OCTOBER 25

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An Overview of AI:
What Is AI & How Does it Work?

ELO Network

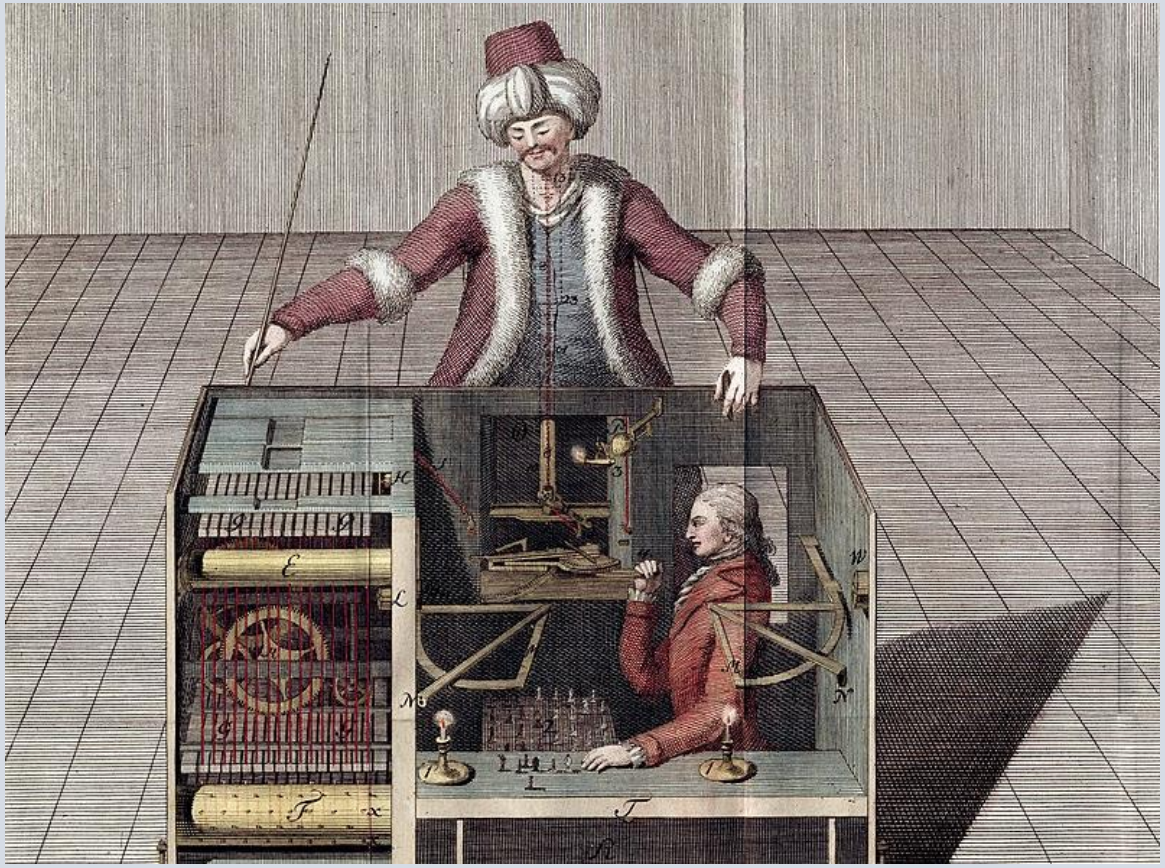
Man vs. Machine

ELO Network

The Turk: Automation Chess Player

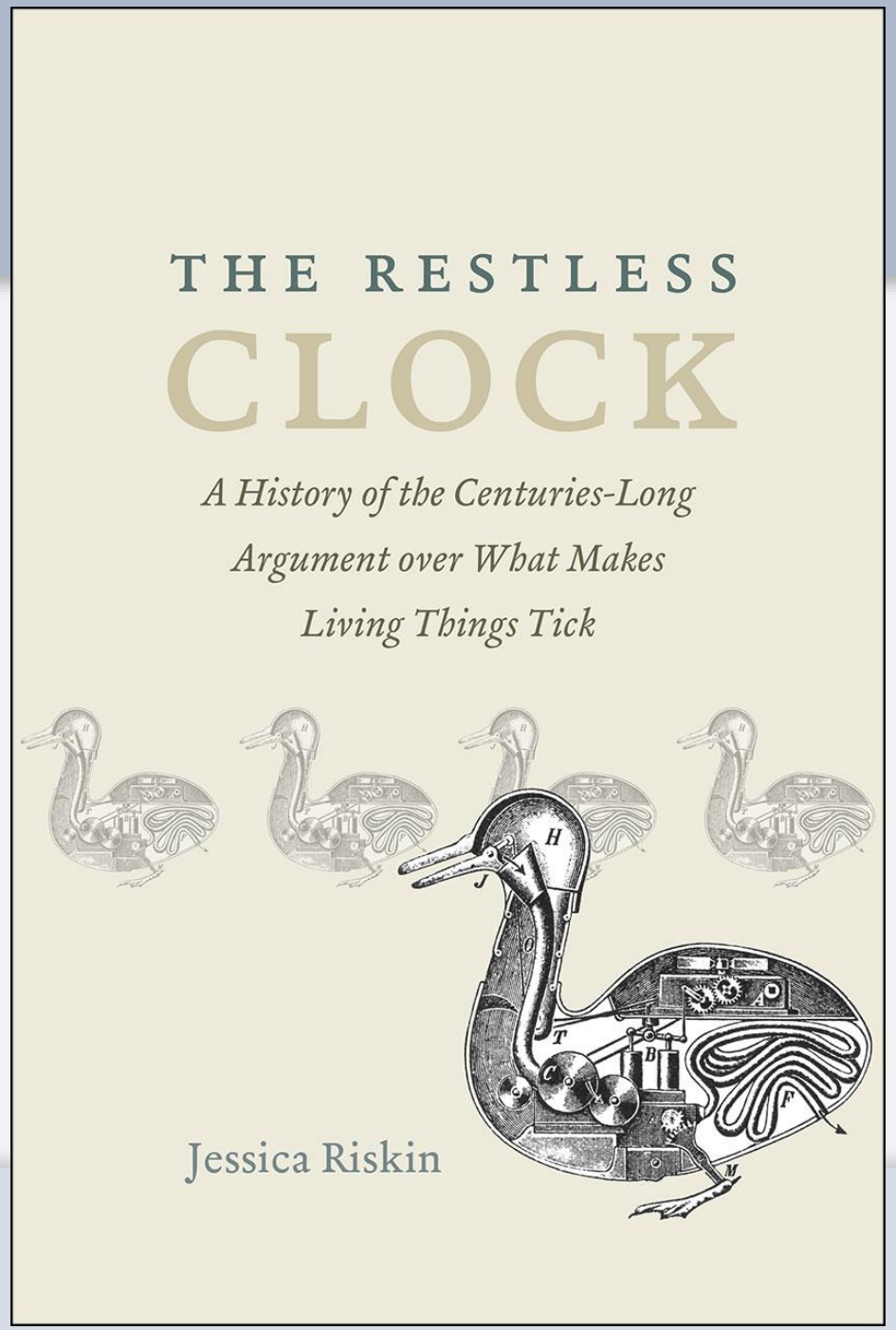
- Constructed in 1770 by Wolfgang von Kempelen
- Toured Europe and North America for 84 years
- Won most games
- Played Napoleon Bonaparte and Benjamin Franklin

Technological Hoax



Jessica Riskin,

“[T]he machine’s fascination, which was fuelled by a growing interest in the question whether a machine could cross the Cartesian divide, that is, whether intelligent mental process could be reproduced in artificial machinery”

