Computer Vision II: Recognition

Jingya Wang

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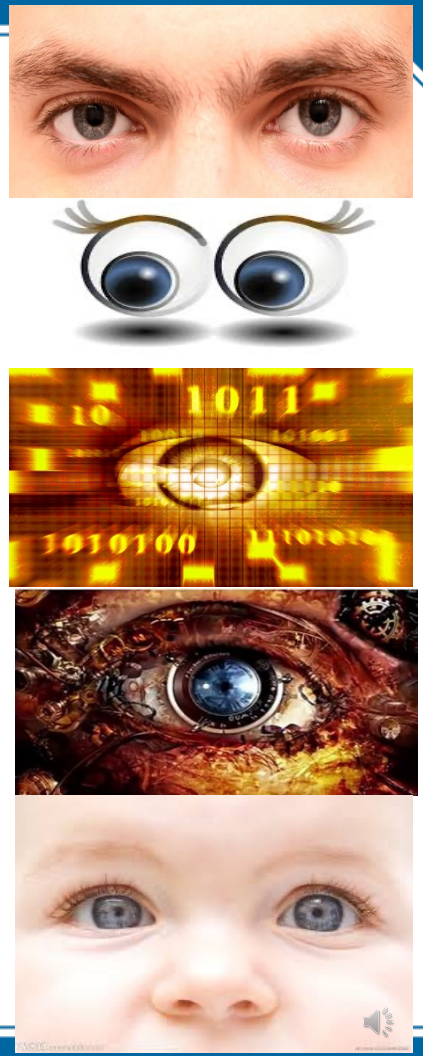
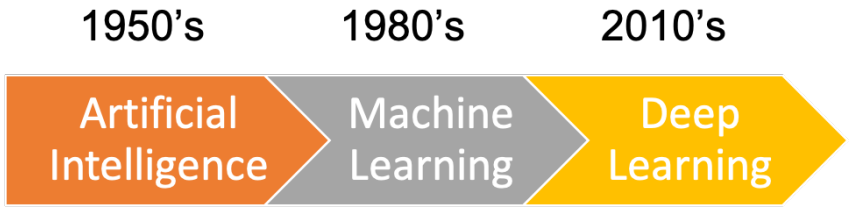




Artificial Intelligence (AI)

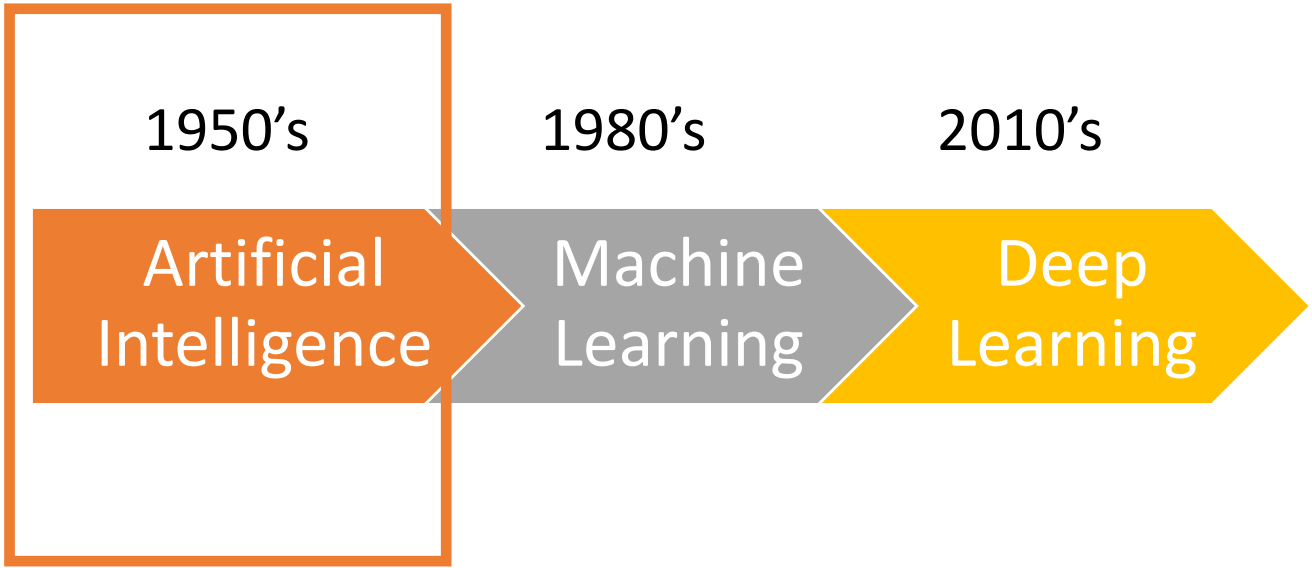
AI is the simulation of human intelligence by machines. It is a concept more than a single technology and covers a variety of technologies, such as natural language processing (NLP), speech recognition, etc.

