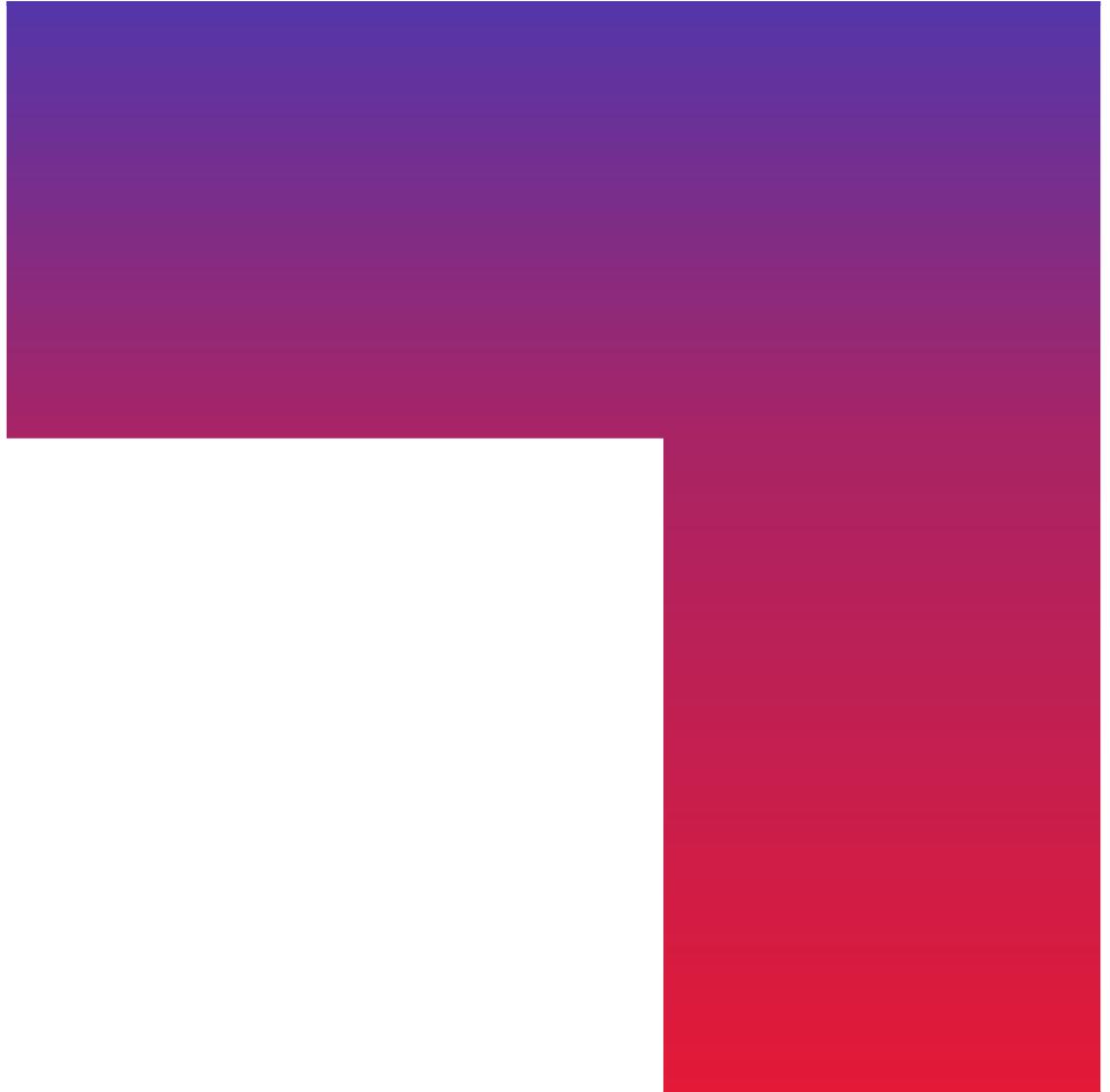


1&1 AI Workshop

Tag 1

CGI



Curriculum & Tracks: CEE Campus- AI Courses

AI Engineering Track

AI Deployment Track

AI Management Track

AI Bootcamp/ Hackathon

Practical Examples Build & Transform AI Projects

Data Science & Machine Learning

Data Engineering

AI Management

Manage AI Projects

Build High Performance Team

AI Fundamentals

Basics of AI

Machine Learning 101

Data Science 101

Data Engineering 101

AI Fundamentals

Business Journey

Ethics and Privacy

Vertical Growth (Technology & Adaptation)

Horizontal Growth (Market & Roles)

Our team



Dr. Alen Berta
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Tobias Oberrauch
CGI Deutschland



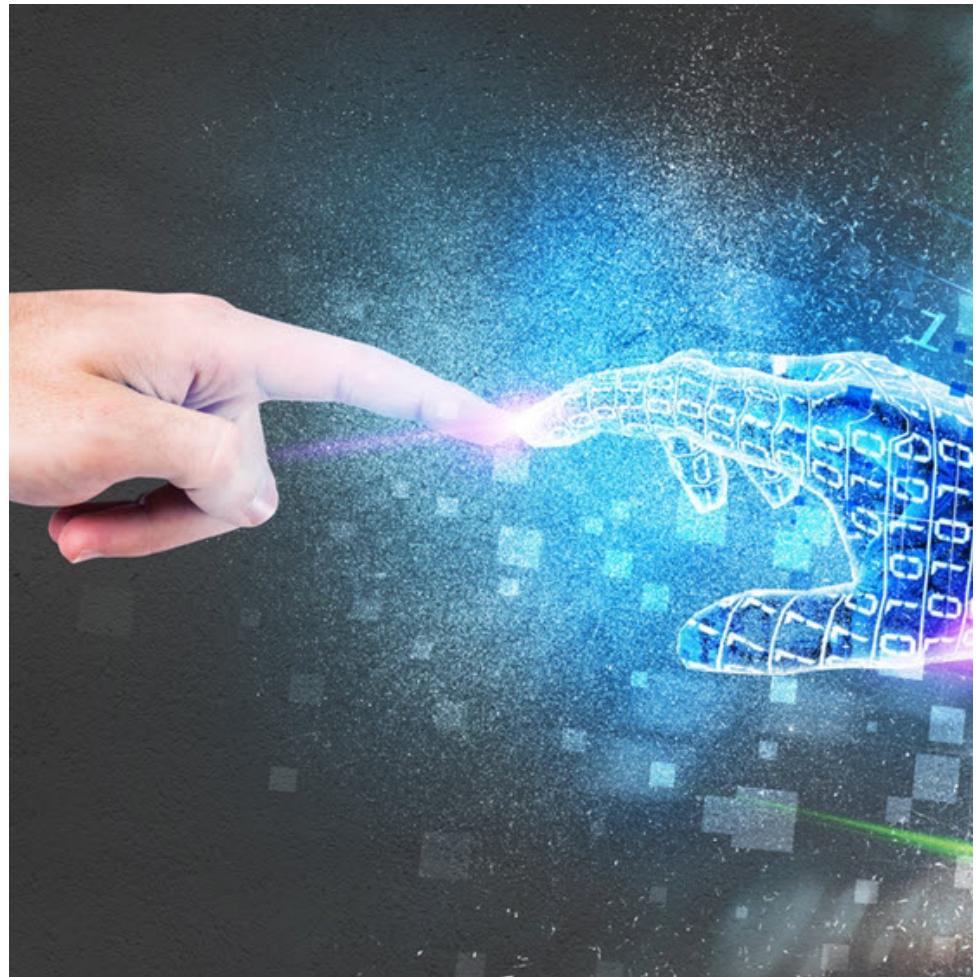
Ipsit Dash
CGI Nederland



Mark Drost
CGI Nederland

Basics of AI

Nima Samsami



AGENDA

- **AI definition**
- **AI history**
- **Why now?**
- **AI, data types and where it is used**
- **AI and Ethics**
- **AI now/in future**

Definition

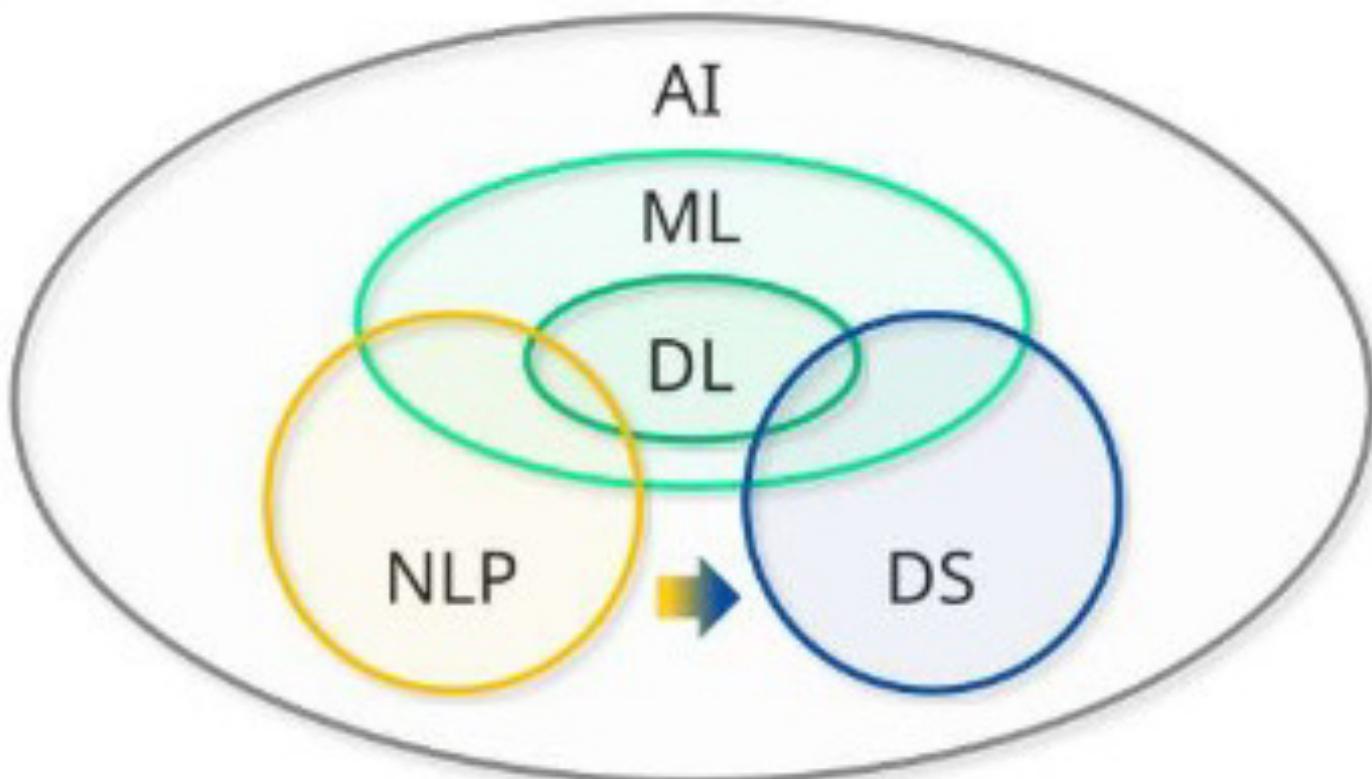
- In computer science, artificial intelligence (AI), sometimes called machine intelligence, is intelligence demonstrated by machines, in contrast to the natural intelligence displayed by humans. (Wikipedia)
- The English Oxford Living Dictionary gives this definition: “The theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.”

Definition

- The Encyclopedia Britannica states, “artificial intelligence (AI), the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings.” Intelligent beings are those that can adapt to changing circumstances.**
- Merriam-Webster defines artificial intelligence this way:**
A branch of computer science dealing with the simulation of intelligent behavior in computers.
The capability of a machine to imitate intelligent human behavior.