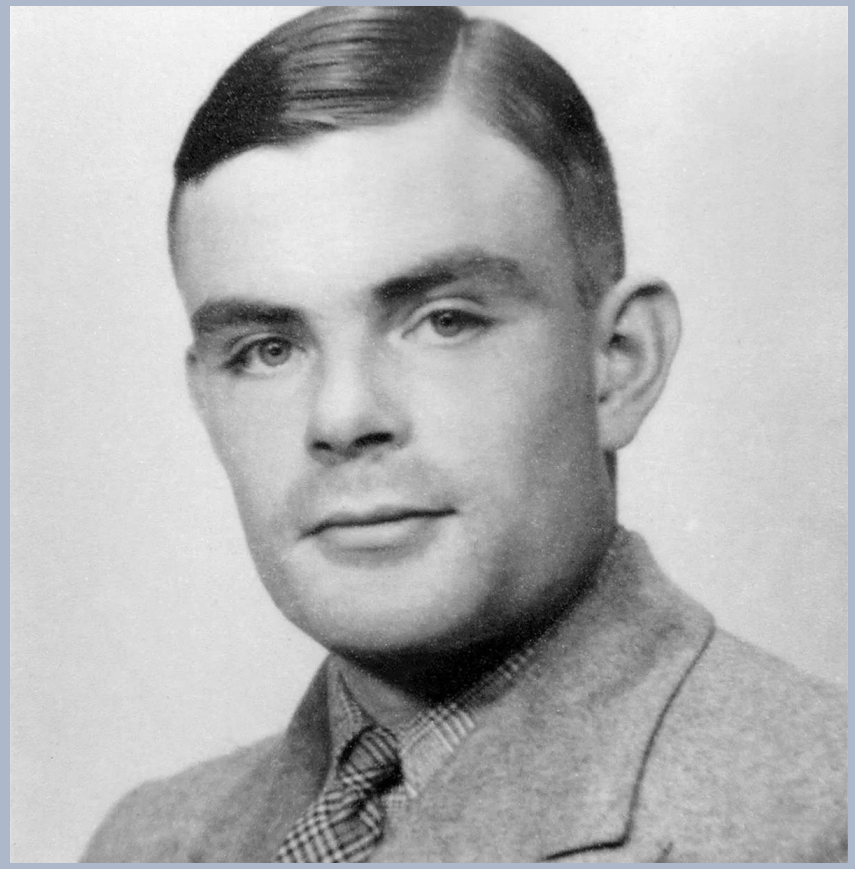


Michael Polanyi

- 1891 - 1976
- Jewish Hungarian Doctor/Scientist
- Fled Nazi Germany
- Taught at Manchester University with Alan Turing
- Left science for philosophy and ultimately found Christian theology

Alan Turing

- 1912 - 1954
- English Mathematician
- He wanted to solve Hilbert's Decision Problem
- 1936 invented the Turing machine
- 1939 cracked the ENIGMA cipher
- Taught at Manchester with Michael Polanyi
- Father of the modern computer

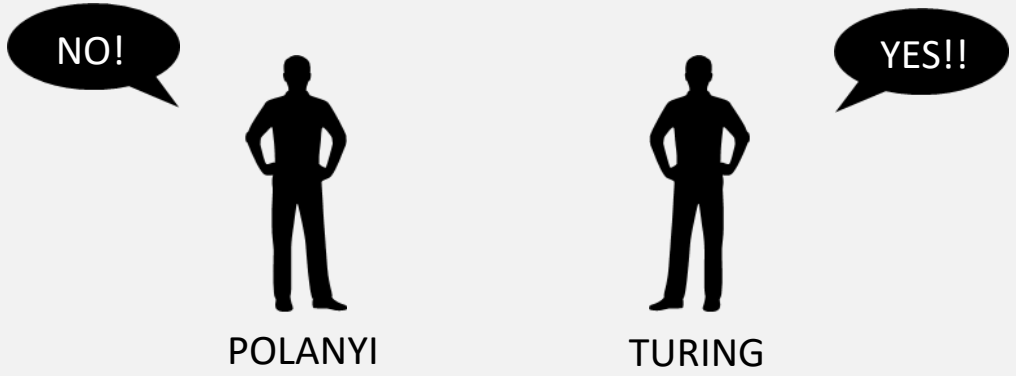


Polanyi vs. Turing Debate

Can Thinking Be Mechanical?

- Polanyi and Turing regularly discussed and debated the possibility of "intelligent machines".
- On October 27, 1949 Polanyi and Turing participated in a interdisciplinary panel discussion on "Mind and the Computing Machine" to discuss the question: Can thinking be mechanical?

Thinking can't be defined, and tacit knowledge can't be made explicit.

