSTRY 4.0:

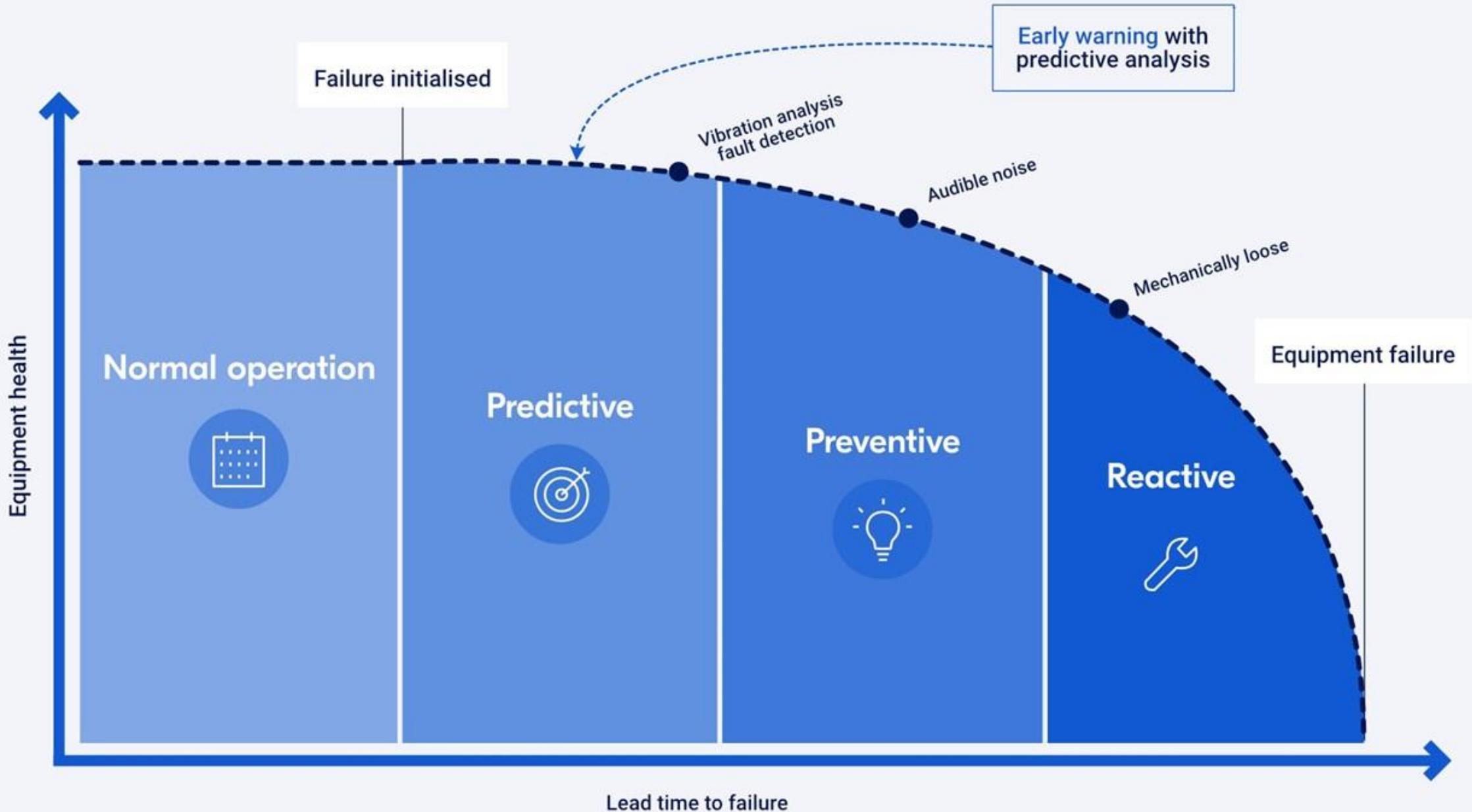




# Anomaly Detection



# Predictive maintenance



# AI FOR SECURITY:



## **ACI Proactive Risk Manager™**

Financial Crime Management



## **ACI ReD Shield®**

Merchant Fraud Protection



**UP PAYMENTS RISK MANAGEMENT®**

## 1. PASSWORD PROTECTION & AUTHENTICATION

AI is helping developers make biometric authentication even more accurate.



## 3. VULNERABILITY MANAGEMENT

Systems based on AI & ML are proactive instead of reactive.



## 5. BEHAVIORAL ANALYTICS

ML algorithms can learn & create a pattern of a user's behavior.



## 2. PHISHING DETECTION & PREVENTION CONTROL

AI & ML can be used to detect, track, react to & resolve phishing issues much more quickly than humans can.



## 4. NETWORK SECURITY

AI is expediting the creation of security policies & determining organizations' network topographies.