Machine Learning (ML)

Machine learning is a core subfield of artificial intelligence (AI) with an emphasis on creating algorithms that can learn from data without human intervention. Just like AI, ML also encompass other fields such as statistics, physics, computer science, etc.

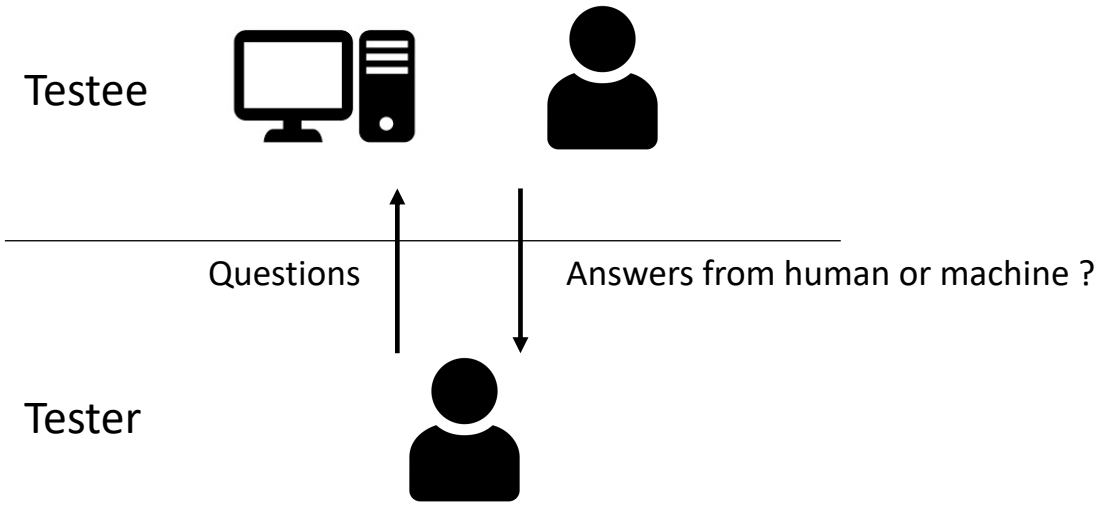
Deep Learning

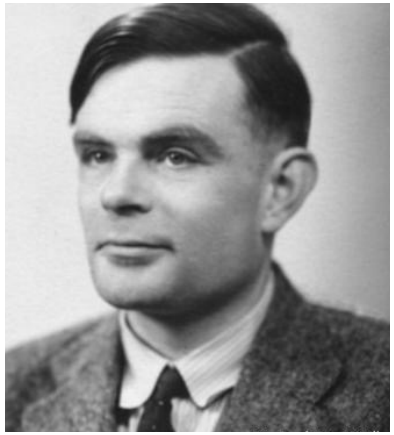
Deep learning or deep neural networks focus on a subset of ML tools and techniques. Deep learning is characterised by large neural networks trained on massive amounts of data.


1950’s
1980’s
2010’s
Artificial Intelligence
Machine Learning
Deep Learning

A brief history of Artificial Intelligence

- 1950 : “Can machines think?” -- Turing test





Alan Turing
(1912-1954)

A brief history of Artificial Intelligence

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(John McCarthy, Marvin Minsky, Claude Shannon)

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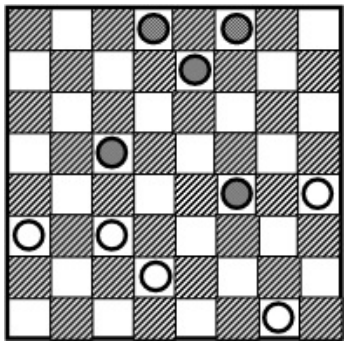

Samuel's checkers program

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- 1960s: Knowledge bases research started. Interest applications: chess games, theorem proving and language translation