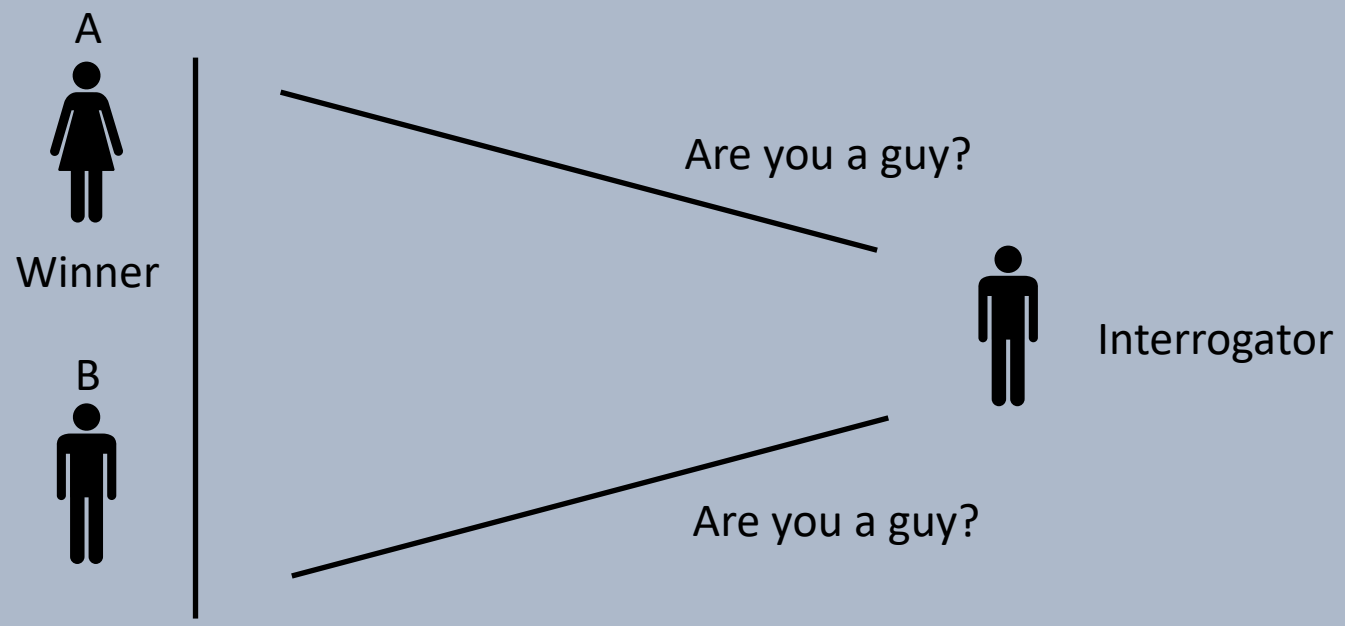


The machine could learn. But he agreed that thinking isn't easily defined.

Turing's Solution to Thinking

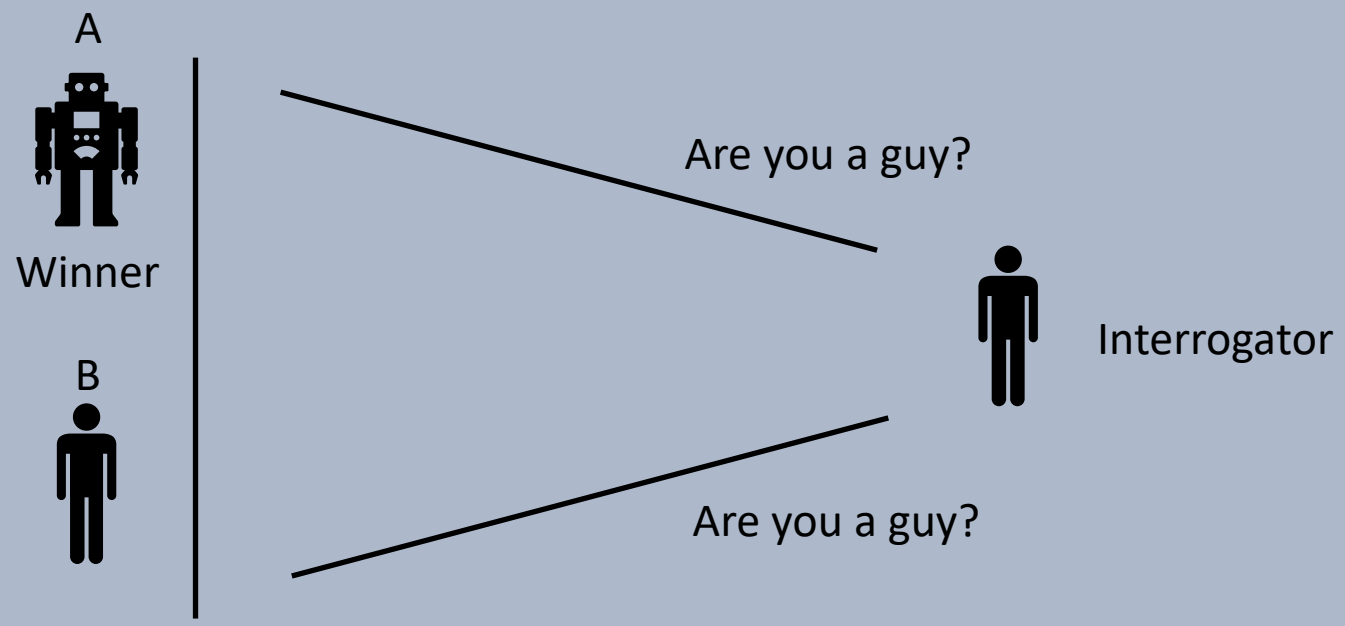
- A few months later in 1950, Turing famously published his article "Computing Machinery and Intelligence" for the journal Mind.
- Turing maintained that the "human computer" could be programmed.
- Turing argued that the "digital computer" can be programmed to "mimic the actions of a human computer."
- Turing believed that a computer could be taught to demonstrate human level thinking such as playing the game Chess and Go.
- Ultimately, Turing proposed that if a machine could successfully win the "imitation game" it demonstrated intelligence which qualified as thinking.

