The Meaning of (Artificial) Life
Prelude to What is Data Science?

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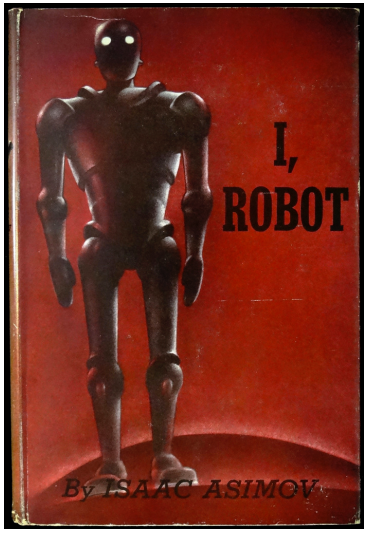
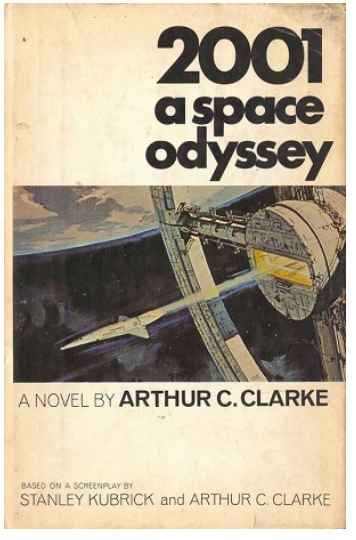
http://WinderResearch.com

History of AI





Early History

Dark Ages

Date	Development
1206	Al-Jazari created a programmable orchestra of mechanical human beings.
~1500	Paracelsus claimed to have created an artificial man out of magnetism, sperm and alchemy.
~1580	Rabbi Judah Loew ben Bezalel of Prague is said to have invented the Golem, a clay man brought to life.
Early 17th century	René Descartes proposed that bodies of animals are nothing more than complex machines (but that mental phenomena are of a different "substance").

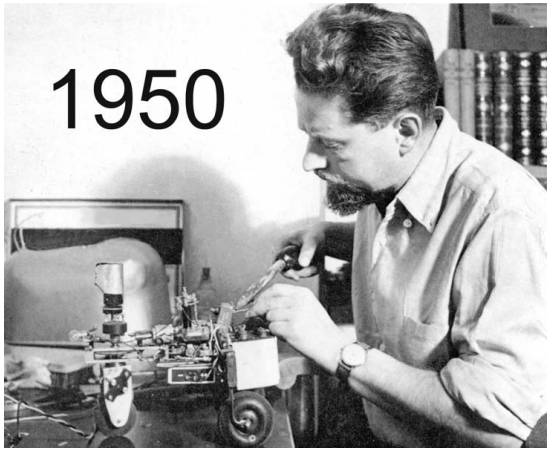
Post-Renaissance

- 1641 Thomas Hobbes published Leviathan: "...reason is nothing but reckoning".
- 1642 Blaise Pascal, the first digital calculating machine
- 1672 Gottfried Leibniz
  - The Stepped Reckoner
  - Binary
  - Differential and integral calculus
  - A system and envisioned a universal calculus of reasoning (alphabet of human thought)
  - Assigning a specific number to each and every object in the world, as a prelude to an algebraic solution to all possible problems.

Around the 1950's: Confluence

- The brain was found to be an electrical network of neurons, that appeared to fire all or nothing pulses.
- **Claude Shannon's** *information theory* described how **all** information could be represented in a limited number of *bits*.
- **Alan Turing's** *theory of computation* defined the functional limitations of computing engine.

The combination of these ideas helped to realise that it *might* be possible to create an artificial brain.

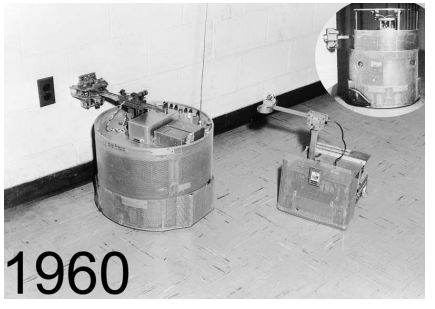


William Grey Walter's Tortoise, Elsie

Phototubes connected to vacuum amplifiers driving relays.

Lights were put next to power outlets.