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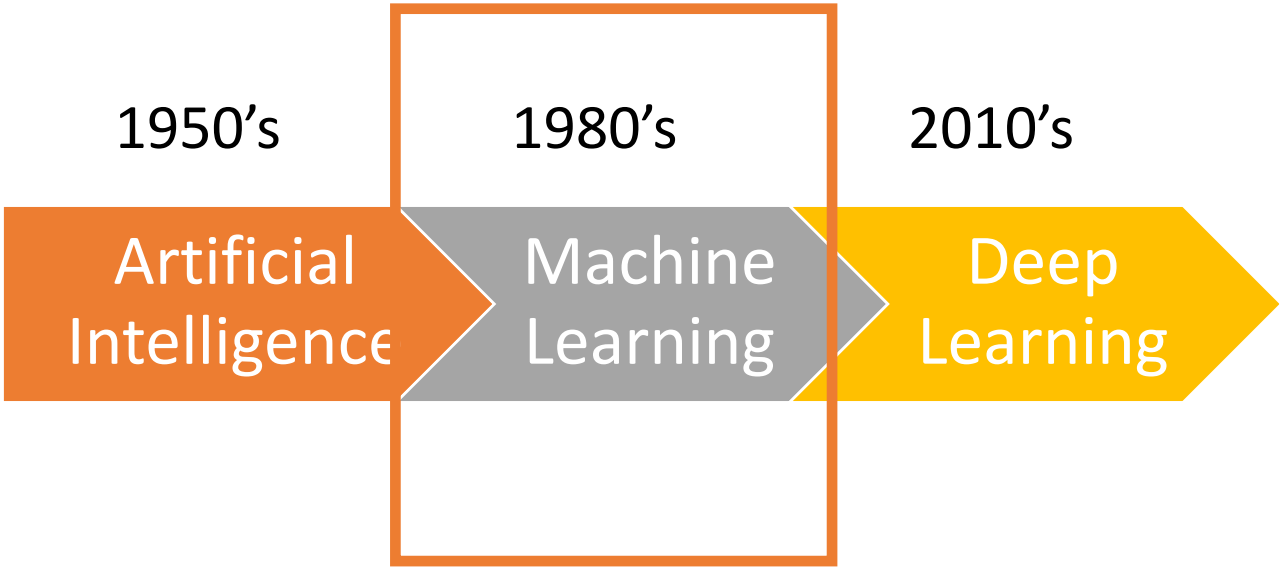
- 1960s: Knowledge bases research started. Interest applications: chess games, theorem proving and language translation
- 1969-1979: Early development of knowledge-based systems Al becomes an industry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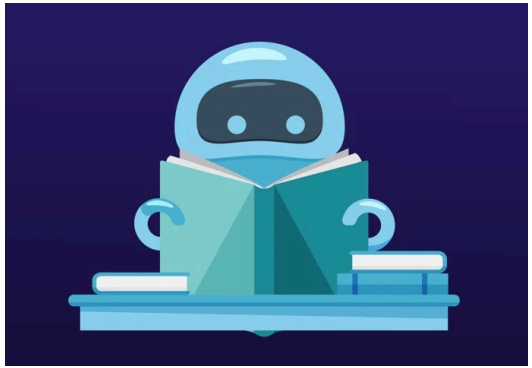
What is machine learning?

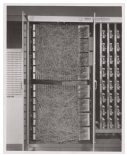
Machine learning (ML) is a field of artificial **intelligence** that uses statistical techniques to give computer systems the ability to "learn".

Algorithms that can improve their performance using training data.