The Imitation Game



Alan Turing,
Instead of attempting such a definition I shall replace the question by another, which is closely related to it and is expressed in relatively unambiguous words. The new form of the problem can be described in terms of a game which we call the ‘imitation game.’

The Imitation Game

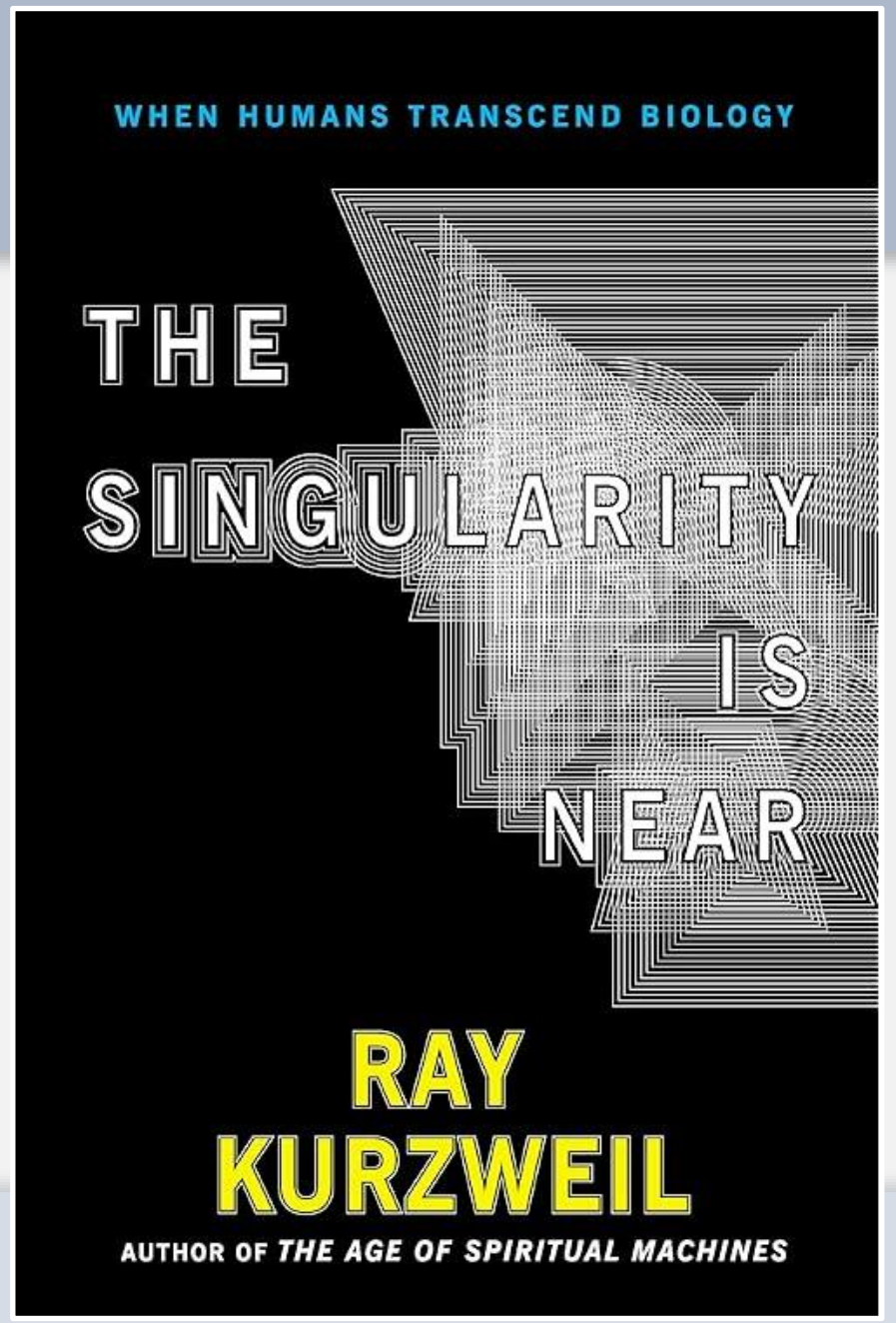


Alan Turing,
What will happen when a machine takes the part of A in this game? Will the interrogator decide wrongly as often when the game is played like this as he does when the game is played between a man and a woman? These questions replace our original, Can machines think?

Machine Learning

- The term 'machine learning' was coined in 1959 by Arthur Samuel.
- Polanyi was correct, tacit knowledge, such as playing Chess or riding a bike, cannot easily be made explicit.
- Turing was correct, a machine can learn to play Chess or ride a bike.
- Turing believed that by 2000, "an average interrogator will not have more than 70 percent chance of making the right identification after five minutes of questioning."
- AI algorithms were invented in the 70's and 80's but lacked the computing power and data necessary to power them.
- Following Moore's Law (number of transistors in an integrated circuit doubles every two years) computing power has followed a bell curve of exponential growth in computing power and data development that now powers machine learning.

- 2005 - The Singularity is Near
- 2025 - The Singularity is Nearer
- 2029 - AI will pass the Turing Test
- 2045 - The Singularity - No longer man vs. machine but man and machine. AI will become a question of human enhancement.