Can be thought of as the first automated robots.



http://www.frc.ri.cmu.edu/~hpm/talks/revo.slides/1950.html

Seminal Moment: The Turing Test

- 1950 – Creating machines that think.
- "What is thinking?"
- If it can fool a human, then it can be viewed as "thinking"
- For the first time, making machines think became a plausible problem to solve

"You insist that there is something a machine cannot do.

If you will tell me precisely what it is that a machine cannot do, then I can always make a machine which will do just that!".

– John von Neumann (quoted by E.T. Jaynes)

Church-Turing Thesis

> *a function on the natural numbers is computable by a human being following an algorithm, ignoring resource limitations, if and only if it is computable by a Turing machine*

In essence, any algorithm used by a human can be converted into machine form.

Church–Turing–Deutsch principle

An extension of the Church–Turing thesis that states *any* physical process can be simulated by a universal computing device.

Assuming: the laws of quantum physics describe every process, and we have a system powerful enough to compute those laws (e.g. quantum computers)

Everyone get Excited

In theory, if we have a computer that is powerful enough, we can simulate any natural process.

This includes us.

1955-1970

Now you understand why everyone was so excited.

It was during this excitement that novels were published, and these ideas spread into the mainstream.

Date	Author	Quote
1958	H. A. Simon	"within ten years a digital computer will be the world's chess champion"
1958	Allen Newell	"within ten years a digital computer will discover and prove an important new mathematical theorem."
1965	H. A. Simon	"machines will be capable, within twenty years, of doing any work a man can do."
1970	Marvin Minsky	"In from three to eight years we will have a machine with the general intelligence of an average human being."

Around this time, vast amounts of money was being poured into research, especially military funding.

Between 1963 and 1970, DARPA funded MIT's AI lab with the equivilent of $25M per year.

1970's

It would not last.

In 1973, the *Ligthill report* criticized the utter failure of AI to achieve its "grandiose objectives", which led to the dismantling of AI research in UK.

The problems were:

- Limited computational power

Processors typical at the time could manage about 1 MIPS. Current computer vision implementations require between 10,000 and 1,000,000 MIPS.

- Curse of Dimensionality

May problems can only be solved in exponential time. "Toy" examples would never scale into useful systems.

- "Common Sense" knowledge.

Many problems, e.g. computer vision, require enormous amounts of supplementary information about the world.

1980-2000: Rise of the expert systems

The solution to the previous problems were constraints.

> *If you will tell me precisely what it is that a machine cannot do, then I can always make a machine which will do just that!".*

An expert system is a product designed to do one thing well. (Unix fans rejoice!)

```
our product will:
   - place orders
   - given by speech
   - for a pizza shop
   - in Denmark
```

But is it thinking?

2000's: Finally...

In 2000, it had been 50 years since Turing. Some feats were achieved, but they were very niche and not very relatable.

But in 1997, an IBM machine called Deep Blue beat the reigning world Chess champion.

39 years after the intial prediction by H. A. Simon.

Details about story: http://magazine.ucla.edu/features/no_drivers/print/

Why Now?

Computing Power

Date	Machine/Chipset	MIPS
1951	Ferranti Mark 1	0.0008
1997	Deep Blue	11,380
2016	Intel Core i7 6950X	317,900

http://www.alanturing.net/turing_archive/pages/reference%20articles/what_is_AI/What%20is%20AI04.html

So AI Now?

Yes and No.

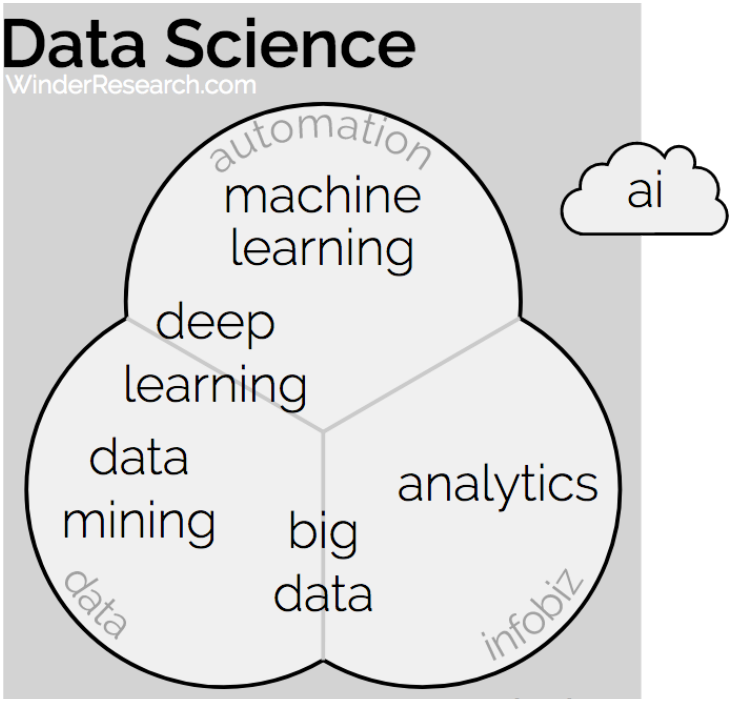
> *"reason is nothing but reckoning" - Hobbes, 1641*