- AI techniques
- Machine Learning
- Deep Learning / Neural Network
- Natural Language Processing
- Data Science

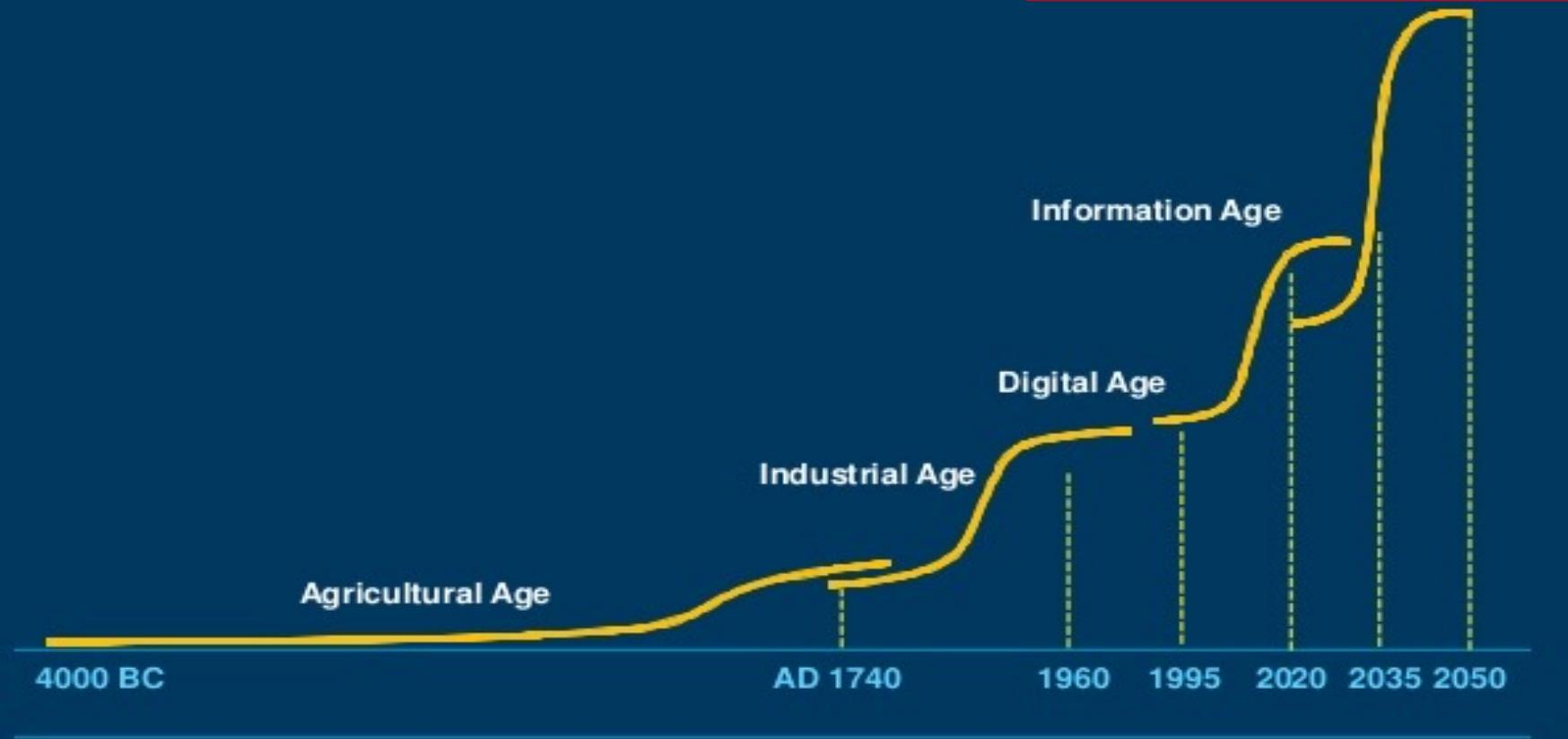
Machine learning is a branch of **artificial intelligence (AI)** focused on building applications that learn from data and improve their accuracy over time without being programmed to do so.



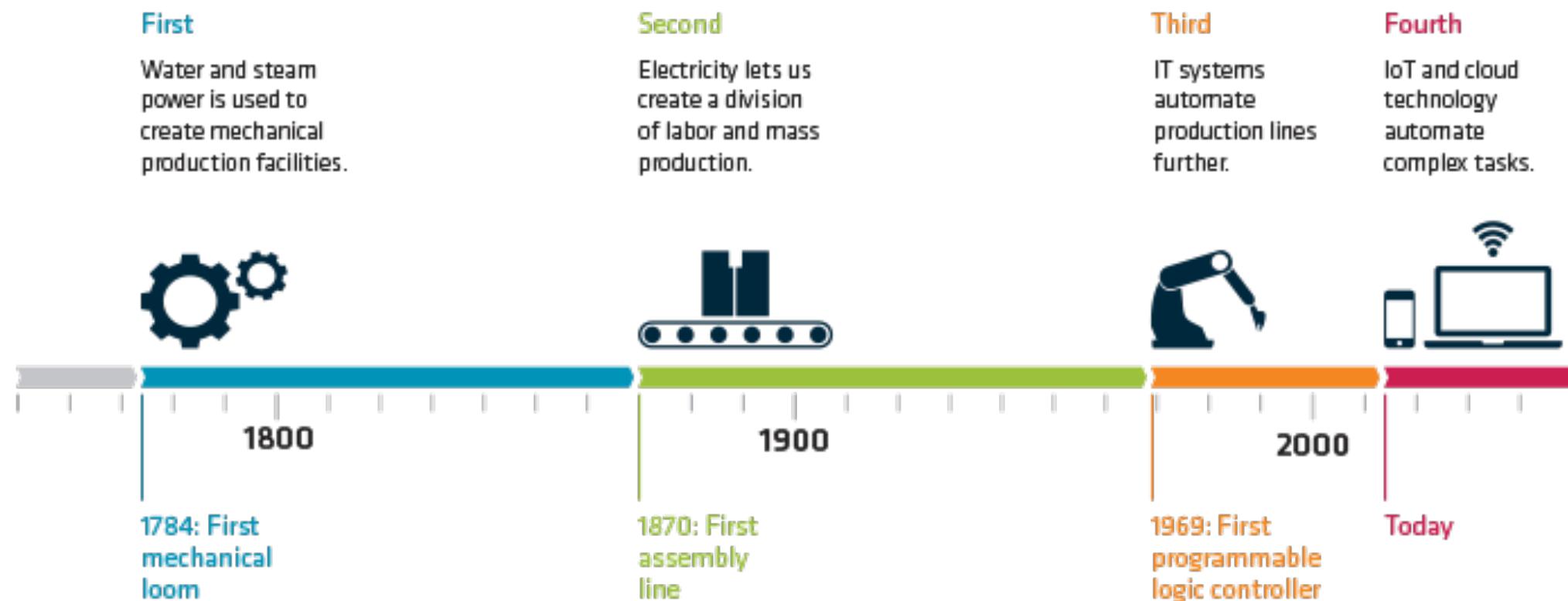
Source: David Milward, PhD CTO, Linguamatics 2017

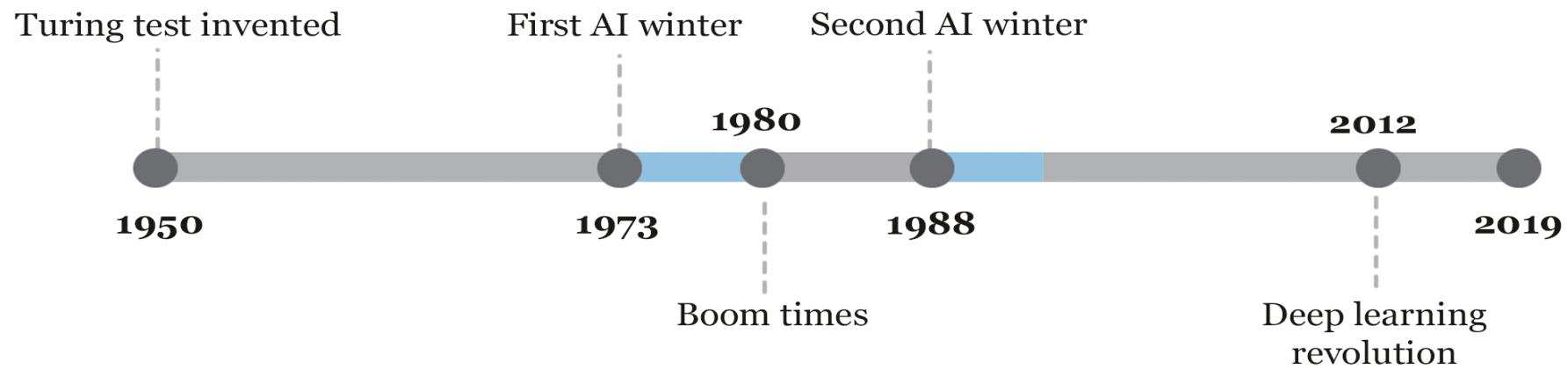
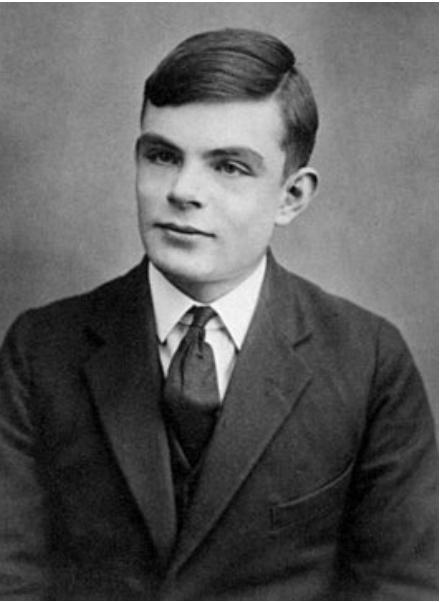
Pace of Innovation

Age of Biotech, Nanotech, New Materials
PERVASIVE COMPUTING

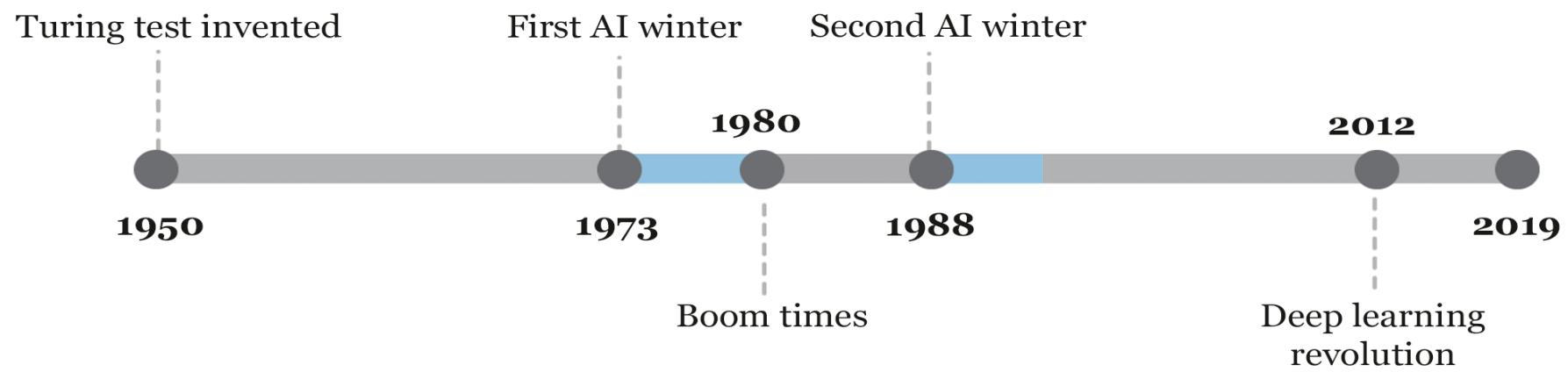
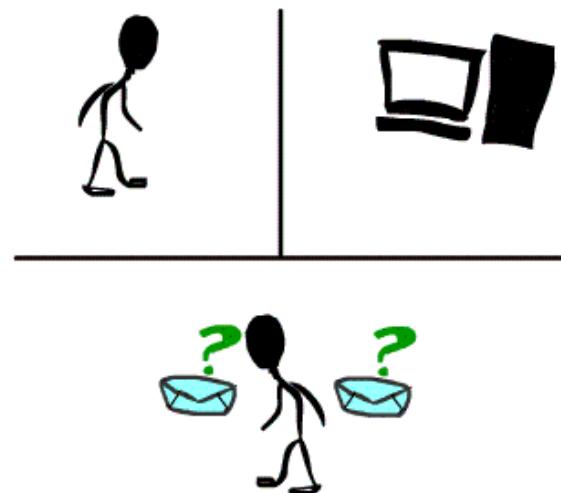