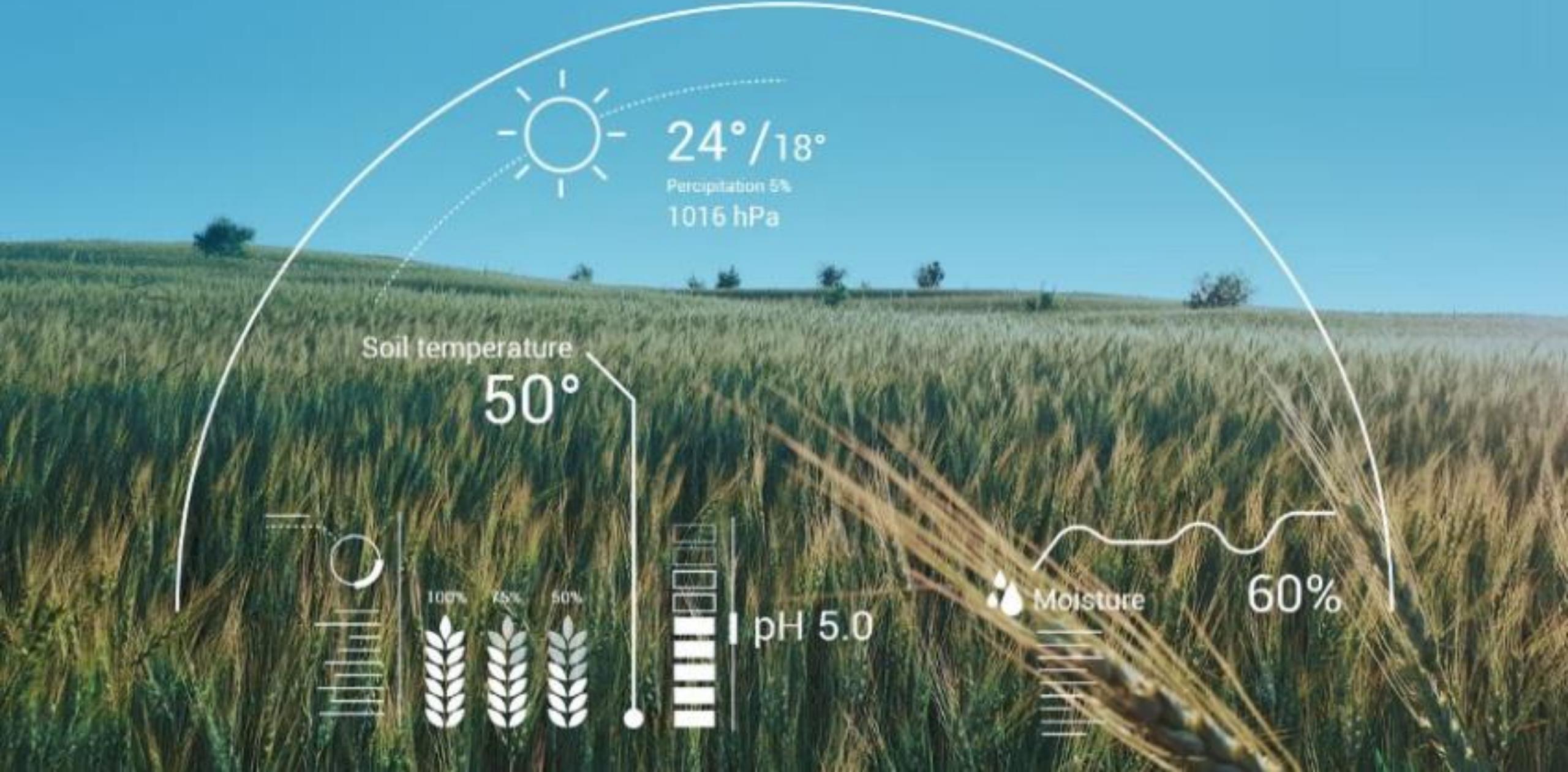


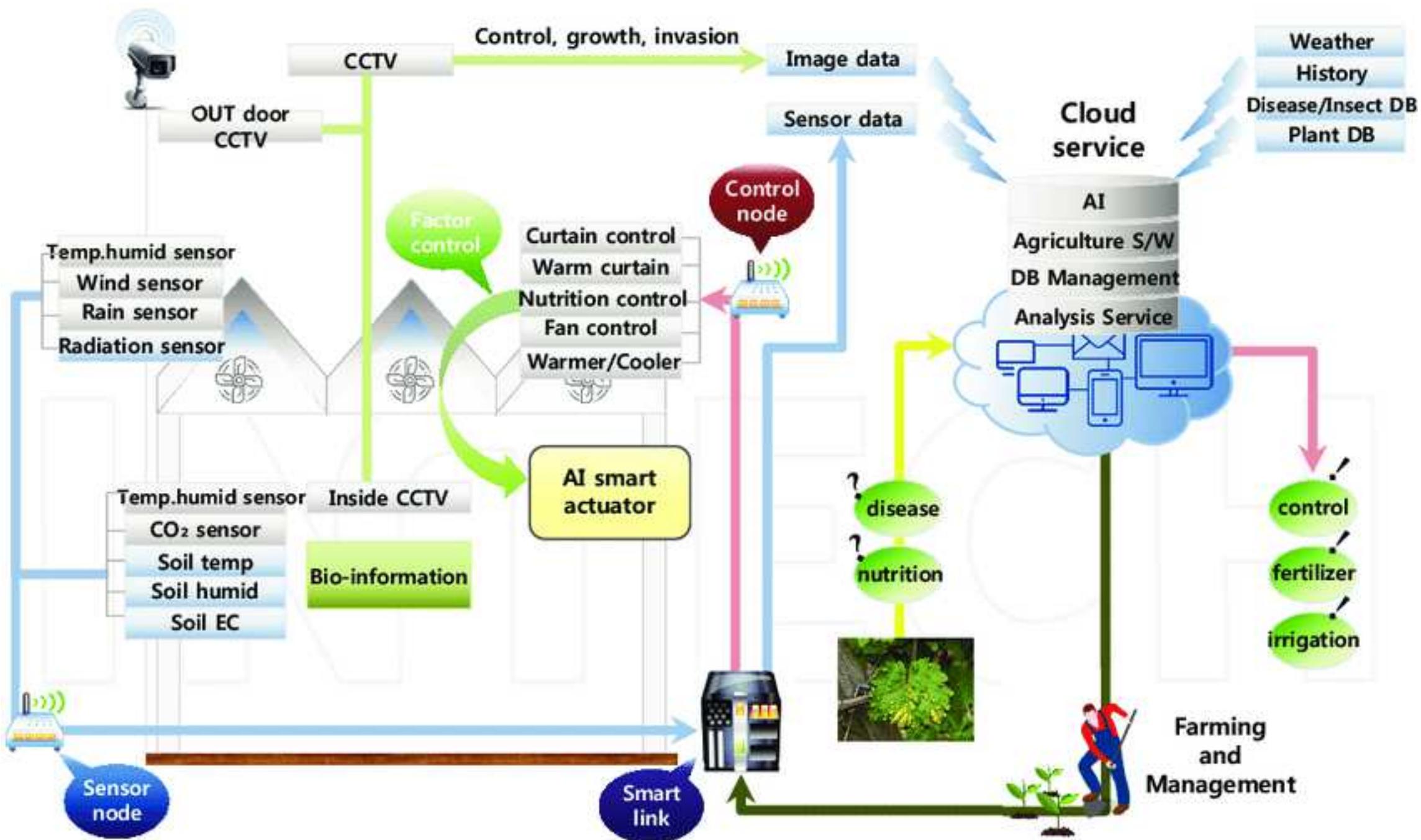
# AI FOR FINANCE:





# AI FOR AGRICULTURE:





## Crop Yield prediction & Price forecasts

Identify the output yield of crops and forecast prices for the next few weeks will help the farmer to obtain maximum profit

## Intelligent spraying

AI sensors can detect weed affected areas and can precisely spray herbicides in the right region reducing the usage of herbicides