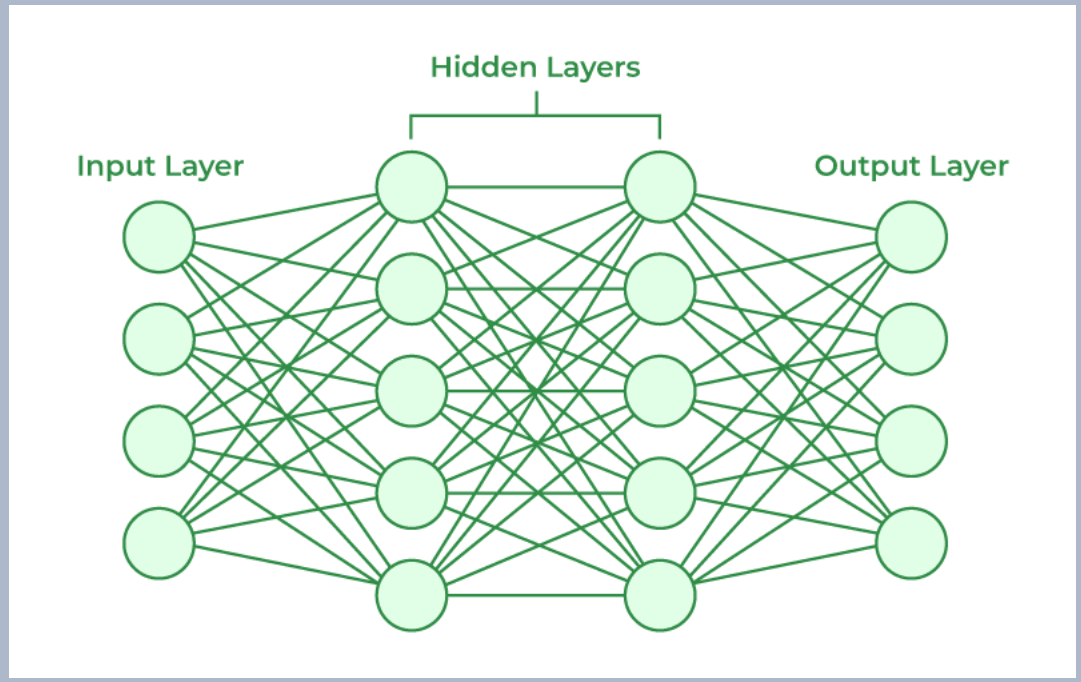


How Does a Machine Learn?

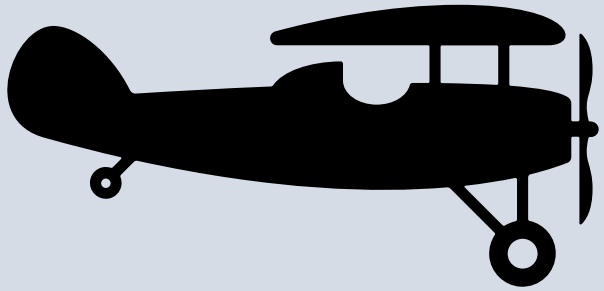
- There are four types of AI algorithms: supervised, semi-supervised, unsupervised, and reinforcement.
- Supervised: Machine learning where data is processed by example in which predictions are corrected by the operator. (Decision Tree, Random Forest, Support Vector)
- Semi-supervised: Machine learning in which data is labelled and unlabelled in order to predict unlabelled data. (Classifier)
- Unsupervised: Machine learning by processing data to identify patterns. (K Means Clustering)
- Reinforcement: Machine learning by trial and error, in which an algorithm is provided a set of actions, parameters and end values. (Artificial Neural Network)

Artificial Neural Network

Neural networks are inspired by the human brain. They work by fine-tuning hidden layers as data is processed. For example, a person cannot be explicitly given the information to drive a car. It is a ‘doing’ kind of knowledge that requires enough input to finely tune hidden variables to achieve the desired output.



~~Artificial Bird~~ Airplane



Alpaydin,
Our immediate source of inspiration is the human brain, just as birds were the source of inspiration in our early attempts to fly… nowadays, we see birds and airplanes as two different ways of flying - we call them airplanes now, not artificial birds.