INDUSTRIAL REVOLUTION TIMELINE

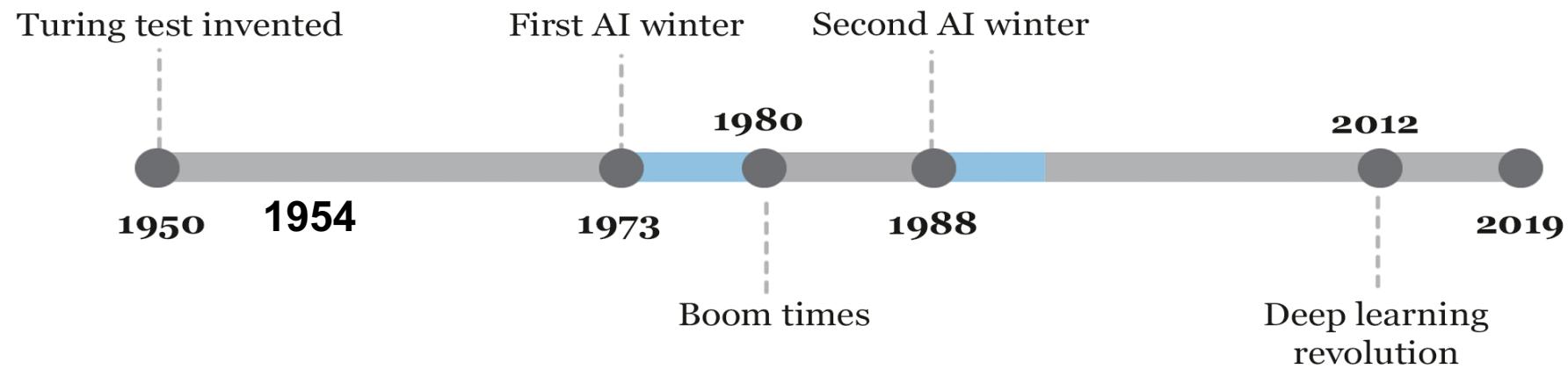
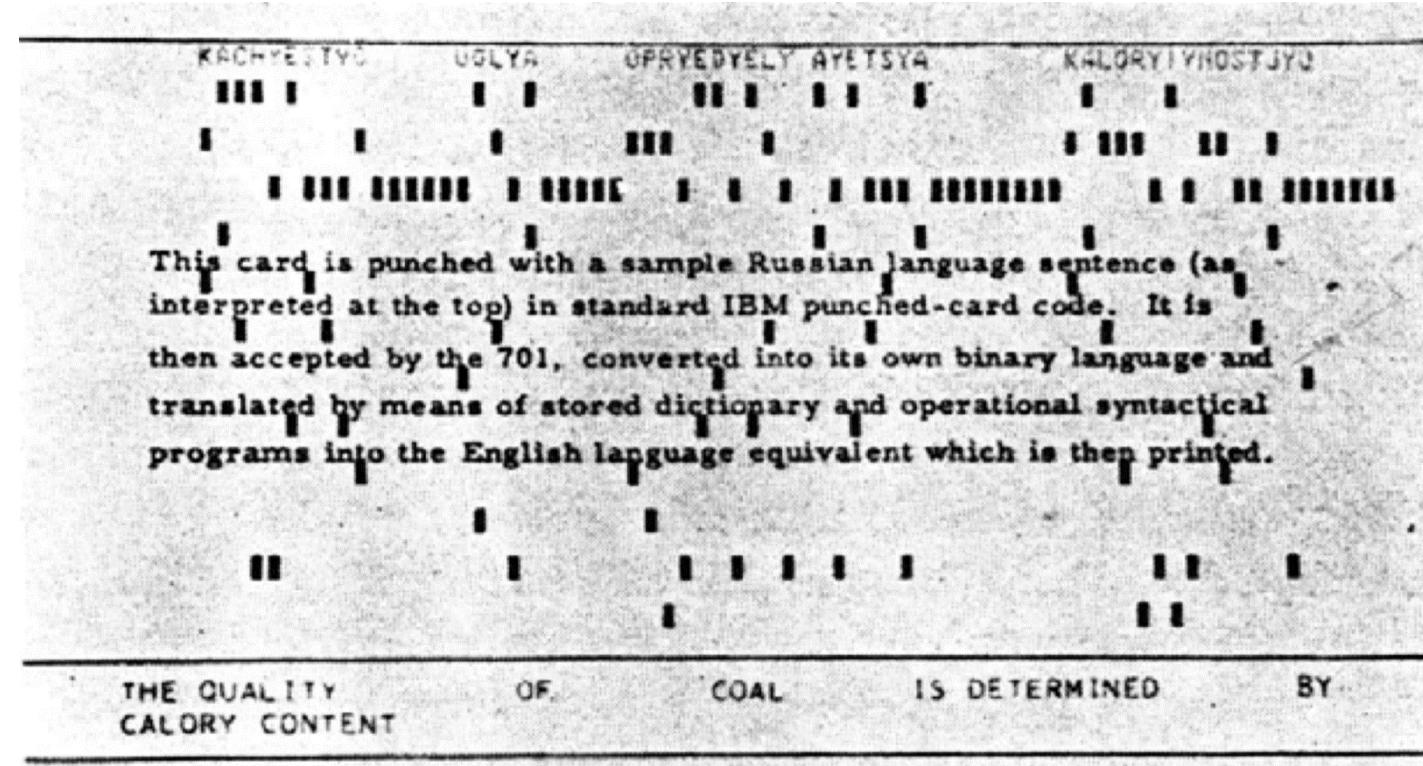




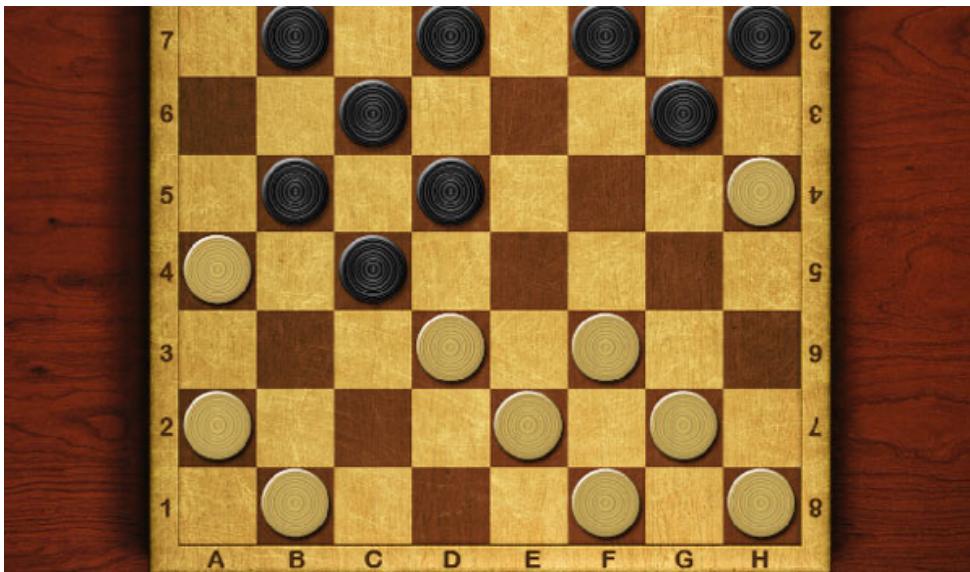
The Imitation Game



First machine translation



Checkers Game



Turing test invented

First AI winter

Second AI winter

1950

1980

2012

1955

1973

2019

Boom times

Deep learning revolution

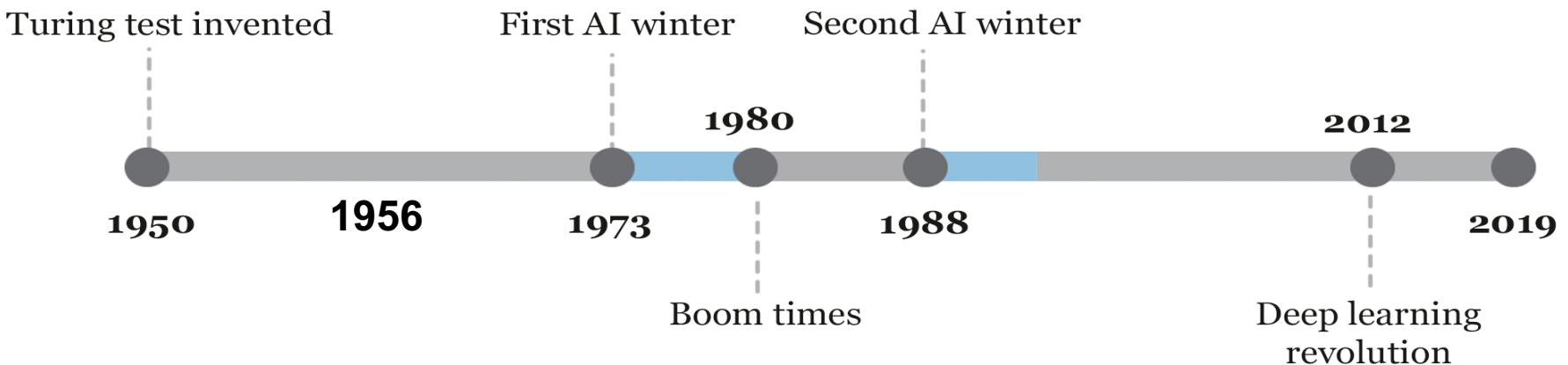
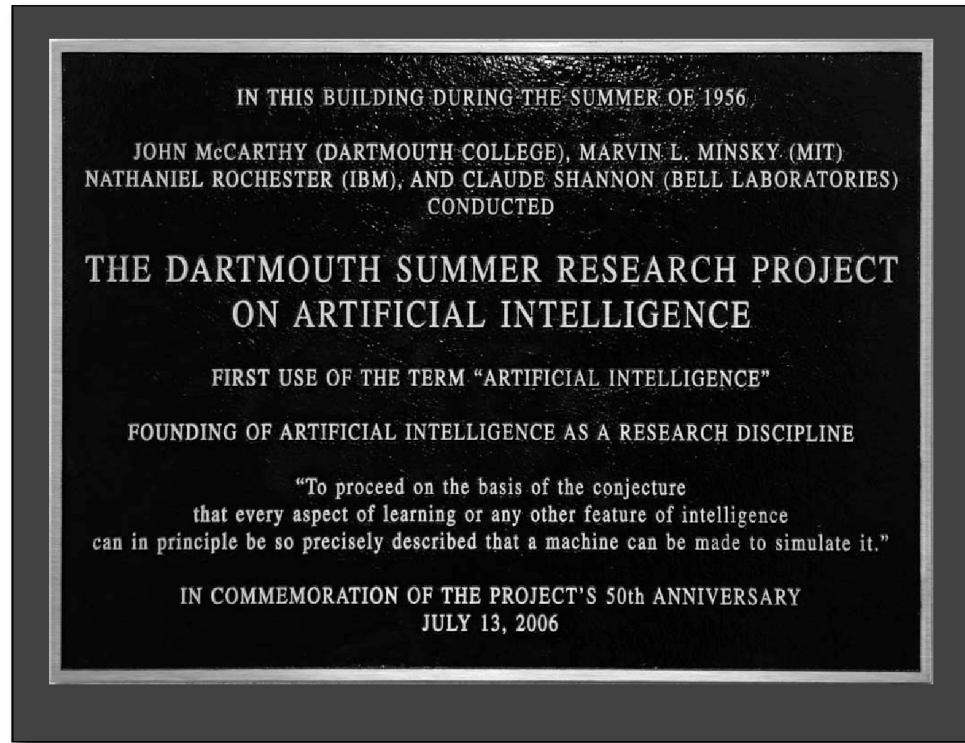
John McCarthy

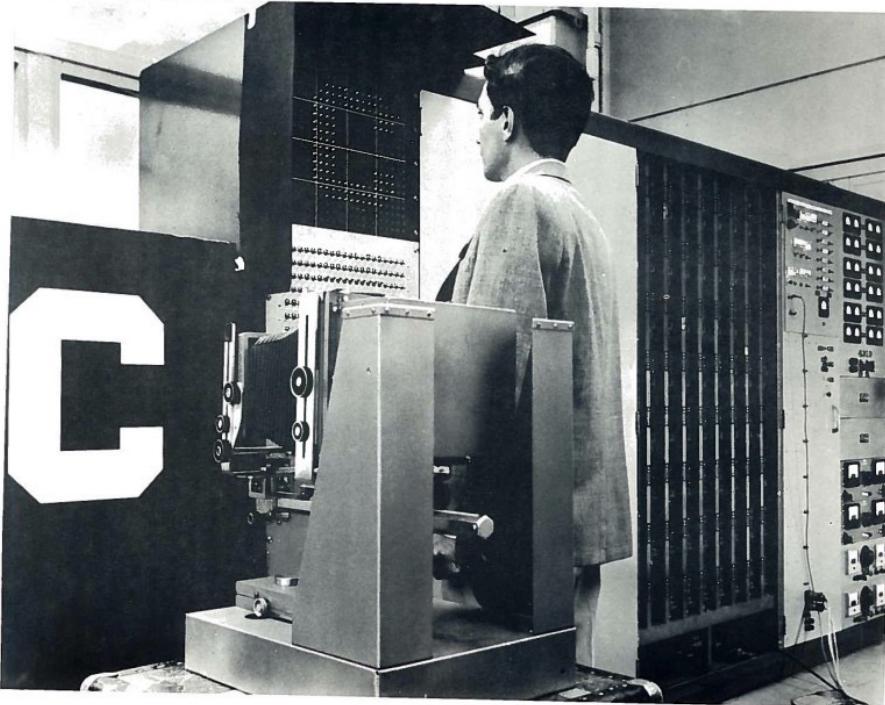


John McCarthy at a conference in 2006

Born	September 4, 1927 Boston, Massachusetts, U.S.
Died	October 24, 2011 (aged 84) Stanford, California, U.S.
Alma mater	Princeton University, California Institute of Technology
Known for	Artificial intelligence, Lisp, circumscription, situation calculus

Father of AI





THE MARK I PERCEPTRON

Turing test invented

First AI winter

Second AI winter

1980

1950

1957

1973

1988

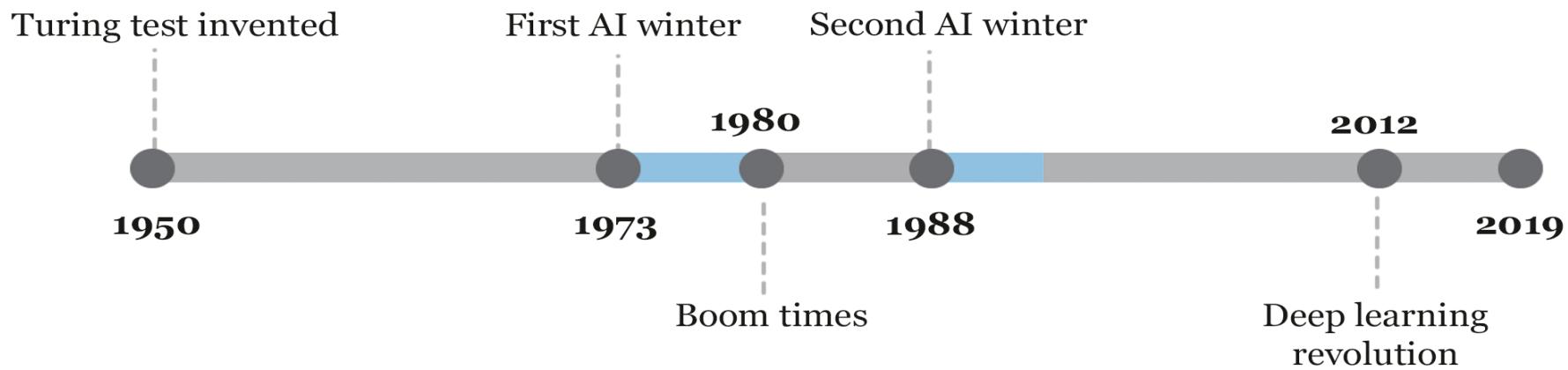
2012

2019

Boom times

Deep learning
revolution

- In 1969, Minsky and Papert's book *Perceptrons* was published. It was a harsh critique on Rosenblatt's perceptrons.
- **The QUIET DECADE | First AI winter**
- New era of AI began to start > a lot more effort was focused on creating commercial products.