## Predictive Insights

Insights on "Right time to sow the seeds" for maximum productivity. Insights on the impacts created by the weather conditions

## Artificial Intelligence in Agriculture



## Agriculture Robots

Using Autonomous robots for harvesting huge volumes of crop at a higher volume and faster pace

## Crop and soil monitoring

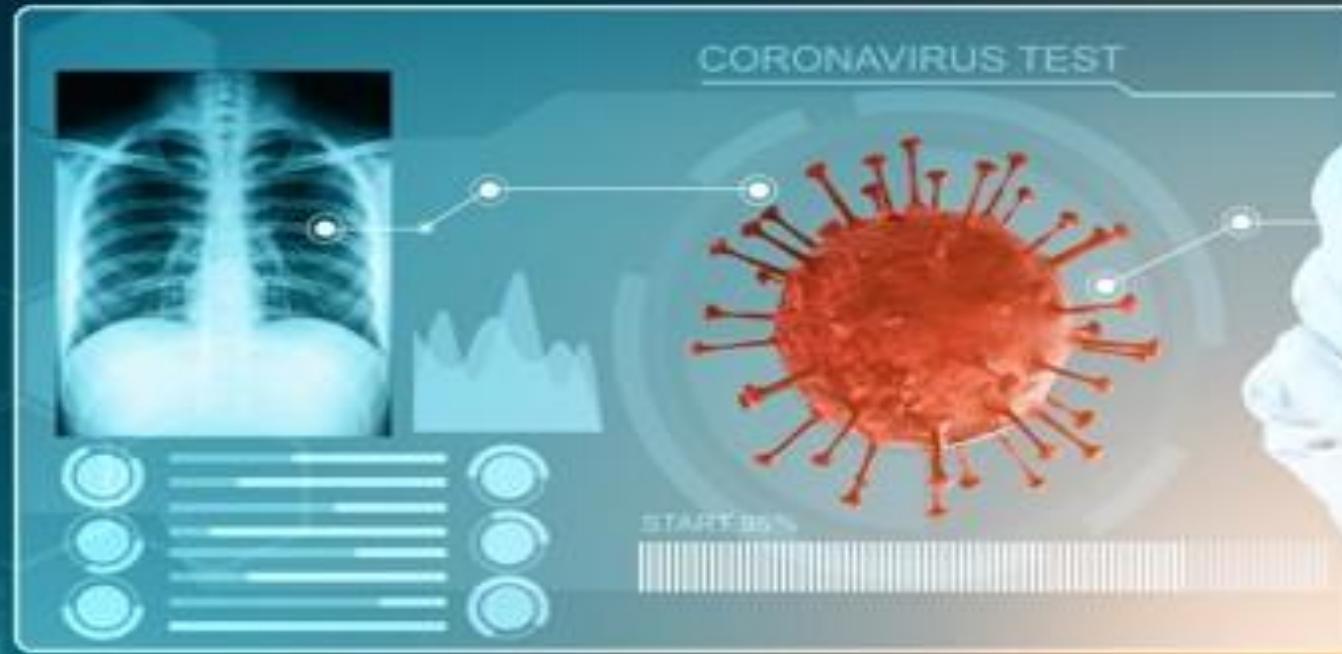
Using ML/AI, we can monitor the crop health for diagnosing pests/soil defects, nutrient deficiencies in soil, etc.