> *"A computer would deserve to be called intelligent if it could deceive a human into believing that it was human" - Turing, 1950*

Stop saying A.I.

Seriously, it makes no sense.

#DataScience


Data Science
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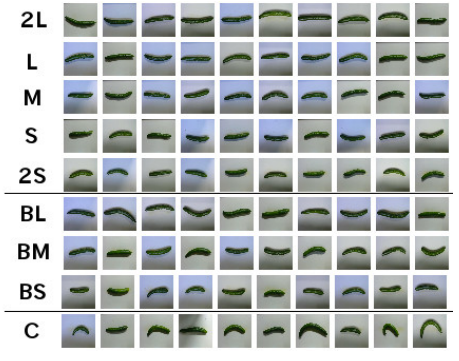
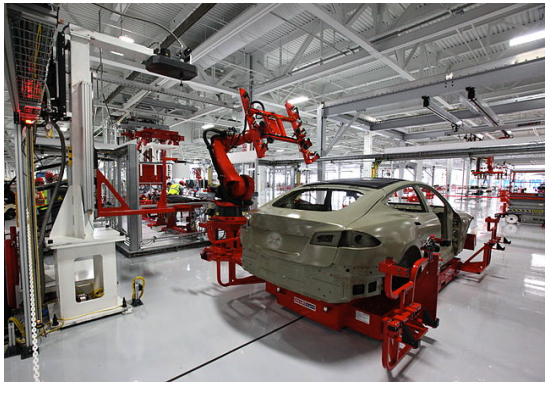
automation
machine learning
deep learning
data mining
big data
analytics
data
infobiz
ai

Machine Learning

is the practice of automating some data driven process



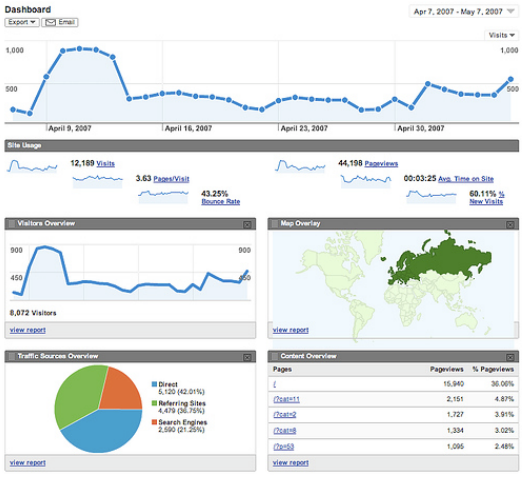
https://cloud.google.com/blog/big-data/2016/08/how-a-japanese-cucumber-farmer-is-using-deep-learning-and-tensorflow



https://commons.wikimedia.org/wiki/File:Tesla_auto_bots.jpg

Analytics

is the process of turning data into actionable insights



https://www.flickr.com/photos/vrypan/490057546

Big Data

is the use of lots and lots of data

Deep Learning

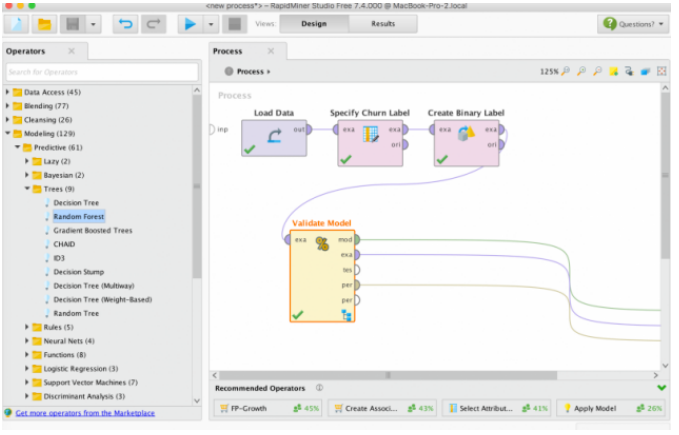
is the first (widely used) general purpose learning framework