AAAI Conference, 1980

Turing test invented

First AI winter

Second AI winter

1950

1973

1988

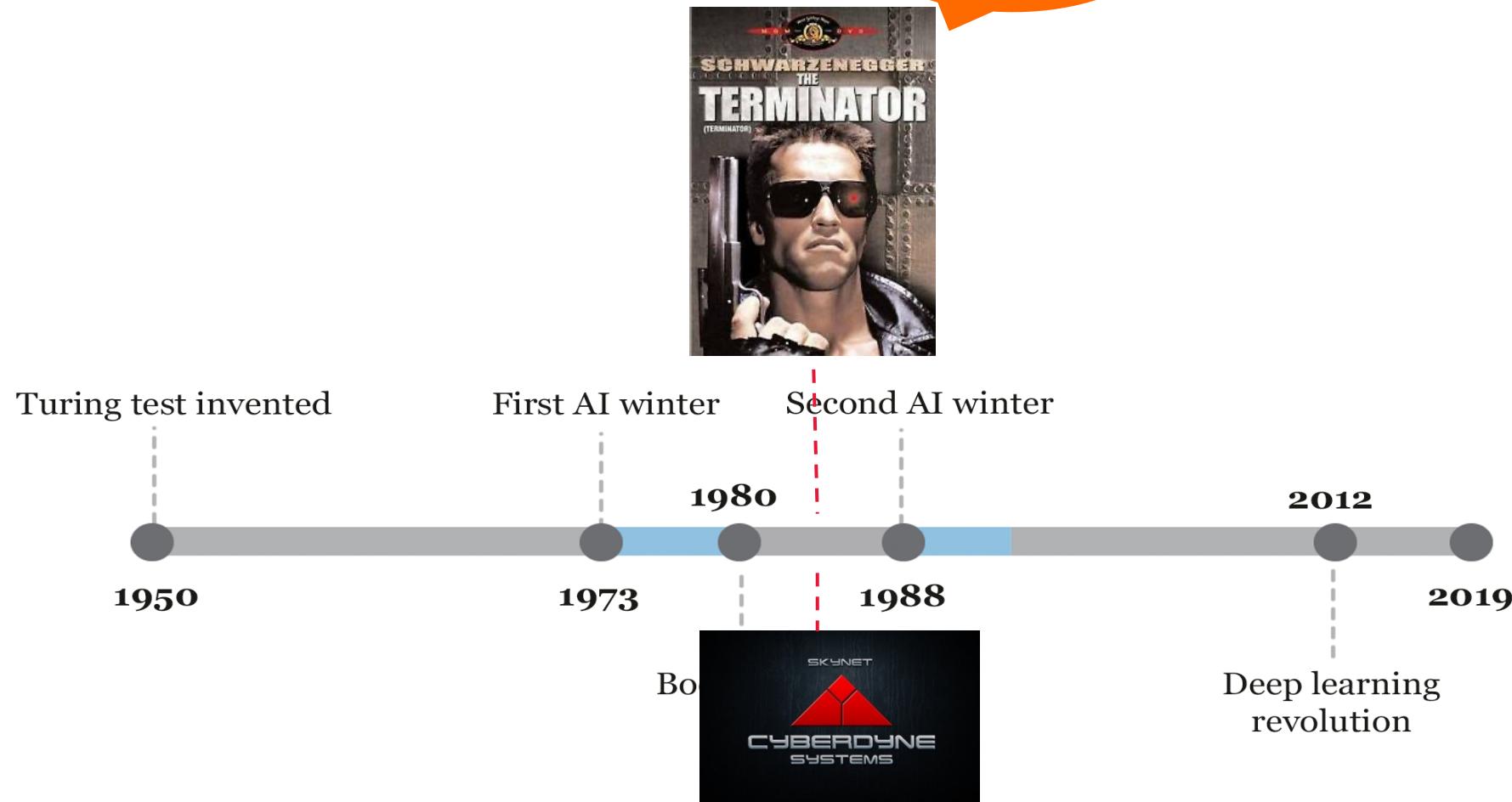
2012

2019

Boom times

Deep learning
revolution

- 1984: John McCarthy criticizes expert systems because they lacked common sense and knowledge about their own limitations
- Described the expert system MYCIN built to diagnose blood infections.



- **2004**-NASA's robotic exploration rovers Spirit and Opportunity autonomously navigate the surface of Mars.
- **2007**-Checkers is solved by a team of researchers at the University of Alberta.
- **2009**-Google builds autonomous car.
- Apple's Siri (**2011**), Google's Google Now (**2012**) and Microsoft's Cortana (**2014**) are smartphone apps that use natural language to answer questions, make recommendations and perform actions.
- **2011**- IBM Watson (a natural language question-answering computer) wins Jeopardy
- **2011**- A convolutional neural network wins the German Traffic Sign Recognition competition with 99.46% accuracy (vs. humans at 99.22%). This was the start of the machine getting the power of vision.

- **ImageNet victory has transformed the AI industry.**[\[105\]](#)

| image-net.org

37.114.94.203:8084 Home Realm Disco... TRIS Beheer My Timesheet - Jira SVN book Discover - Kibana Landingspagina AS... EC TPL

IMAGENET

14,197,122 images, 21841 synsets indexed

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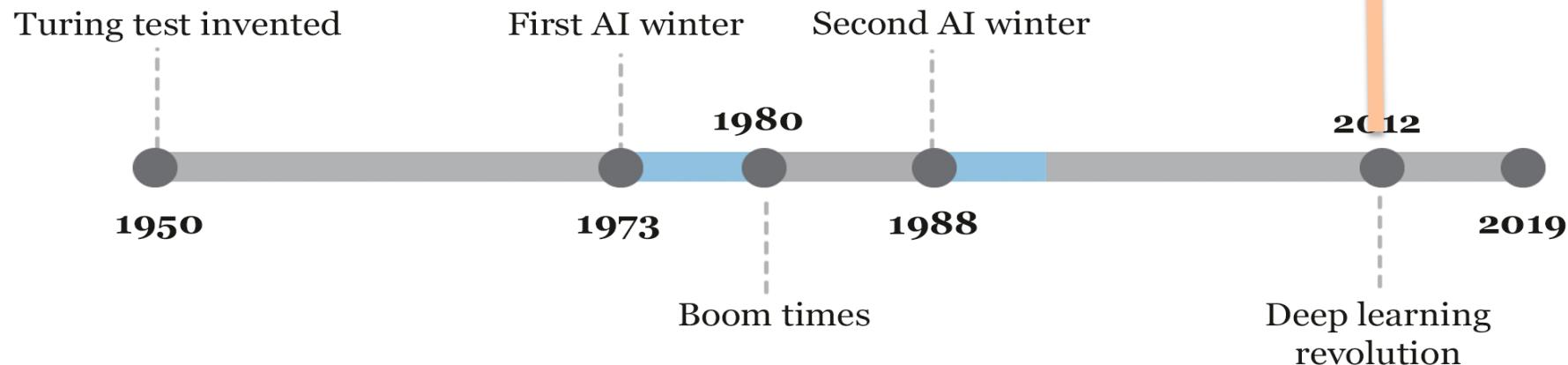
ImageNet is an image database organized according to the WordNet hierarchy (currently only the nouns), in which each node of the hierarchy is depicted by hundreds and thousands of images. Currently we have an average of over five hundred images per node. We hope ImageNet will become a useful resource for researchers, educators, students and all of you who share our passion for pictures.
Click here to learn more about ImageNet, Click here to join the ImageNet mailing list.



What do these images have in common? *Find out!*

Research updates on improving ImageNet data

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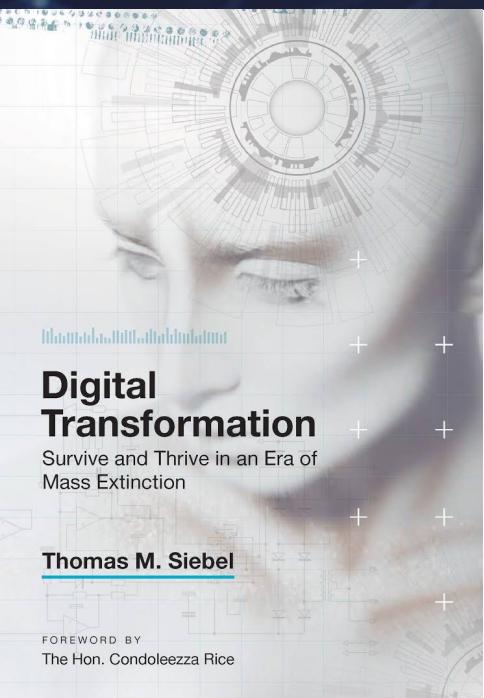
- **2014**-Invention of **GAN** (Generative adversarial network)- By pitting neural networks against one another, Ian Goodfellow created a powerful AI tool. GAN gave machines the power of imagination and creation
- **2015**-the poker AI **Libratus** individually defeated each of its 4 human opponents—among the best players in the world. Poker is an imperfect information game unlike Checkers or Chess.
- **2015- FACESWAP**- App that take a person in an existing image or video and replace them with someone else's likeness using artificial neural networks
- **2015-Tensorflow Release**- Google open-sourced its deep learning framework Tensorflow, this can be considered as one of the important moments because it gave everyone the tool to build great models
- .
- .
- **2019-** Yoshua Bengio, Geoffrey Hinton and Yann LeCun were awarded the **Turing Award** for conceptual and engineering breakthroughs that have made **deep neural networks a critical component of computing**

Articles

The Coming Mass Extinction of Fortune 500 Companies

July 23, 2019

AXIOS



Must-have must-read book for leaders

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Thomas Siebel



Thomas Siebel in 2013

Born	Thomas M. Siebel November 20, 1952 (age 67) Chicago, Illinois, US
Nationality	United States
Education	University of Illinois at Urbana-Champaign
Occupation	Software developer and investor
Known for	Founder of Siebel Systems , C3.ai
Net worth	▲ \$2.9 billion (January 2018) ^[1]
Spouse(s)	Stacey Siebel
Children	4 ^[1]
Parent(s)	Arthur F. Siebel Ruth Schmid
Website	Thomas M. Siebel