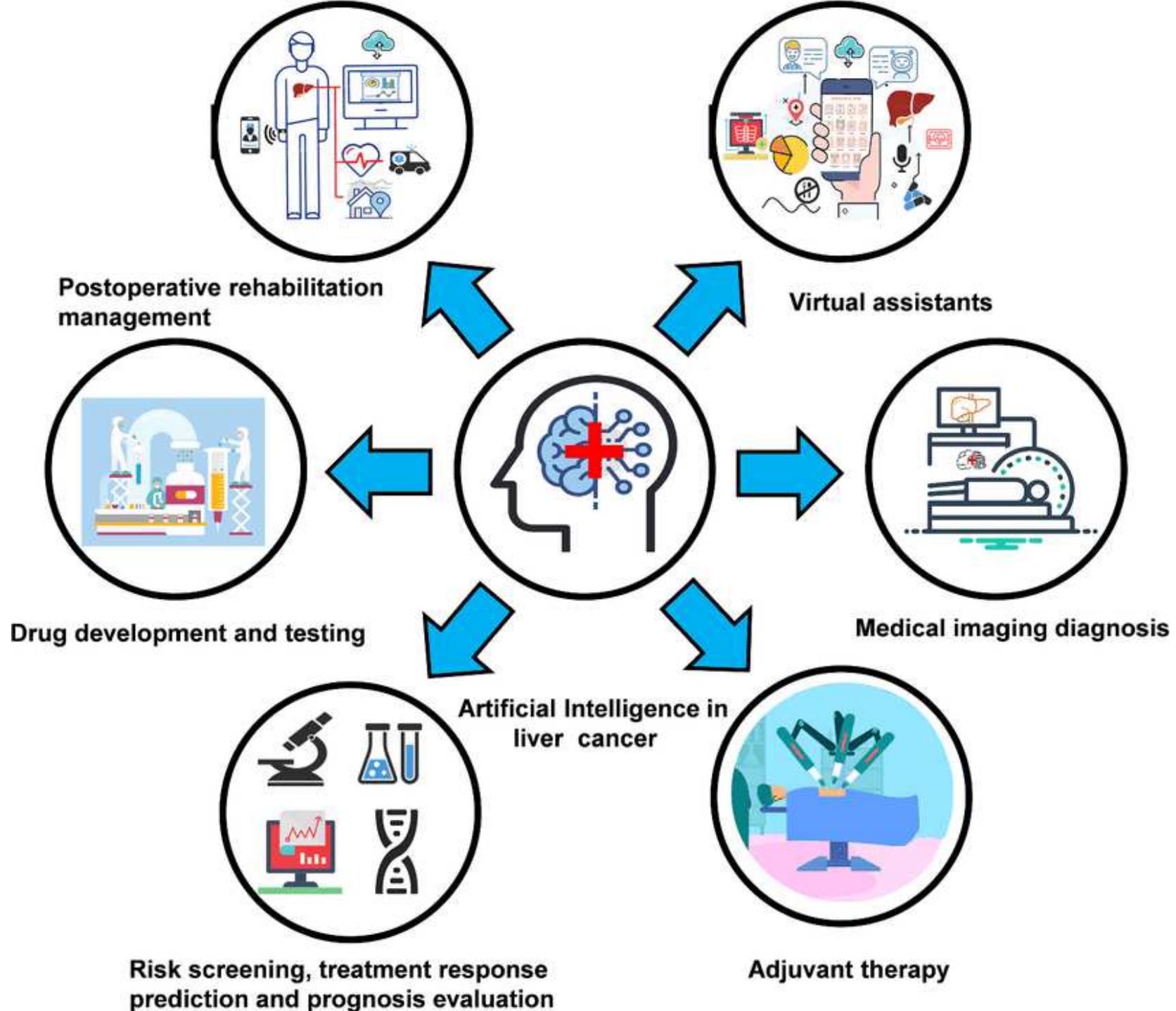
## Disease Diagnosis

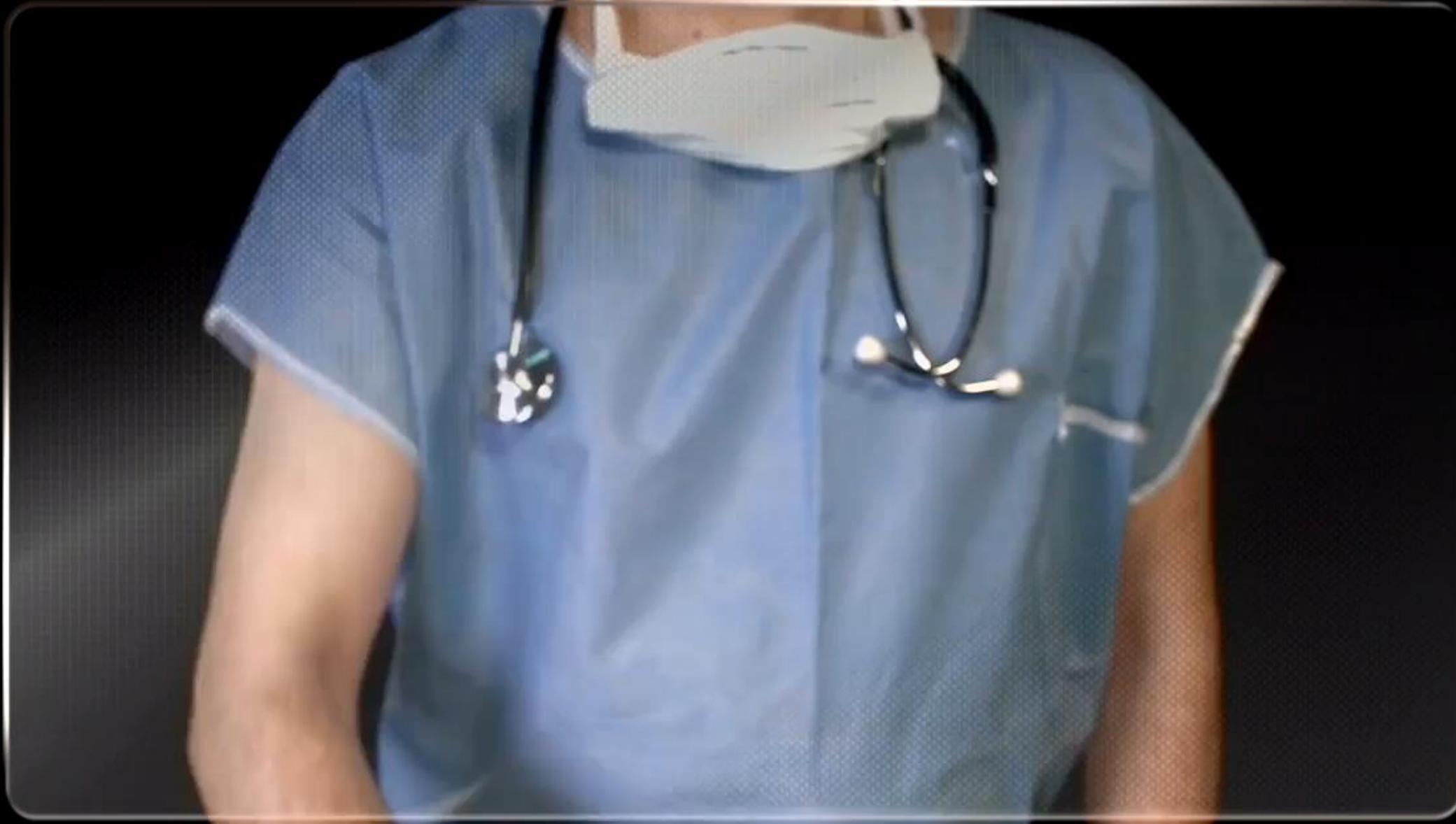
Prior information and classification of Plant diseases help farmers control the disease through proper strategy.

# AI FOR HEALTHCARE:











David

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Bravo - 1

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## RADIOLOGY

The algorithm helps perform radiological tests with outstanding accuracy, which means that artificial intelligence in medicine can reduce medical professionals' workload



## DERMATOLOGY

AI-powered tools are designed to identify skin cancer by feeding a vast number of images of malignant melanomas and benign moles



## ONCOLOGY

AI is forecast to assist in decoding individualized cancer diagnosis and developing a treatment plan



## CARDIOLOGY

Since cardiovascular diseases relate to 'number one death cause' globally, early detection of this medical condition is critical