The Turing Test

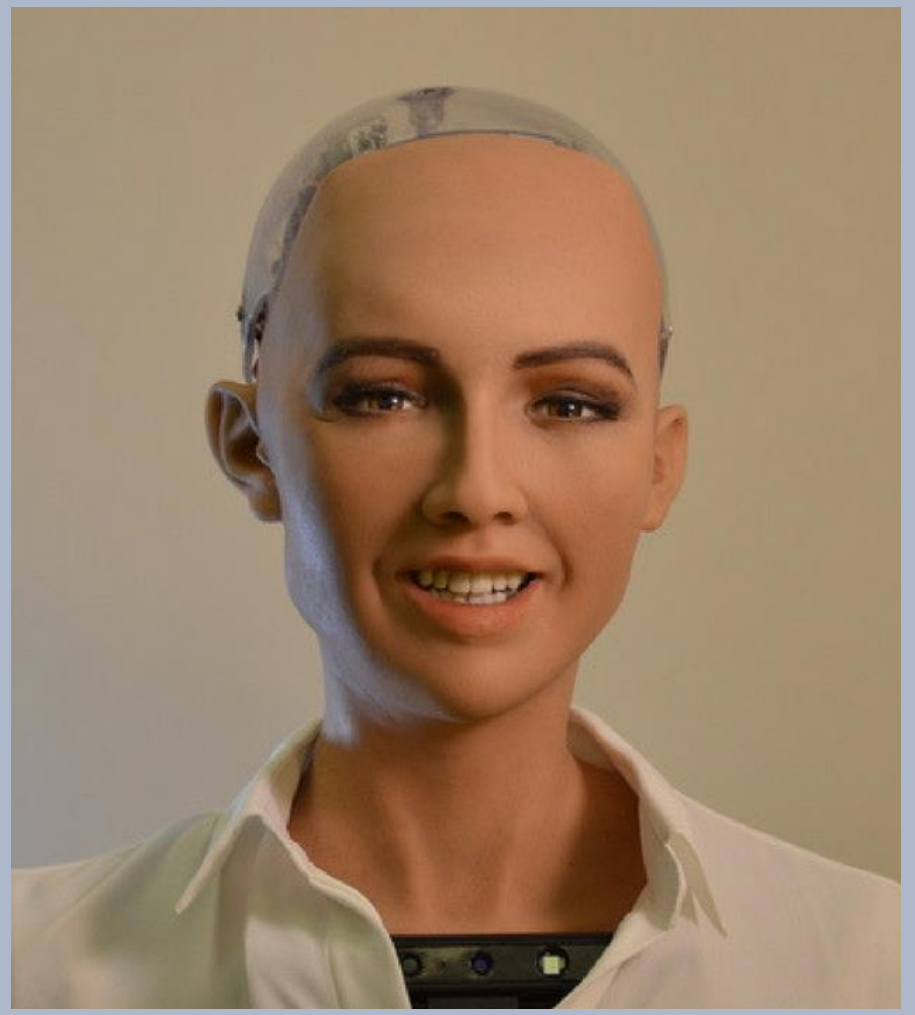
Man vs. Machine

- In 1997 IBM's Deep Blue beat Gary Kasparov at Chess.
- 2011 IBM's Watson beat Brad Rutter and Ken Jennings at Jeopardy.
- 2015 DeepMind's AlphaGo beat Fan Hui and in 2016 Sodol Lee.
- 2017 AlphaGo Zero was completely self-taught without learning from humans.
- 2017 AlphaGo Zero beat AlphaGo 100-0.
- 2022 ChatGPT has significantly advanced the Imitation Game.

Is the Imitation Game Flawed?

- If a machine wins does that indicate the machine is intelligent or the person is not?
- What does is it mean if the machine wins against a 6 year old but fails against a 60 year old?
- What age of person and education level does the machine need to imitate?
- What if the machine choses to not play?
- What if we know it's a game of deception?
- The imitation game is a flawed ontology based on behaviourism.

The Imitation Game Reduces Humanity to Behaviour



- Sophia was granted citizenship to Saudi Arabia in 2017
- First robot to receive legal personhood in any country
- 2019 displayed ability to create drawings
- 2021 a self-portrait NFT sold for $688,888

Reframing the Ontological Debate

Part vs. Whole

PART

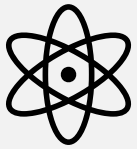
WHOLE

There is an ontological difference between the parts a thing is made of and the purposeful whole a thing is made for.

Reframing the Ontological Debate

Part vs. Whole

LAW



PURPOSE

The difference between Pure and Applied Science or Physics vs. Engineering.

Reframing the Ontological Debate

Part vs. Whole

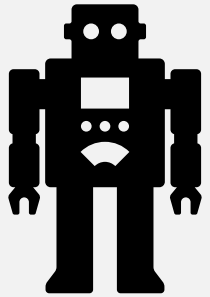
IRON (Fe)

CHAIR

A created thing is defined by its purpose not its parts.

Reframing the Ontological Debate

Part vs. Whole



A machine that passes the Turing Test is a successful human imitation machine.

A Machine Cannot Be Human

2 Arguments a Machine Cannot be Human

1) Argument from Status:

- A machine is a human tool.
  - *Did Deep Blue beat Gary Kasparov or did a team of computer scientists at IBM create a tool that successfully achieved it's purpose of beating him?*
- It is called the Imitation Game not the Identity Game. A machine can only pretend to be human (Chinese Room Thought Experiment).
- Modal logic indicates that necessarily a machine cannot change its ontology.

2 Arguments a Machine Cannot be Human

2) Argument from Dependency:

- Because people created machines, machines exist in an ontological dependency upon people.
  - *Even if a machine achieved consciousness it is not human.*
- For example, you can have a world of people and no machines but you cannot have a world of machines without people.
- It's logically impossible for a machine to change its ontology because machines were created by people. Machines can only fail or succeed at their purpose.
  - *If a machine can qualify for humanity, people could unqualify for humanity.*

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