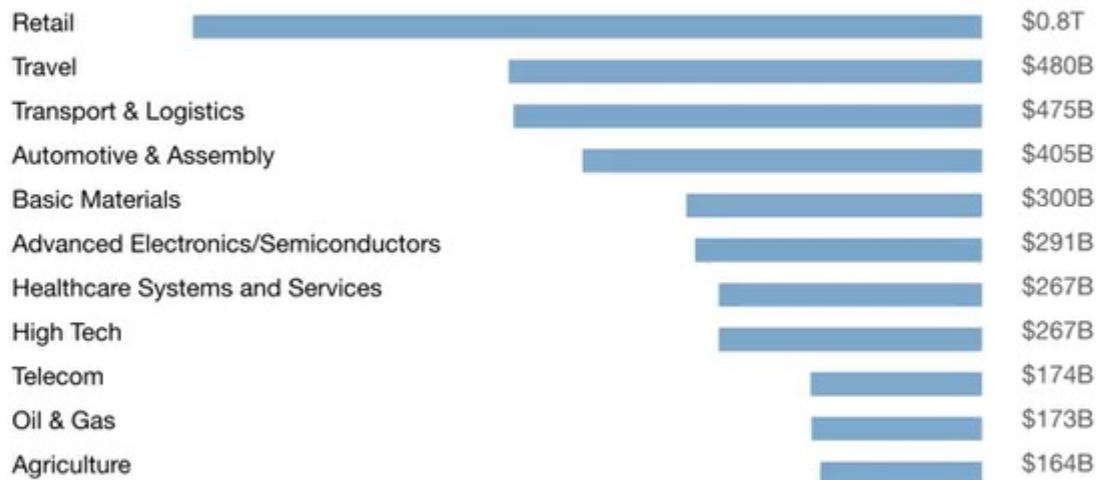
Internal

Why now

Introduction

AI value creation
by 2030

\$13
trillion

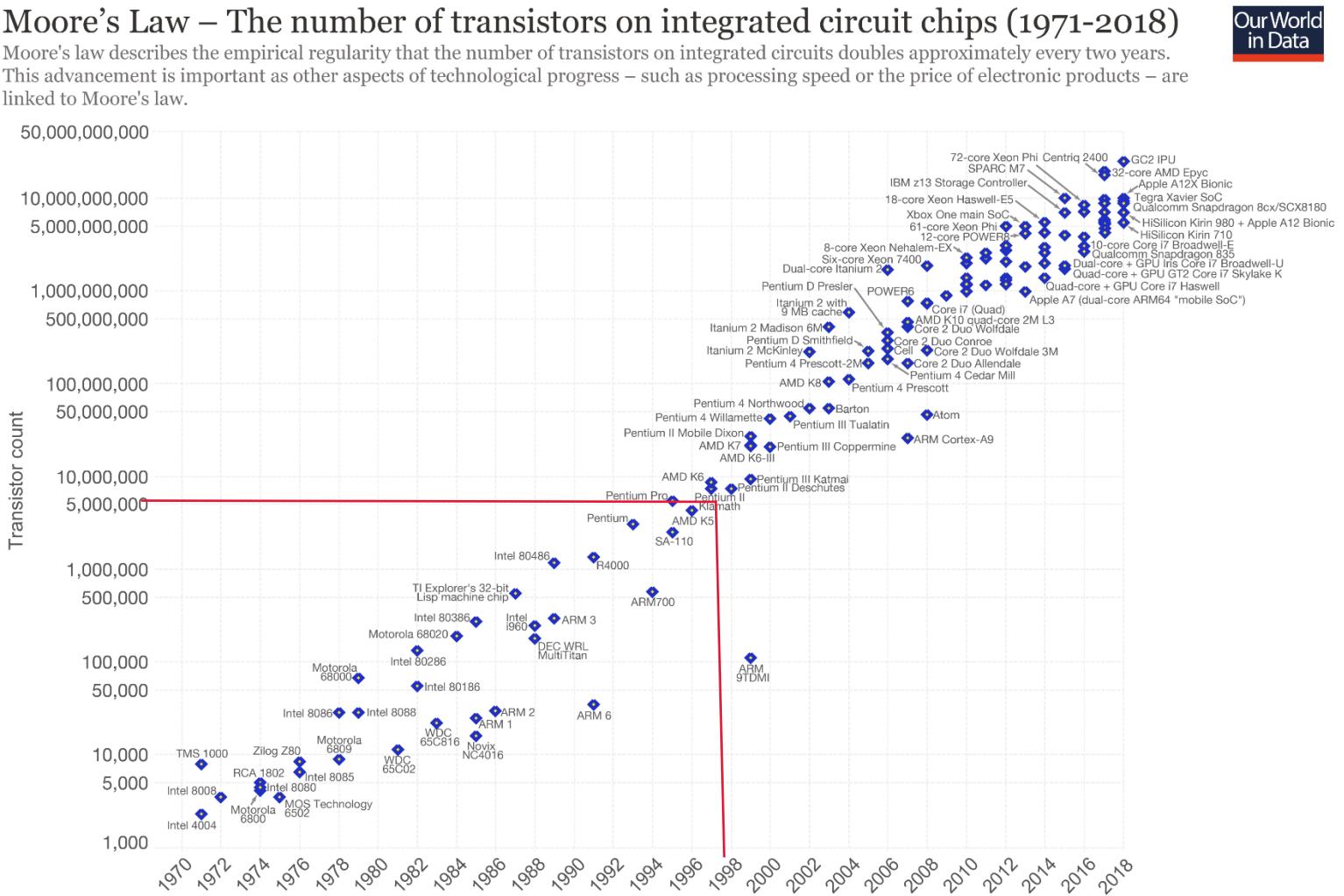
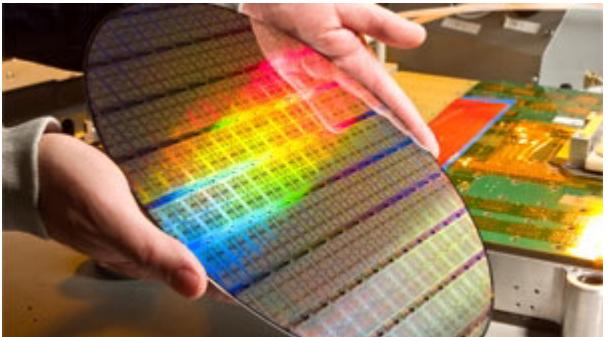


[Source: McKinsey Global Institute.]

Why now

Massive computation available at low cost

Parallel computation



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Data source: Wikipedia (https://en.wikipedia.org/wiki/Transistor_count)
The data visualization is available at [OurWorldInData.org](#). There you find more visualizations and research on this topic.

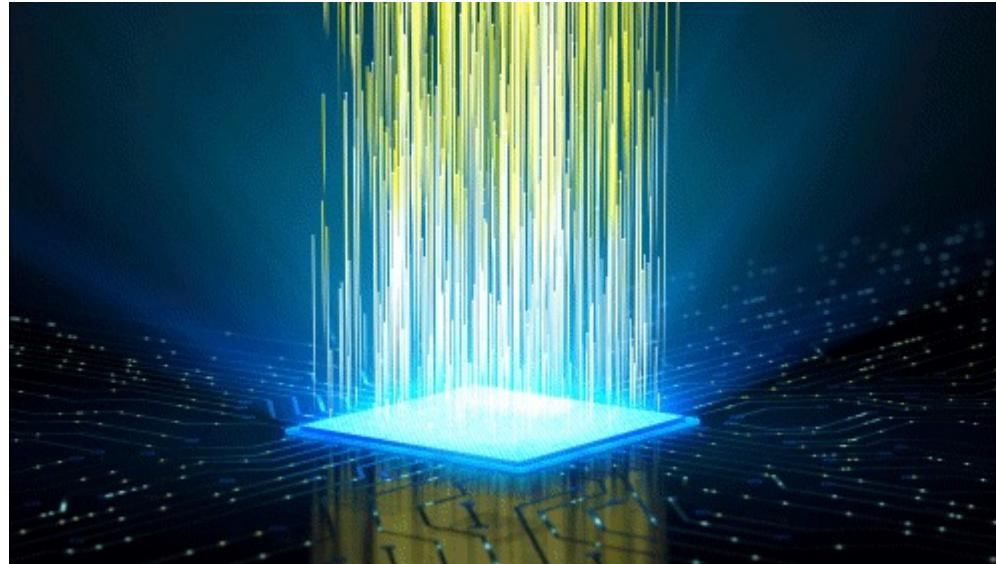
Licensed under CC-BY-SA by the author M

Why now

Why now

GPU

Massive computation
available at low cost

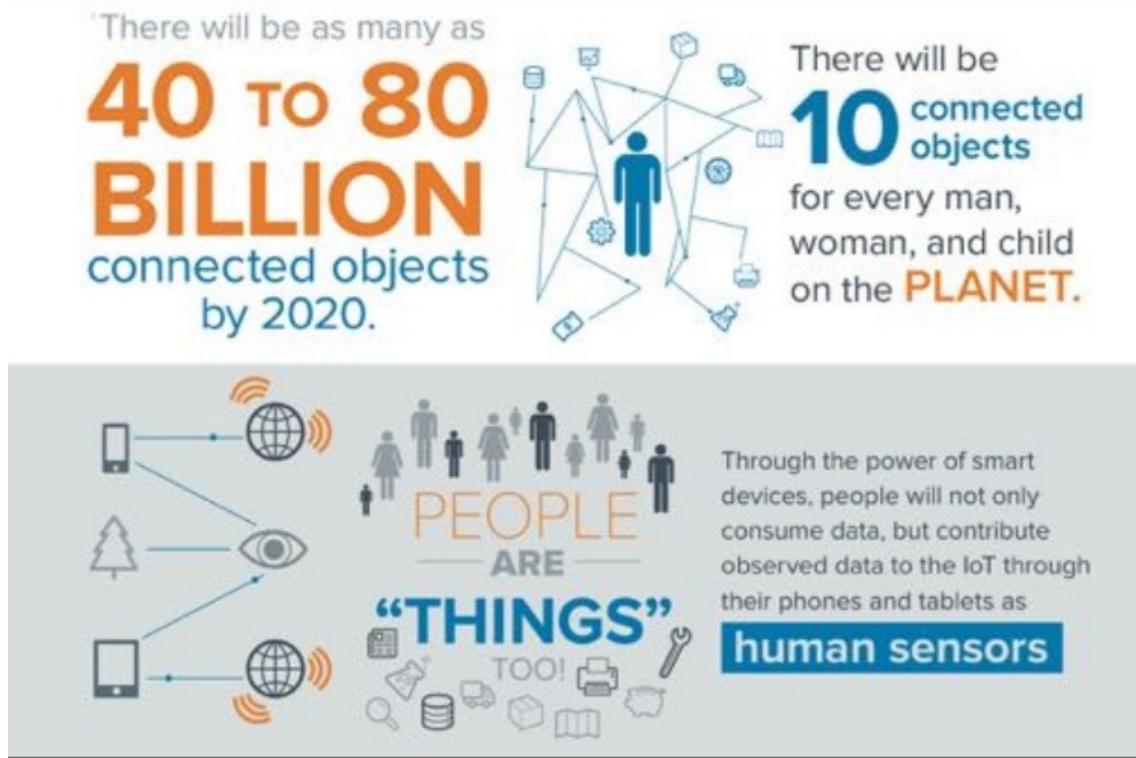


Why now

Massive computation available at low cost

Amount of data doubling every 2 years

Ease of use of ML and AI Platforms



Internal

Why now

Why now



Ease of use of ML and AI Platforms

Magic quadrant of ML Platforms

Internal

Why now

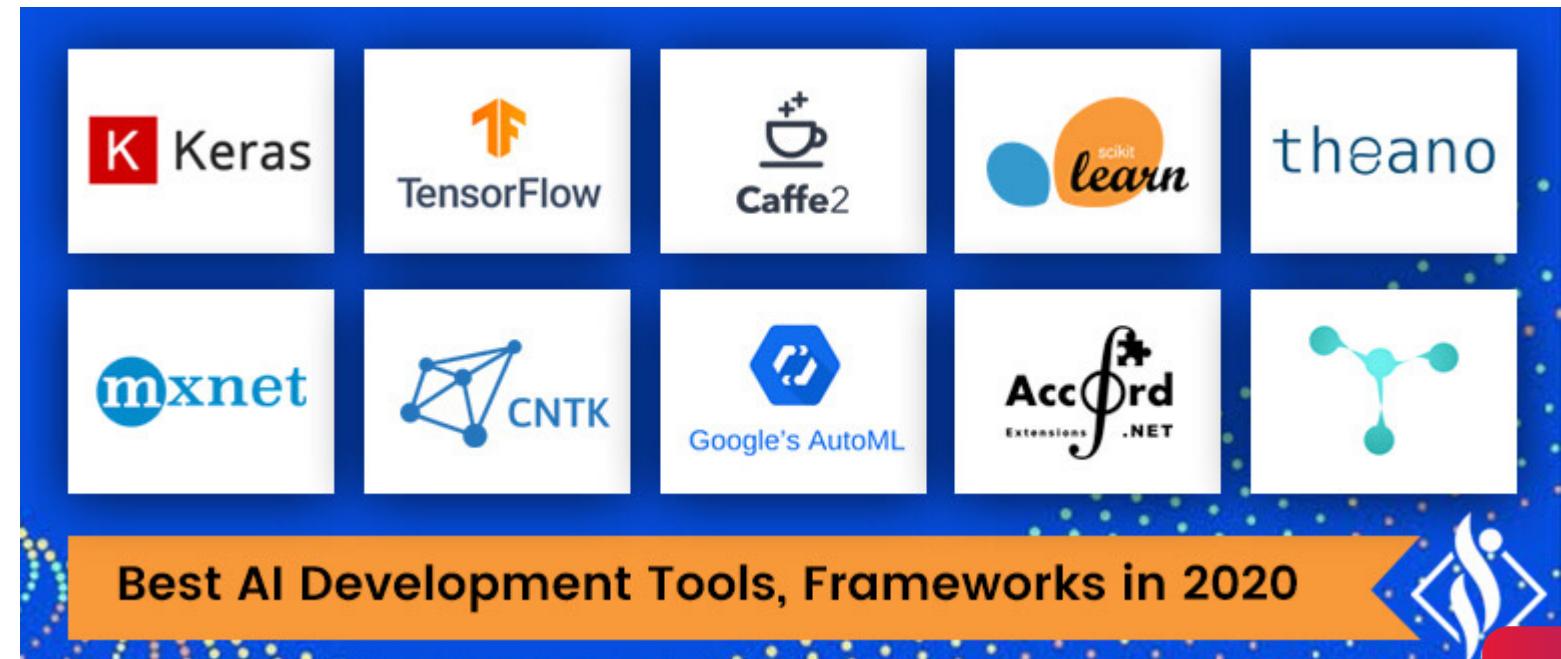
Why now

Massive computation available at low cost

Amount of data doubling every 2 years

Ease of use of ML and AI Platforms

New development tools and paradigms



Why now

Massive computation available at low cost

Amount of data doubling every 2 years

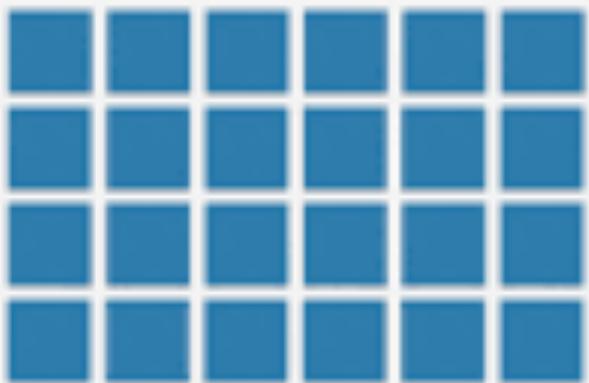
Ease of use of ML and AI Platforms

New development tools and paradigms

Expectations for apps to be intelligent



Structured Data



What you find in a DB
(typically)