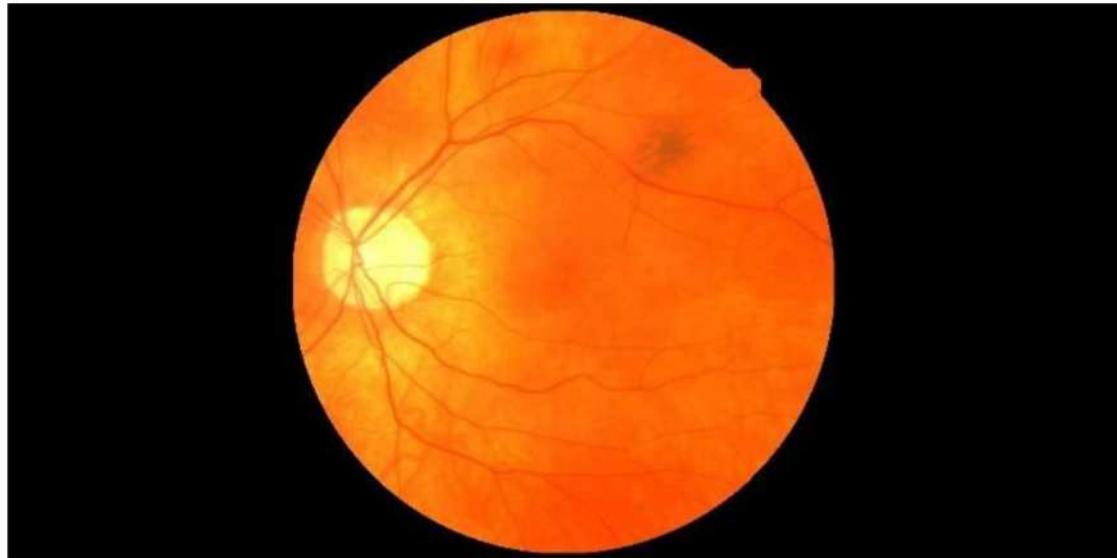


## DEEP LEARNING APPLICATIONS IN HEALTHCARE

# AI can identify heart disease from an eye scan

Technology news

25 January 2022



- Scientists have developed an artificial intelligence system that can analyse eye scans taken during a routine visit to an optician or eye clinic and identify patients at a high risk of a heart attack.

## Gli algoritmi per predire la gravità del Covid studiando le radiografie

### Intelligenza artificiale

Studio Bracco imaging

#### Nataszia Ronchetti

Il progetto è in fase sperimentale ma ha già attratto l'attenzione della comunità scientifica internazionale. Per ora è utilizzato per l'infezione provocata dal Covid-19. Ma presto sarà possibile estenderlo anche ai tumori e alle malattie degenerative come il morbo di Alzheimer.

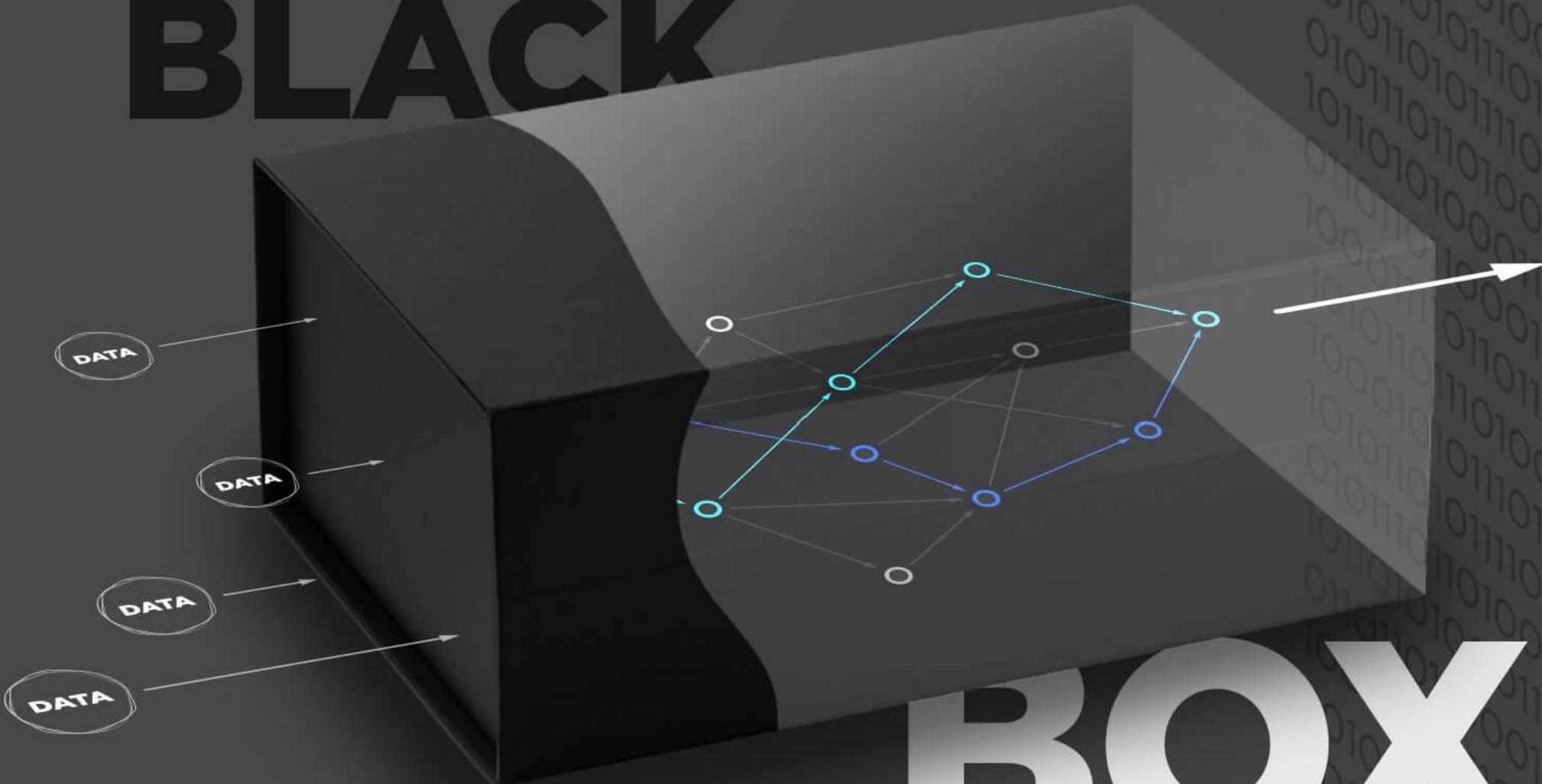
Il metodo infatti è sempre lo stesso. Applica gli algoritmi dell'intelligenza artificiale alla diagnostica per immagini per migliorare la formulazione della prognosi e sviluppare analisi predittive sull'evoluzione della malattia. Si chiama «Ai-For-Covid» lo studio che dall'inizio della pandemia ha impegnato Bracco Imaging, società del gruppo Bracco, e il Centro Diagnostico italiano, la struttura sanitaria ambulatoriale (sede a Milano) per la prevenzione, la diagnosi e la cura in regime di day hospital, che da tre

anni sviluppa algoritmi predittivi. Tutto nato quasi per caso con l'inizio della pandemia, quando i ricercatori hanno iniziato a raccogliere negli ospedali italiani le radiografie toraciche di circa 1300 pazienti, all'esordio della malattia, che presentavano polmonite interstiziale.