- Its base unit is the neuron. A simple linear function.
- A "non-linearity" is often added at the output of a neuron.
- Collections of neurons are presented in well-defined structures.
- These structures, given adaquate training data, can "learn" to model the input data.

DeepLearning4j

Data Mining

is the collective name for collecting, cleaning and prioritising data



https://rapidminer.com/

How is this related to A.I?

Machine learning

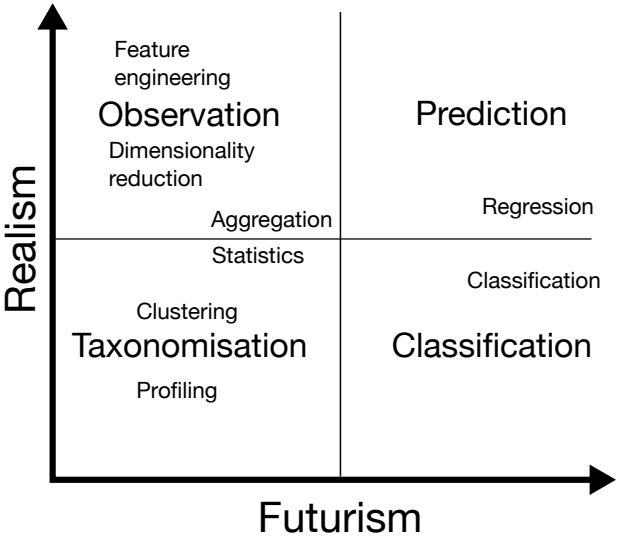
Data mining

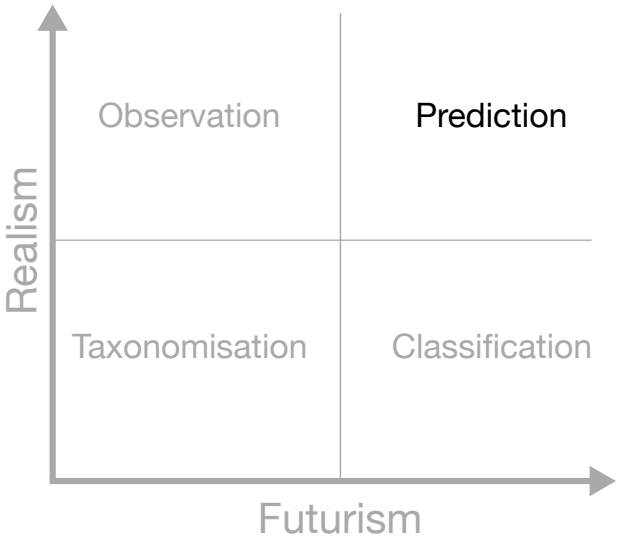
Big data

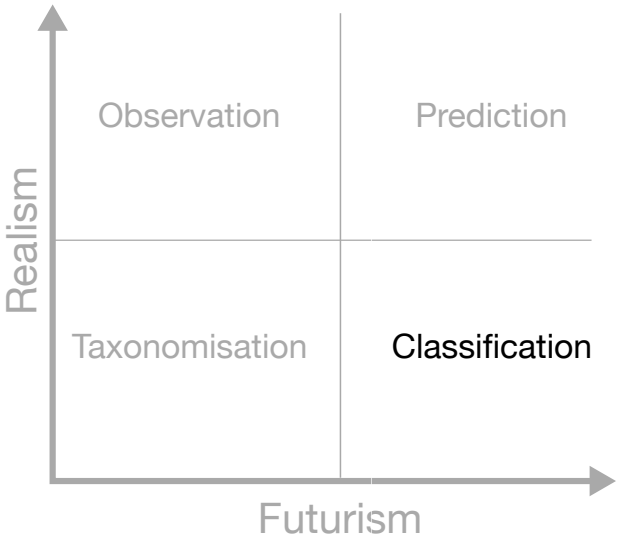
Deep learning

Analytics

Human Faculties




Observation
Prediction
Taxonomisation
Classification
Realism
Futurism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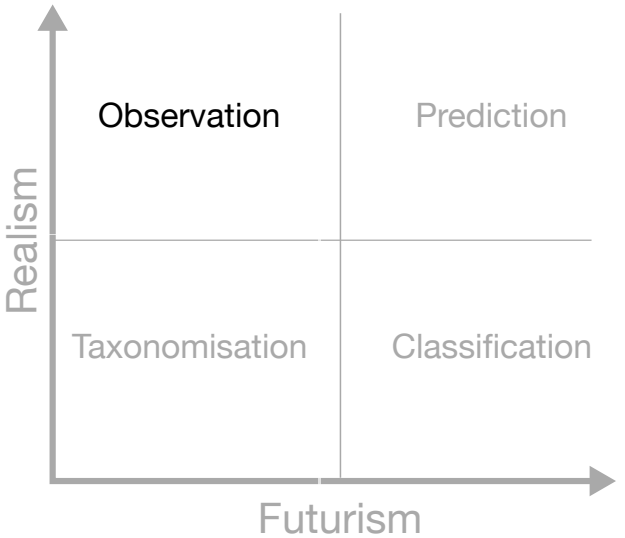
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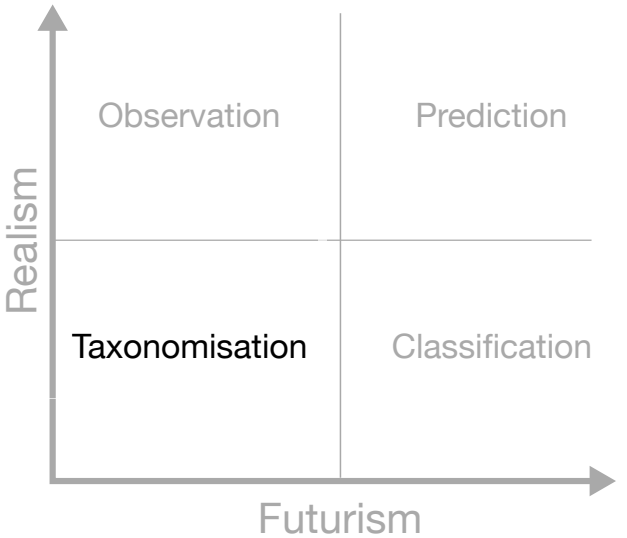
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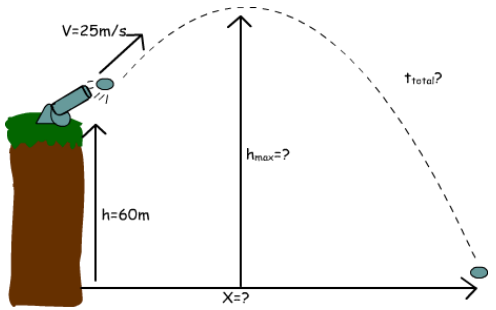
V=25m/s
t_{total}?
h_{max}=?
h=60m
X=?

http://failking.com

1966-1972: Shakey The Robot

From: https://www.youtube.com/watch?v=GmU7SimFkpU

More info: https://en.wikipedia.org/wiki/Shakey_the_robot

2016: Atlas - Boston Dynamics

From: https://www.youtube.com/watch?v=rVlhMGQgDkY

More info: https://www.bostondynamics.com/atlas

Robots are so 1970

SQUAD: https://rajpurkar.github.io/SQuAD-explorer/explore/1.1/dev/

Flow demo: http://35.165.153.16:1995/

Text: http://www.clearwhitelight.org/hitch/hhgttg.txt

AWS

Honey-Chat

Wolfram Alpha

So What is the Meaning of Artificial Life?

- A.I. isn't a thing. It's a construct to fool people into believing the thing they are interacting with is a human.
- If it can completely fool us, then in effect, it is as good as interacting with a human.
- If we're talking on human terms, what is the meaning of human life?

I'm an Engineer!
Don't ask me those kind of questions!

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Data Science **Training, Consultancy, Development**

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