Unstructured Data

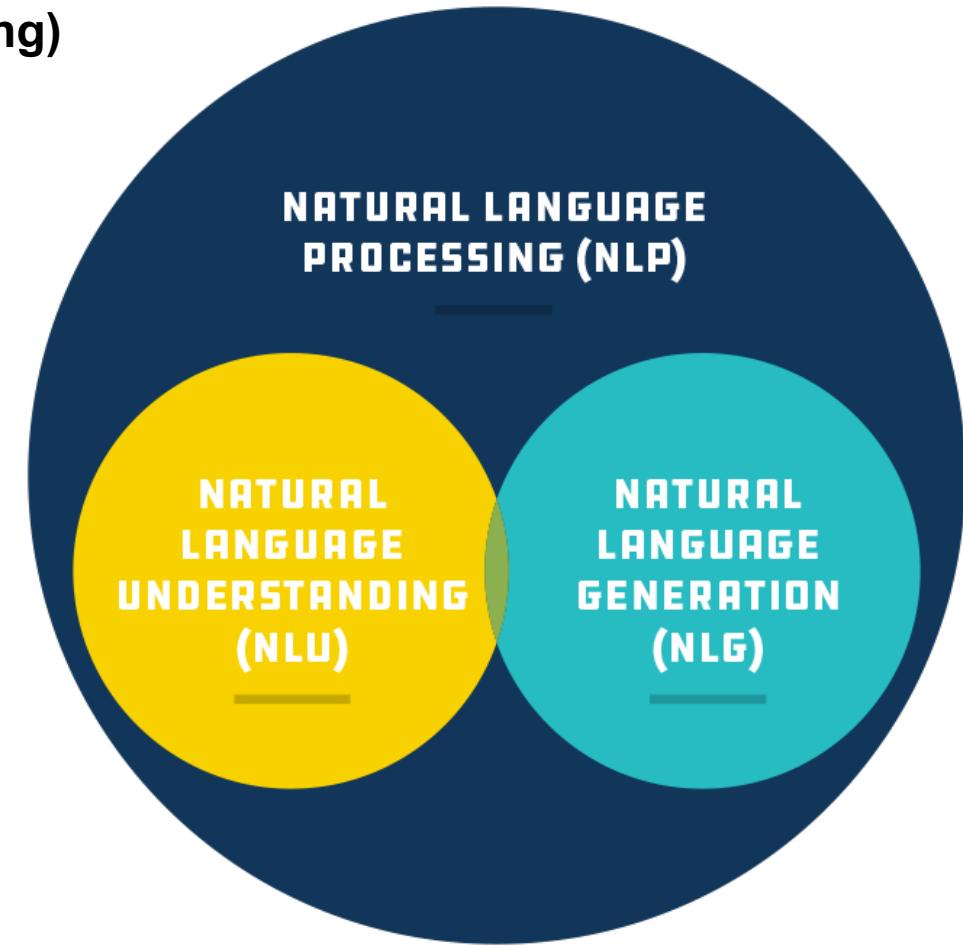


What you find in the 'wild'
(text, images, audio, video)

AI in Voice & Text processing (in Language Processing)



Speech recognition
Speech detection
Speech reconstruction



Existing AI-based voice applications/devices



Google
ASSISTANT

amazon alexa

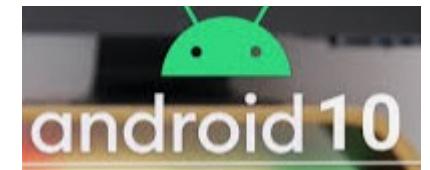
Siri



**Identify songs
playing around you**

Shazam will name your song in seconds

Live captioning



Live captioning and translating



AI in Voice & Text processing (in Language Processing)

I am hungry
I don't have time to
"Please, what? Who are you and what am I?" Her tone of voice remained as quiet as the darkness before him. The silence and the silence as well.
"How about, help me?" Blake asked.
Ruby's grin grew wider, as if she heard just about her only true expression. She turned to look Yang in the eye. Her smile was more than just an expression. Her eyes sparkled, her eyes so bright that there was literally no way she could understand the feeling of what Ruby was saying. "I'm happy. I feel all happy around me."
That was what she was hoping. At least, until she saw that her smile had also changed into a more sympathetic expression with the words "I'm happy."
"I'm happy" she sighed.
Blake took a second to take in the sudden change in expression without blinking. Her lips curled and closed, her hands reaching around to release her hands. After they began to take on a more peaceful tone, the redhead raised her head down into the air, breathing deeply into her eyes.

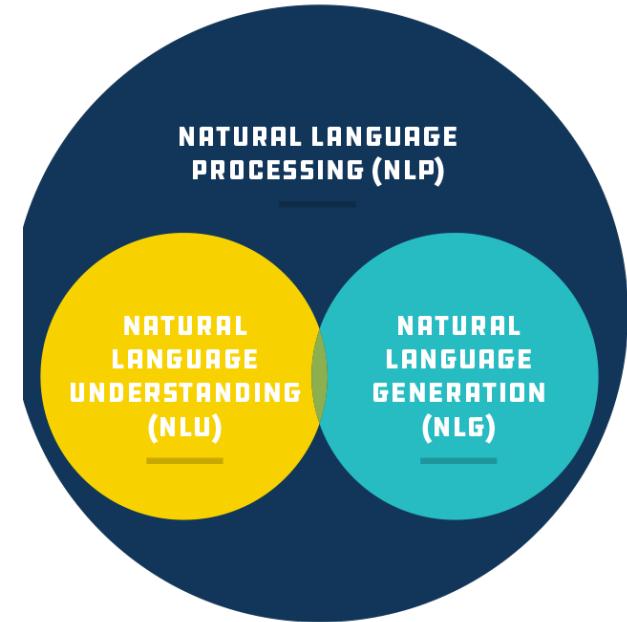
Text Generation API

95 · share

The text generation API is backed by a large-scale unsupervised language model that can generate paragraphs of text. This transformer-based language model, based on the GPT-2 model by OpenAI, intakes a sentence or partial sentence and predicts subsequent text from that input.

I am hungry

Submit



API Docs



Predictive typing – Gmail Autocorrection Sentiment analysis

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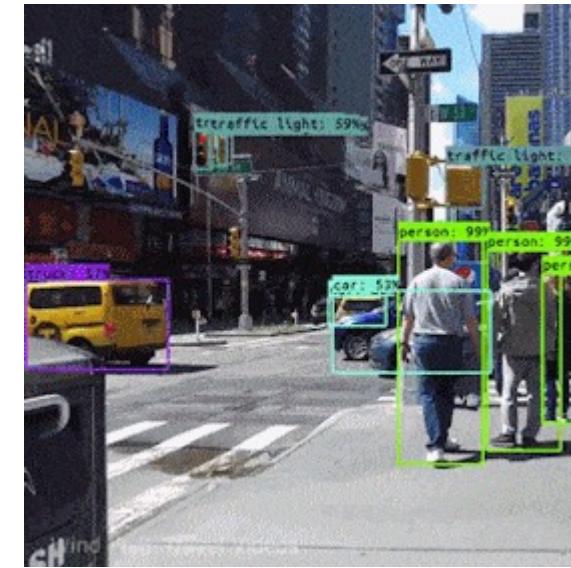
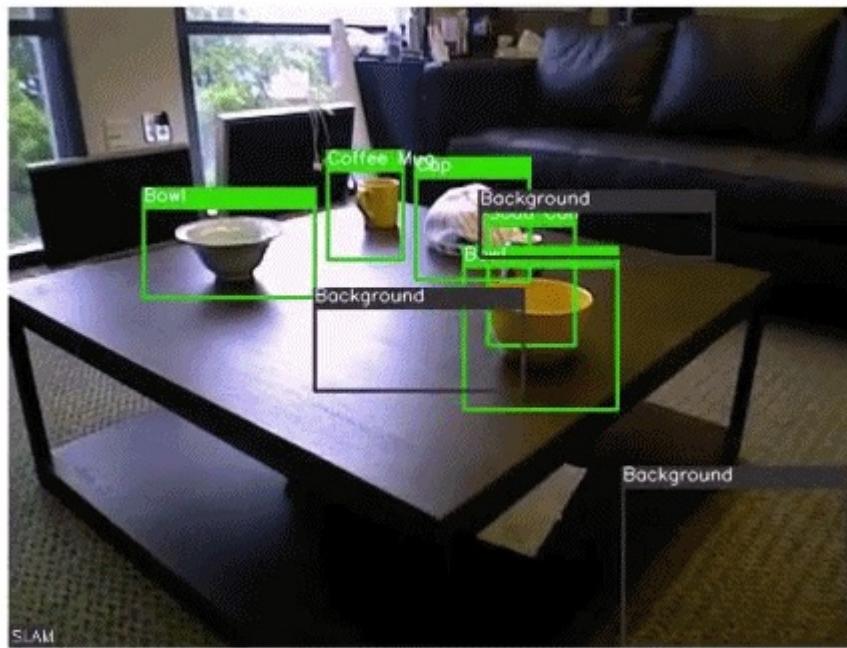
GPT2 – OpenAI (2019)

Play time: <https://deepai.org/machine-learning-model/text-generator>

AI and
datatype

AI for video analyses (Computer Vision)

- Object detection
- Object tracking
- Object recognition
- Object classification
- Object identification



AI in Tabular data

Google open-sourced [Table Parser](#) (TAPAS), a deep-learning system that can answer natural-language questions from tabular data. TAPAS was trained on 6.2 million tables extracted from Wikipedia and matches or exceeds state-of-the-art performance on several benchmarks.

Table				Example questions		
Rank	Name	No. of reigns	Combined days	#	Question	Answer
1	Lou Thesz	3	3,749	1	<i>Which wrestler had the most number of reigns?</i>	Ric Flair
2	Ric Flair	8	3,103	2	<i>Average time as champion for top 2 wrestlers?</i>	$\text{AVG}(3749,3103)=3426$
3	Harley Race	7	1,799	3	<i>How many world champions are there with only one reign?</i>	$\text{COUNT}(\text{Dory Funk Jr., Gene Kiniski})=2$
4	Dory Funk Jr.	1	1,563	4	<i>What is the number of reigns for Harley Race?</i>	7
5	Dan Severn	2	1,559			
6	Gene Kiniski	1	1,131			

A table and questions with the expected answers. Answers can be selected (#1, #4) or computed (#2, #3).