«Volevamo capire se in certi stati patologici è possibile dare indicazioni su una determinata evoluzione migliore delle prognosi che vengono fatte dal medico», dice Sergio Papa, direttore della diagnostica per immagini del centro milanese. «Oggi — prosegue Papa — siamo in grado di dire che il sistema migliora la capacità del medico di qualche punto percentuale in più». I risultati dello studio sono stati pubblicati sulla rivista scientifica «Medical Image Analisys» e poi caricati su un portale a disposizione degli scienziati di tutto il mondo: in poco tempo sono arrivate un centinaio di richieste di download. Un successo che ha portato i ricercatori a cimentarsi con i tumori alla mammella e alla prostata. «Abbiamo già iniziato a raccogliere casi clinici», conferma Papa.

E siccome gli algoritmi sono dei medical device è stato avviato anche l'iter per ottenere il via libera dagli enti regolatori, dalla Food and Drug Administration degli Usa a Ema, l'agenzia del farmaco europea. Le prospettive che si aprono sono innumerevoli. L'intelligenza artificiale può infatti essere applicata non solo a radiografie ma anche a risonanze magnetiche, Tac, ecografie. Lo studio è stato presentato all'Expo di Dubai dal gruppo Bracco, la multinazionale (vanta un patrimonio di oltre duemila brevetti e investe ogni anno in R&S il 10% del fatturato di riferimento nell'imaging) specializzata nella diagnostica per immagini. Il Centro diagnostico italiano, che ogni anno serve circa 400 mila pazienti, ha messo a disposizione know-how e competenze. «Adesso vogliamo anche valutare il long Covid», spiega Papa, precisando che tutto è partito dalla considerazione che due pazienti possono avere destini differenti anche se uguali dal punto di vista clinico. «Se facciamo leggere le immagini a un esperto — aggiunge Papa — vediamo che il si-

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# BOX

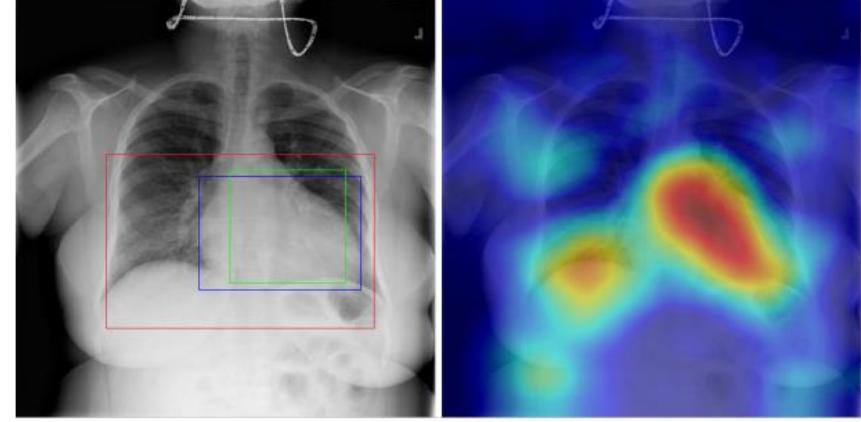
Radiology report	Keyword	Localization Result
findings include: 1. cardiomegaly (ct ratio of 17/30). 2. otherwise normal lungs and mediastinal contours. 3. no evidence of focal bone lesion. dictating	Cardiomegaly	

Table 9. A sample of chest x-ray radiology report, mined disease keywords and localization result from the “Cardiomegaly” Class. Correct bounding box (in green), false positives (in red) and the ground truth (in blue) are plotted over the original image.

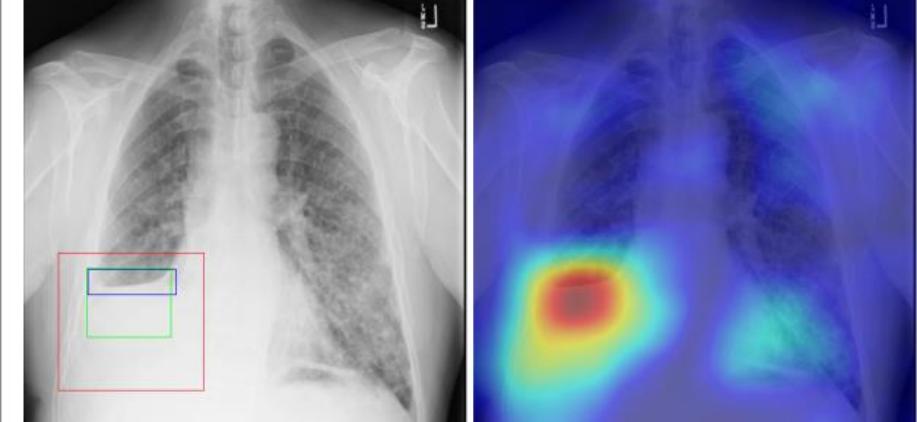
Radiology report	Keyword	Localization Result
findings: no appreciable change since XX/XX/XX. small right pleural effusion. elevation right hemidiaphragm. diffuse small nodules throughout the lungs, most numerous in the left mid and lower lung. impression: no change with bilateral small lung metastases.	Effusion; Nodule	

Table 10. A sample of chest x-ray radiology report, mined disease keywords and localization result from the “Effusion” Class. Correct bounding box (in green), false positives (in red) and the ground truth (in blue) are plotted over the original image.