4 BIG CHARACTERISTICS OF TIME SERIES:

- (1) Seasonal variations that repeat over a specific period such as a day, week, month, season, etc.,**
- (2) Trend variations that move up or down in a reasonably predictable pattern**
- (3) Cyclical variations that correspond with business or economic 'boom-bust' cycles or follow their own peculiar cycles, and**
- (4) Random variations that do not fall under any of the above three classifications.**

AI in Time series - remote sensing data

- Change detection (health, pest, plant invasive species, disaster)
- Agriculture type classification
- Tree species classification

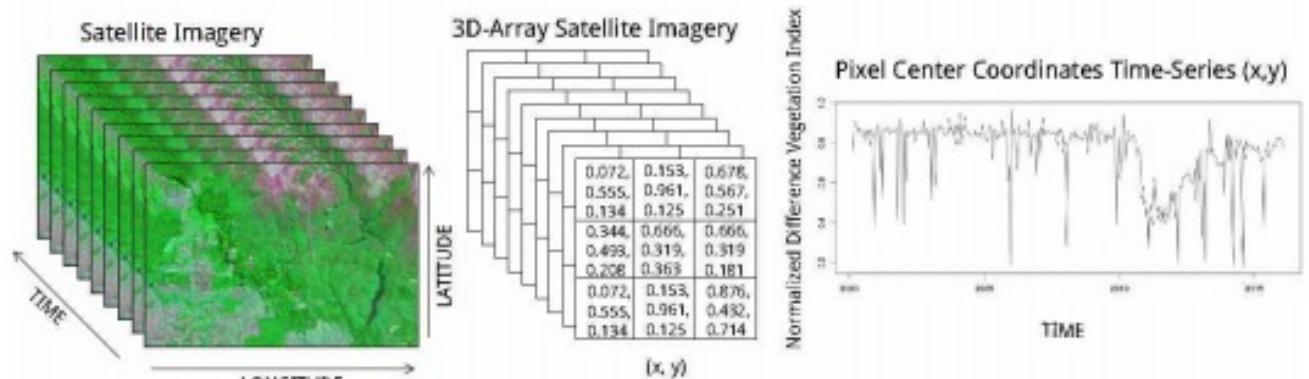
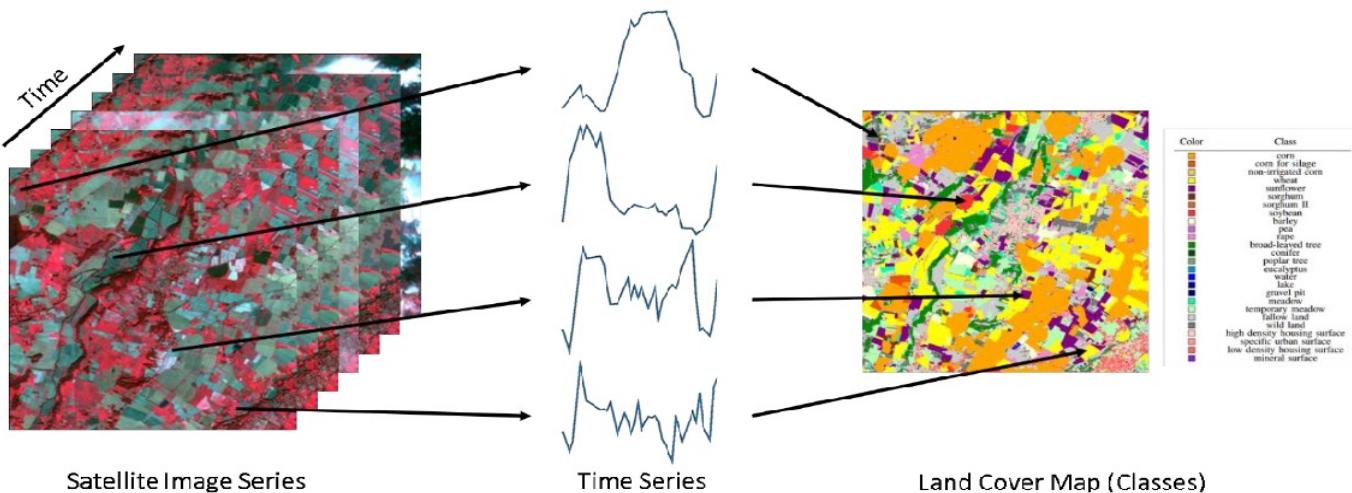


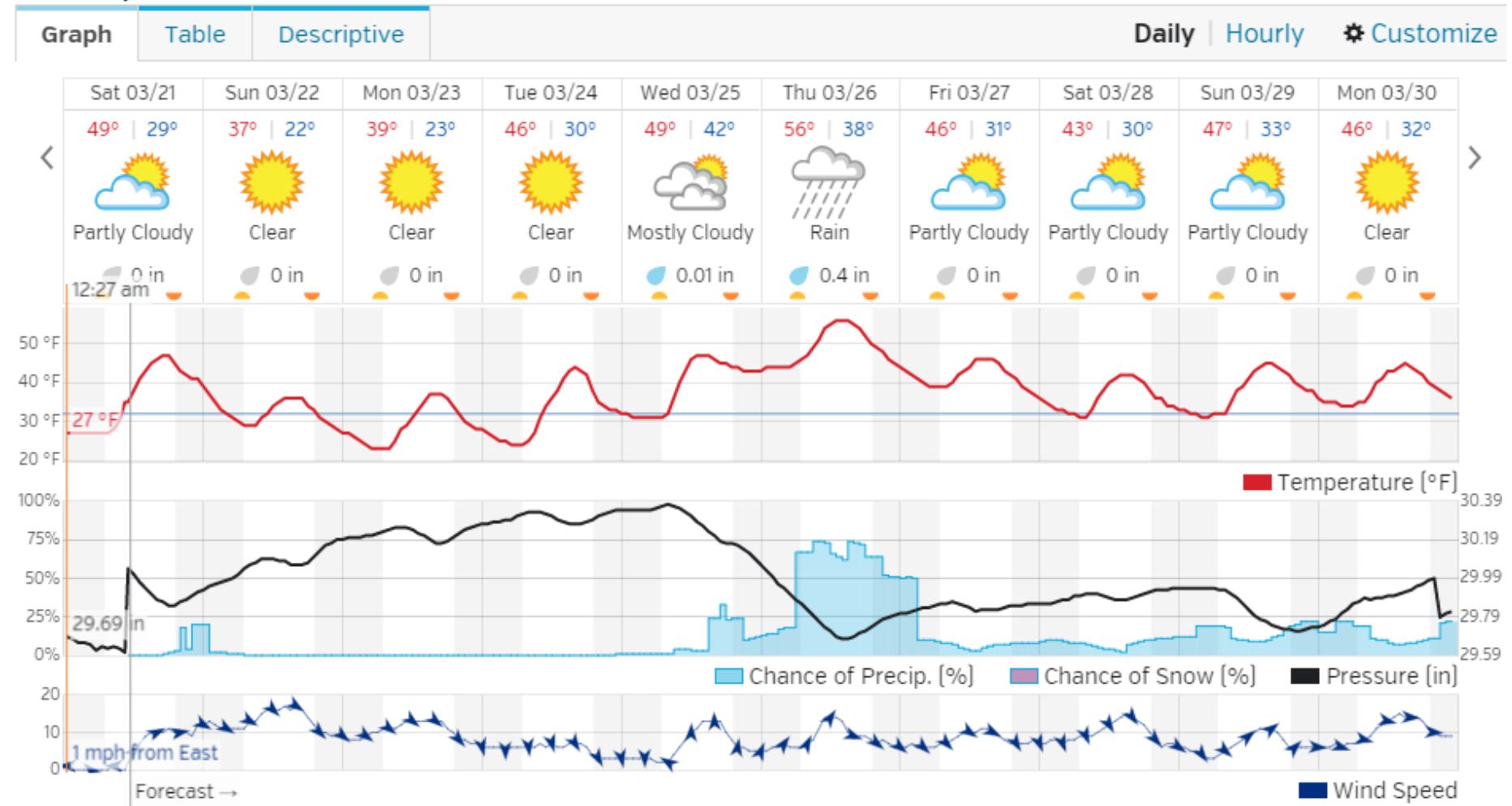
Figure 1: A Normalized Difference Vegetation Index (NDVI) time series



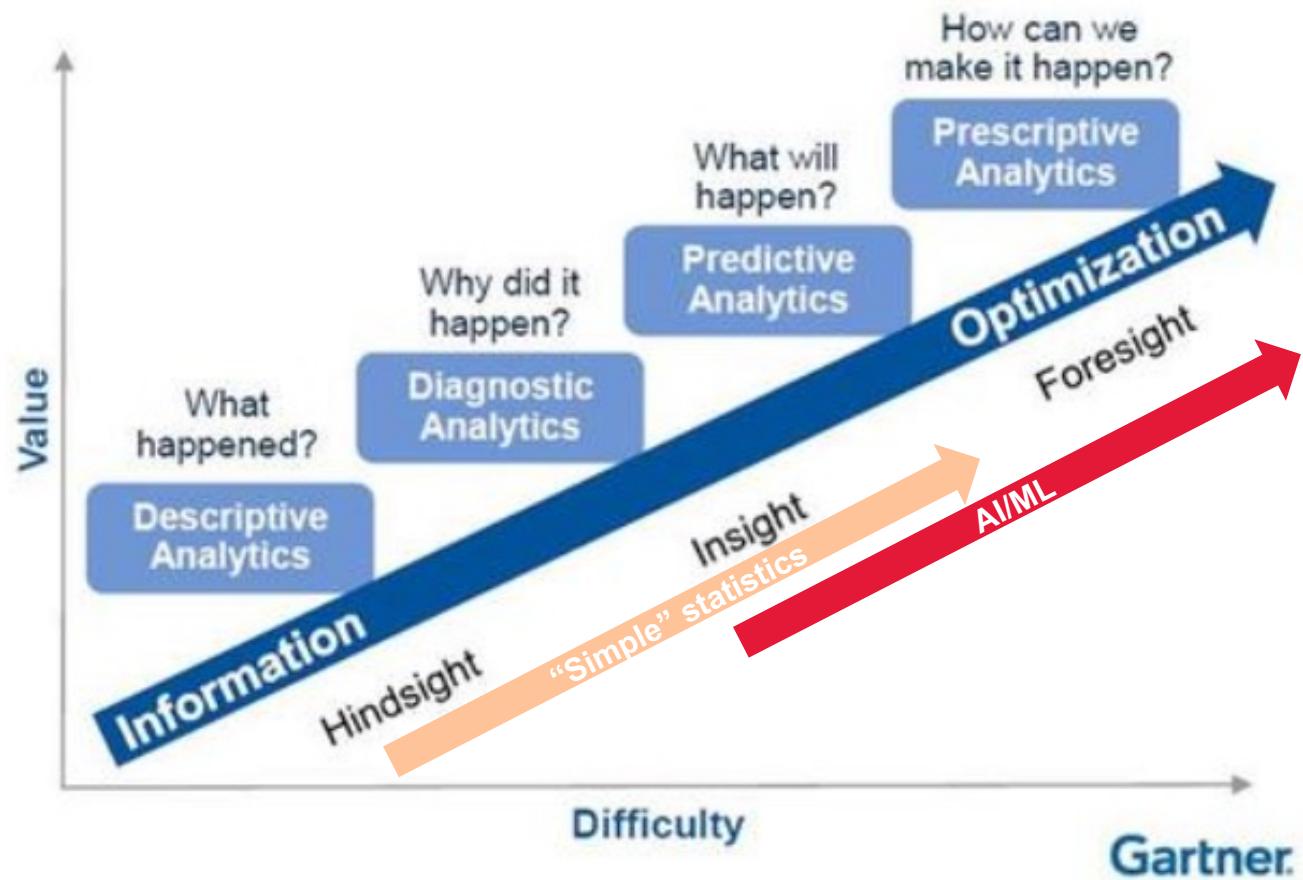
AI in Time series data

Examples of Time Series AI applications

10-Day Weather Forecast



What AI can do?



General ethical concerns surrounding Artificial Intelligence

- As *Artificial Intelligence is gaining traction*, ethical considerations and constraints related to the technologies are becoming increasingly urgent.
- Technology giants occupying 95% of the industry landscape have differing opinions about the ramification of AI and Machines at Work concept.

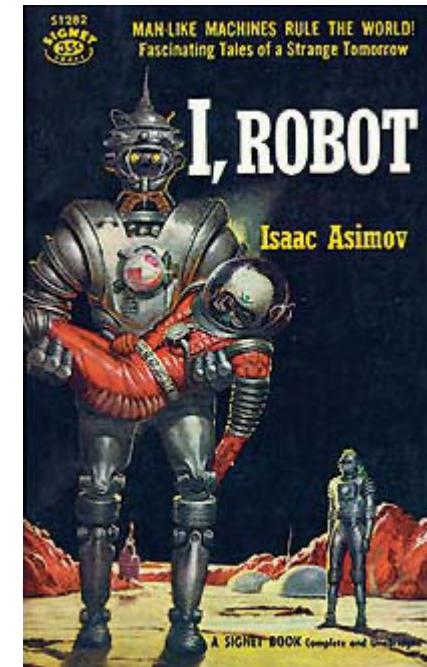
General ethical concerns include:

- *Balancing* between benefits and risks of AI
- *Regulating* the machine and system behavior
- *Placing* ethical decision during adoption/development



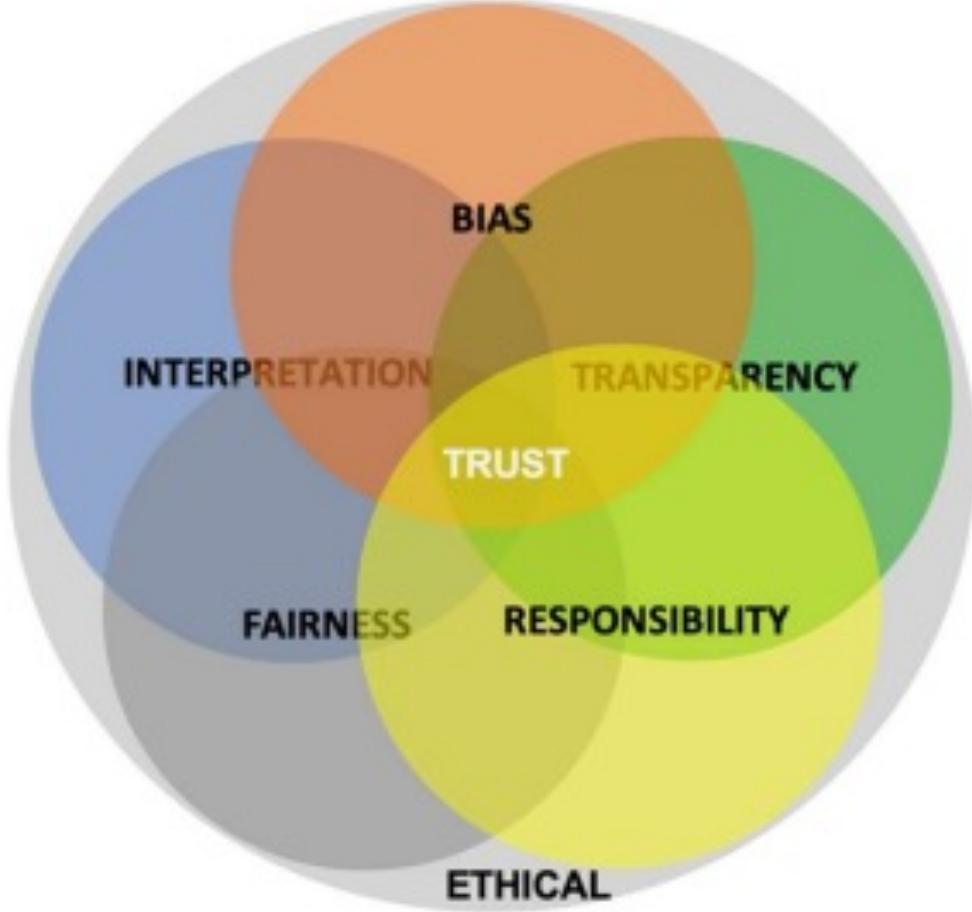
Asimov's three laws of robotics

1. A robot *may not injure* a human being or, through inaction, allow a human being to come to harm
2. A robot *must obey* the orders given to it by human beings except where such orders would conflict the first law
3. A robot *must protect* its own existence as long as the protection does not conflict with the First or Second law.