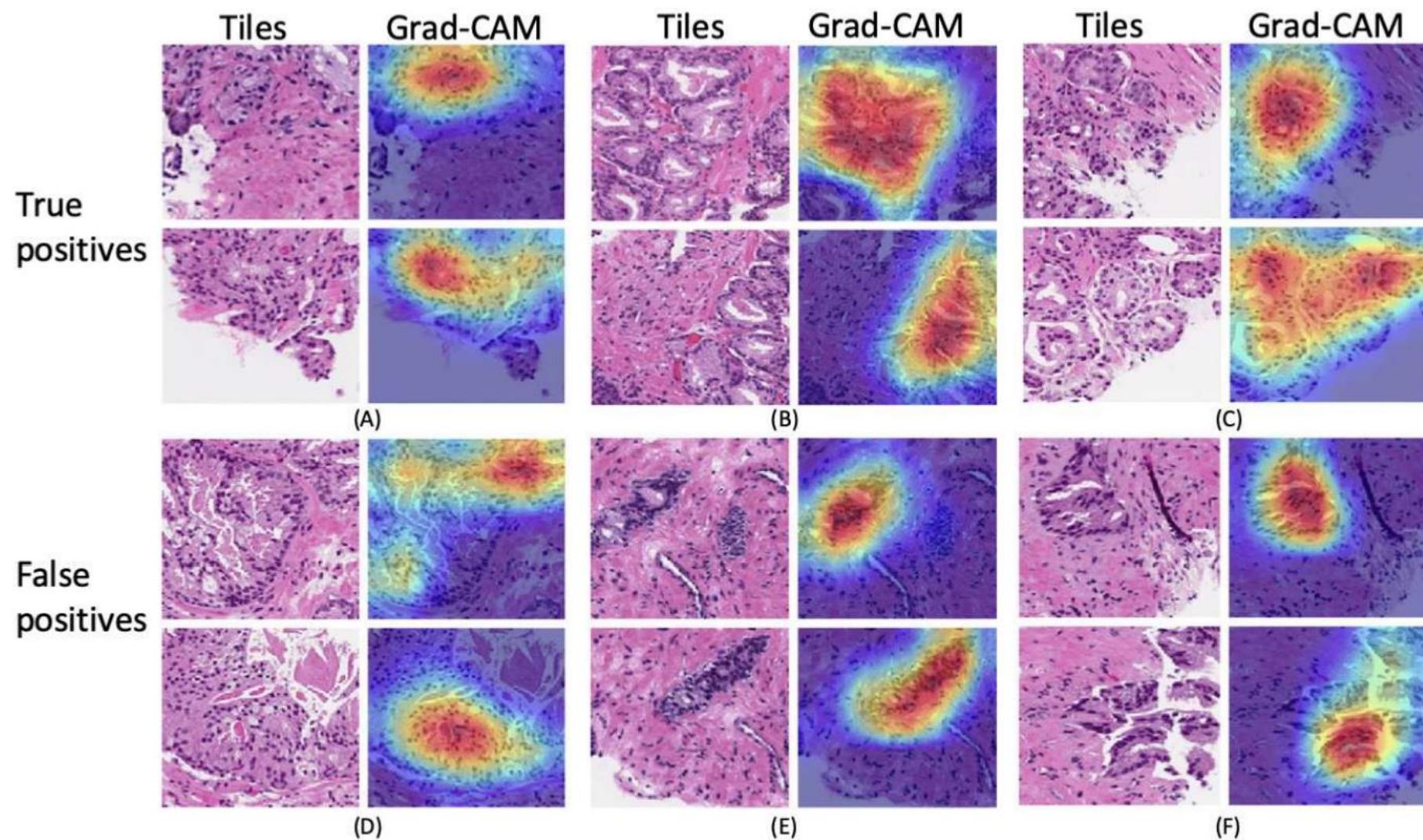
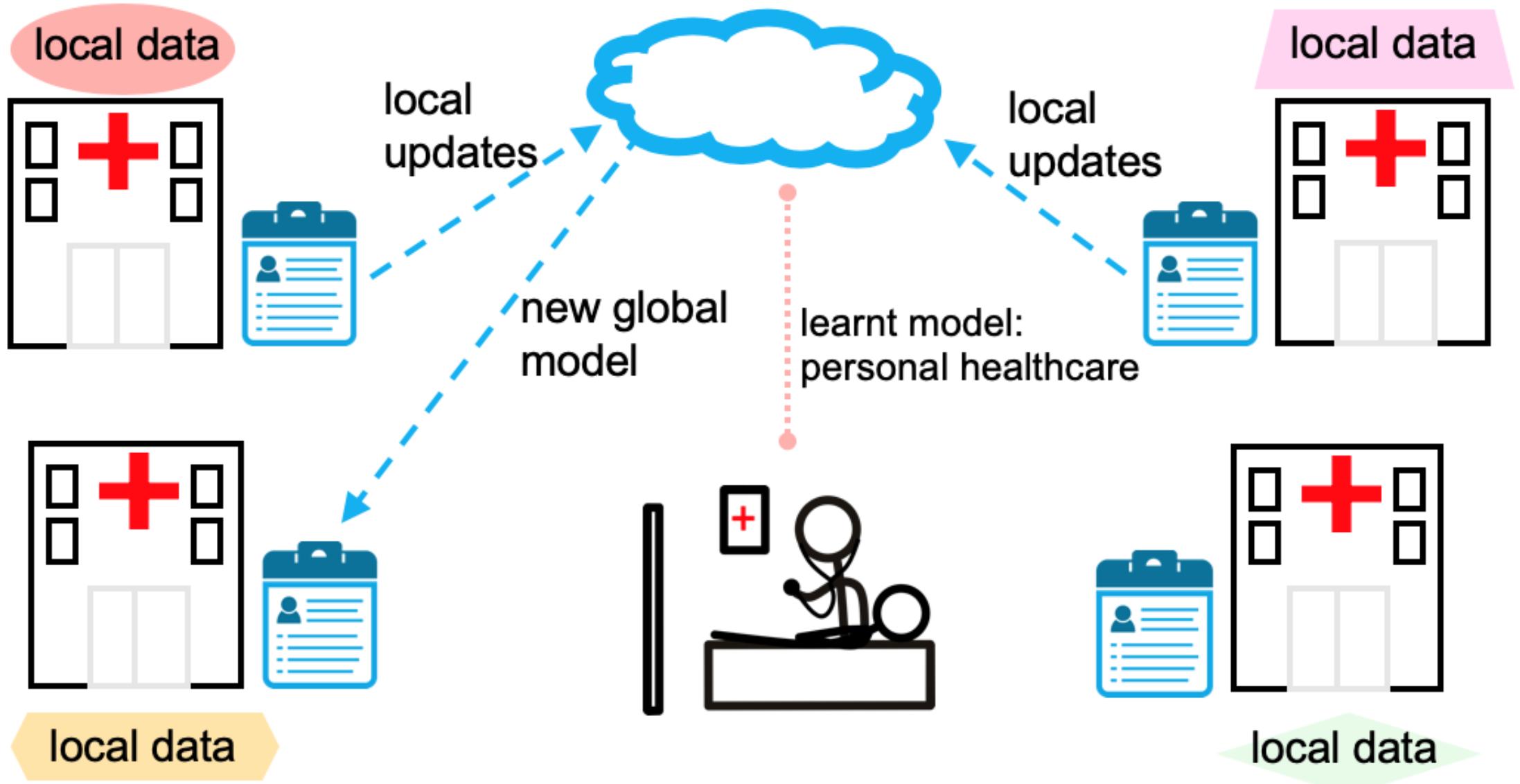
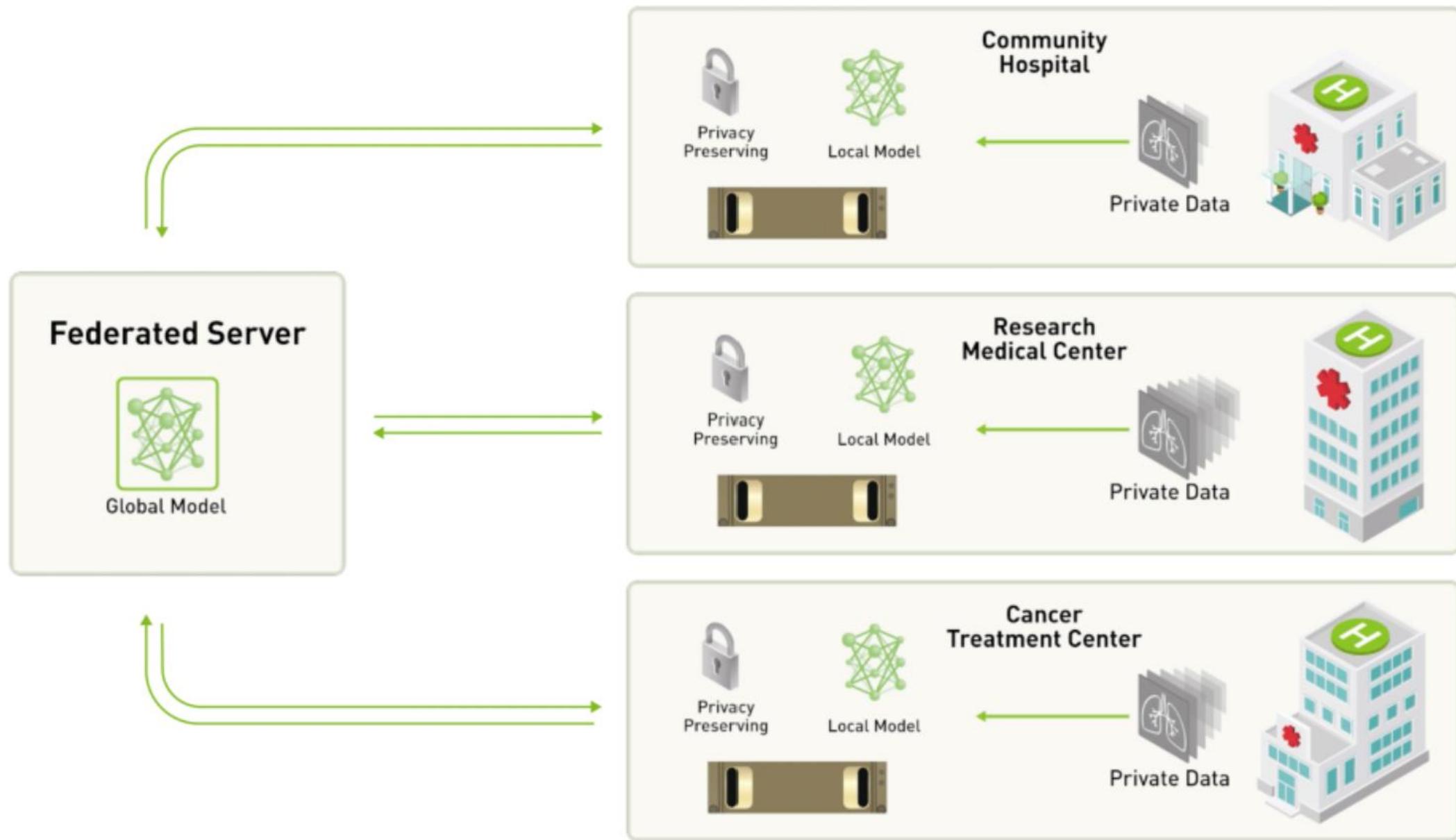