SOURCE:
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Artificial Intelligence-Ethical and trustworthy



https://www.actiac.org/system/files/Ethical%20Application%20of%20AI%20Framework_0.pdf

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Artificial Intelligence-Ethical and trustworthy



<https://docs.microsoft.com/en-us/azure/cloud-adoption-framework/innovate/best-practices/trusted-ai>

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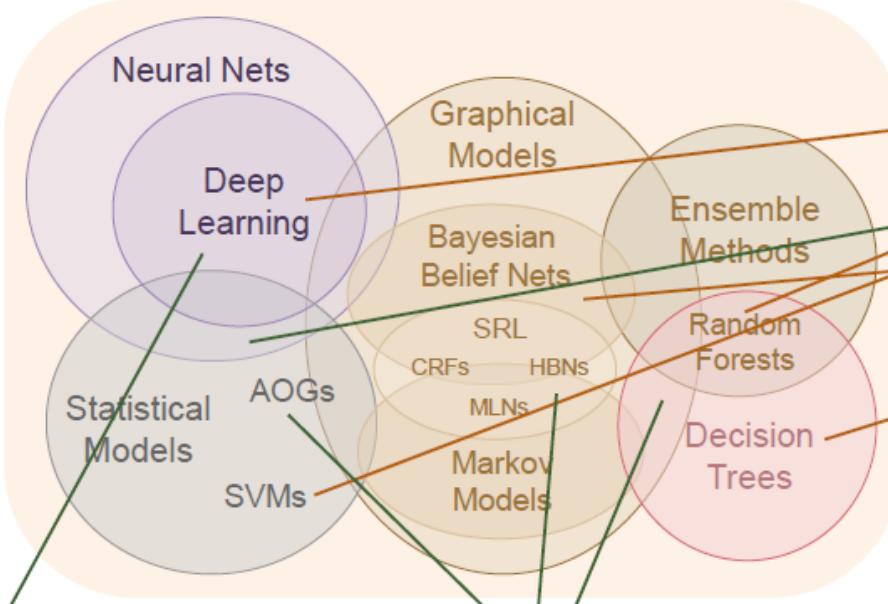


The Need for Explainable AI-XAI

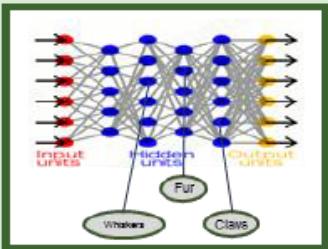
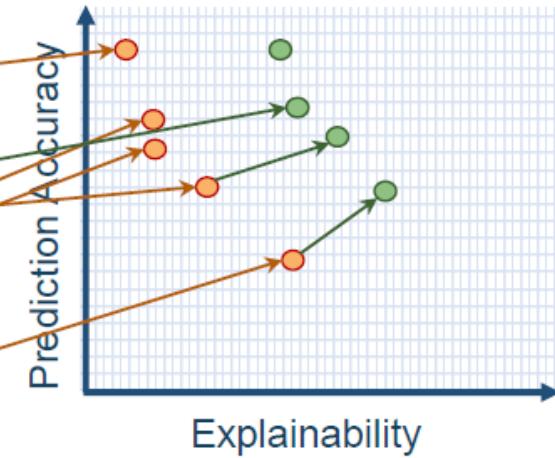
New Approach

Create a suite of machine learning techniques that produce more explainable models, while maintaining a high level of learning performance

Learning Techniques (today)

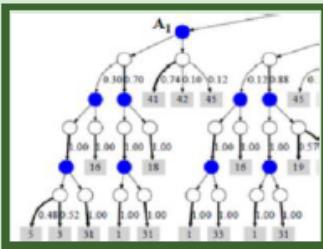


Explainability (notional)



Deep Explanation

Modified deep learning techniques to learn explainable features



Interpretable Models

Techniques to learn more structured, interpretable, causal models

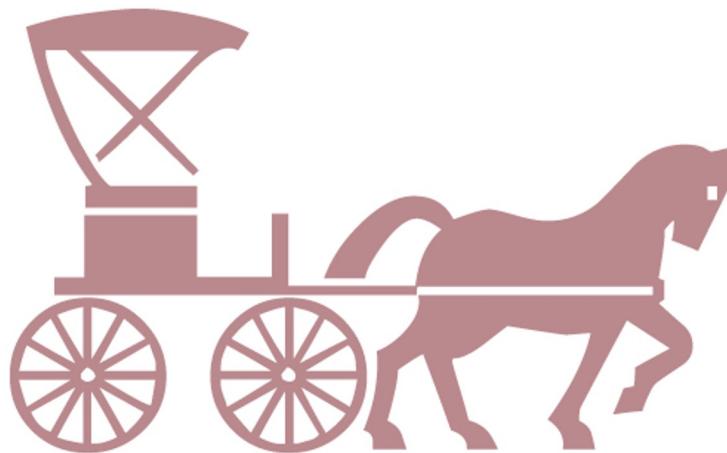
The Need for Explainable AI-XAI

- The current generation of AI systems offer tremendous benefits, but their effectiveness will be limited by the machine's inability to explain its decisions and actions to users.
- Explainable AI will be essential if users are to understand, appropriately trust, and effectively manage this incoming generation of artificially intelligent partners.
- The target of XAI is an end user who:
 - depends on decisions, recommendations, or actions of the system
 - needs to understand the rationale for the system's decisions to understand, appropriately trust, and effectively manage the system
- The XAI concept is to:
 - provide an explanation of individual decisions
 - enable understanding of overall strengths & weaknesses
 - convey an understanding of how the system will behave in the future
 - convey how to correct the system's mistakes(perhaps)

Ethics behind Autonomous vehicle

Although this a specific case study, the concept of Autonomous vehicle is gaining popularity.

When horses were replaced by humans driving and now humans to be replaced by machine with unknowns regarding the judgment call and moral decisions.



<https://www.moralmachine.net/>

SOURCE:

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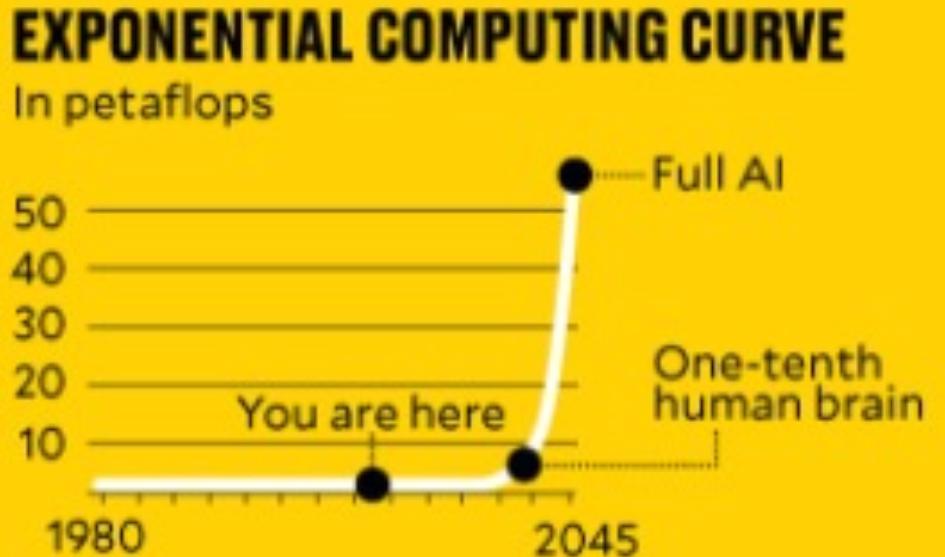
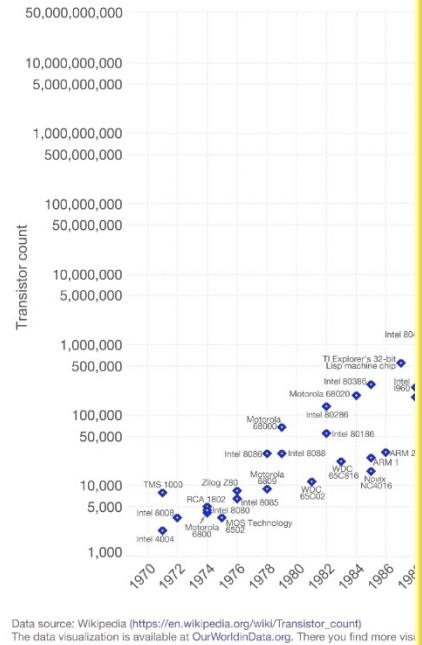
Internal

48

Future of AI

Moore's Law – The number of transistors on integrated circuit chips (1971-2018) OurWorld

Moore's law describes the empirical regularity that the number of transistors per integrated circuit doubles approximately every two years. This advancement is important as other aspects of technology have also been linked to Moore's law.

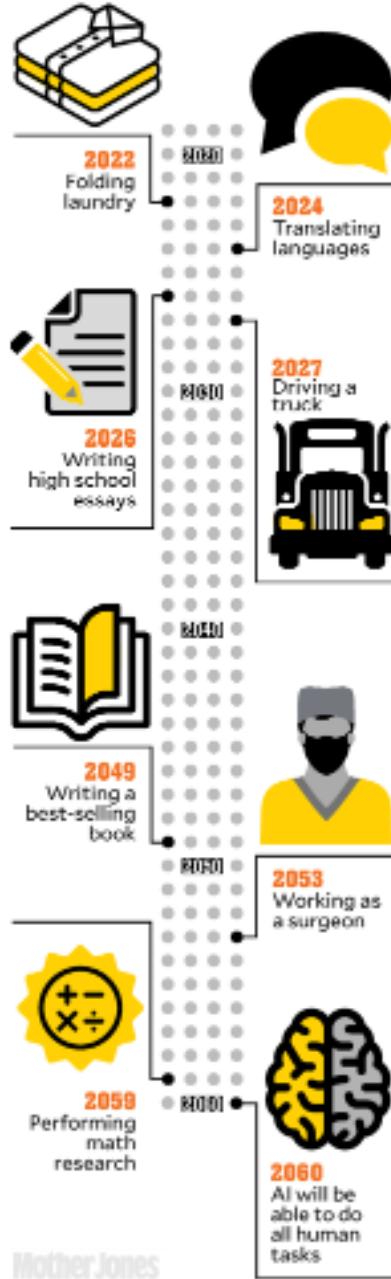


**Human brain- 10 to 50 petaflops
(floating-point operations per second)**

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<https://www.motherjones.com/politics/2017/10/you-will-lose-your-job-to-a-robot-and-sooner-than-you-think/>

AI WILL LIKELY OUTPERFORM HUMANS AT...



What AI cannot do?

What AI cannot do? according to one 2016 article

- Write software
- Perform Jazz
- Invent
- Exercise Free Will
- Make Moral Choise

- Bajou 2019
- deepjazz.io 2019
- March 2021

IBM develops AI to invent new antibiotics – and it's made two already



<https://www.linkedin.com/pulse/10-things-artificial-intelligence-cant-do-jame>

<https://www.futurity.org/artificial-intelligence-bayou-coding-1740702/>

<https://www.bbc.com/news/technology-52474250>

<https://newatlas.com/medical/ibm-ai-new-antibiotics-superbugs/>

Business Journey

Helping our clients become AI-driven and transform
their business with data

Shujohn Ahmed/Ipsit Dash
29th March 2022



AI maturity level of our customers