Fig. 5. Visualization of discriminative regions within tiles for TP and FP predictions. For each slide (A)-(F), we selected the top two tiles with the highest attention weights from the model, which were then forwarded to the model to generate activations and gradients for Grad-CAM.

# Federated Learning in Healthcare







# The Global Artificial Intelligence Indexes 2021

Show: Rank

Country	Implementation		Innovation		Investment		Total rank	
	Talent	Infrastructure	Operating Environment	Research	Development	Government Strategy		
United States of America	1	1	6	1	2	13	1	1
China	18	3	3	2	1	1	2	2
United Kingdom	5	8	1	3	11	7	4	3
Canada	4	23	5	8	10	4	5	4
Germany	9	12	7	4	12	5	9	5
France	8	30	2	12	9	6	7	6
Singapore	2	4	39	16	15	30	6	7
South Korea	28	5	30	22	3	31	25	8
Japan	26	16	16	6	7	12	8	9



15-20 20-25 25-30 30-35 35-40 40-45 45-50 50-55 55-60 60-65 65-70 70-75 75-80 80-85 85-90

Country	Rank	Score
Singapore	1	9.186
United Kingdom	2	9.069
Germany	3	8.810
United States of America	4	8.804
Finland	5	8.772
Sweden	6	8.674
Canada	6	8.674
France	8	8.608
Denmark	9	8.601
Japan	10	8.582
Australia	11	8.126
Norway	12	8.079
New Zealand	13	7.876
Netherlands	14	7.659

# Limiti e Punti Deboli AI:

- Bad Data
- Materia Difficile
- Applicazioni ancora molto sperimentali
- Alfabetizzazione digitale italiana molto bassa
- Gap tecnologico Università ed esigenze del mercato
- Grow Rate tecnologico molto frenetico
- Etica
- Privacy dei dati



# La formula del futuro: giovani e aziende alleati nell'innovazione

19  
AGO 2020

pubblicato in: Progetti, Rassegna stampa | 0



# Domande?



*Grazie per  
l'attenzione!*

**(Daniele Grotti)**