Machine Learning Timeline

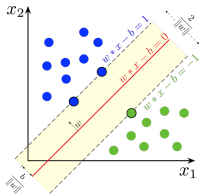
1957 Perceptron



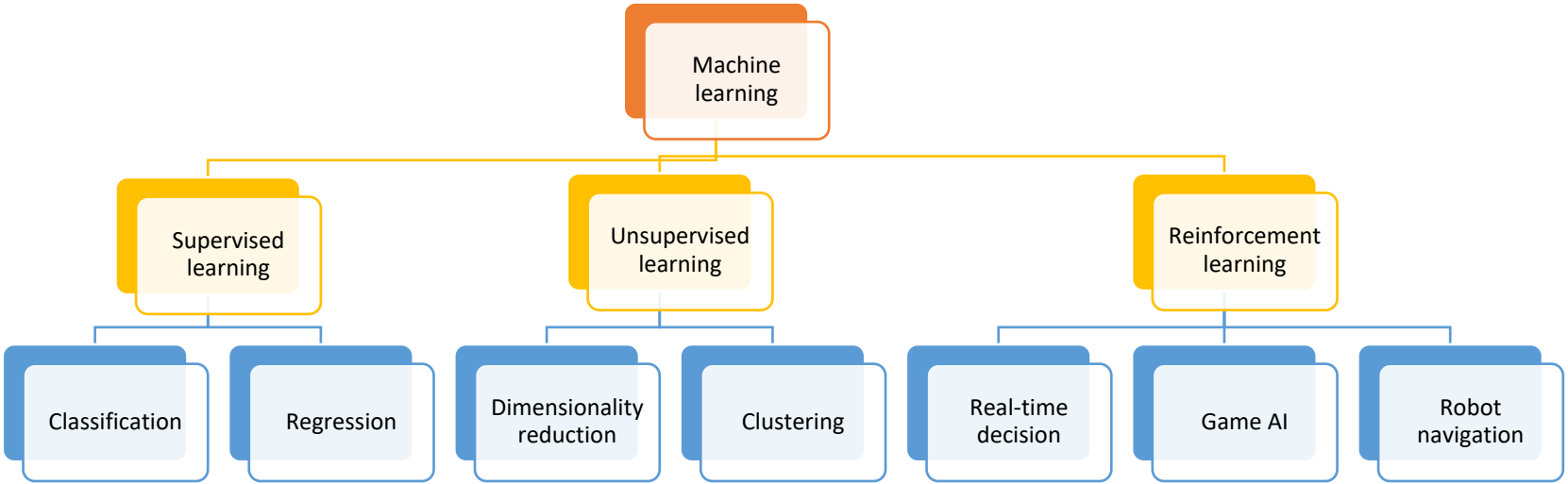
AI Winter

1974 Backpropagation

1995 SVM



General categories for ML



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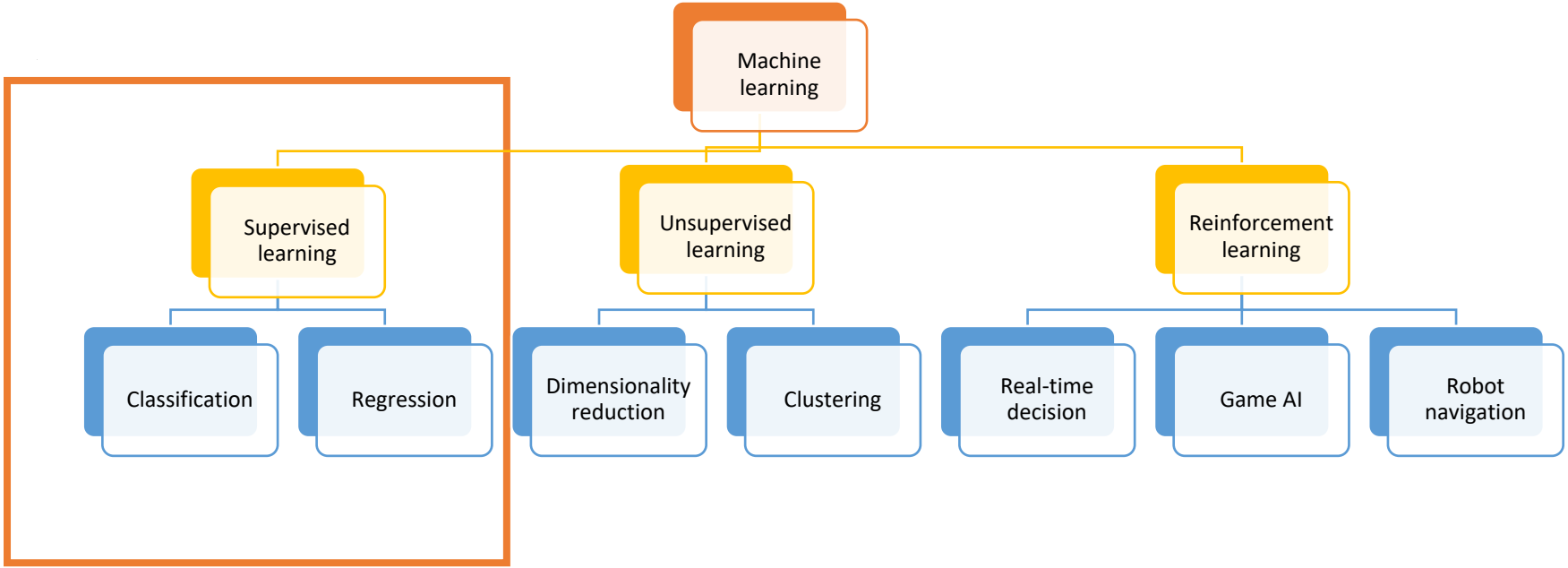
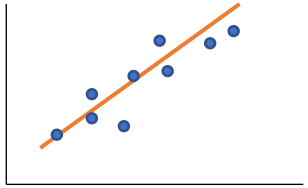


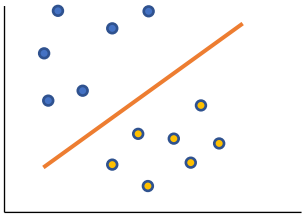
Regression (supervised)

- Estimate parameters, e.g. house price, salary



Classification (supervised)

- Estimate class, e.g. digit recognition



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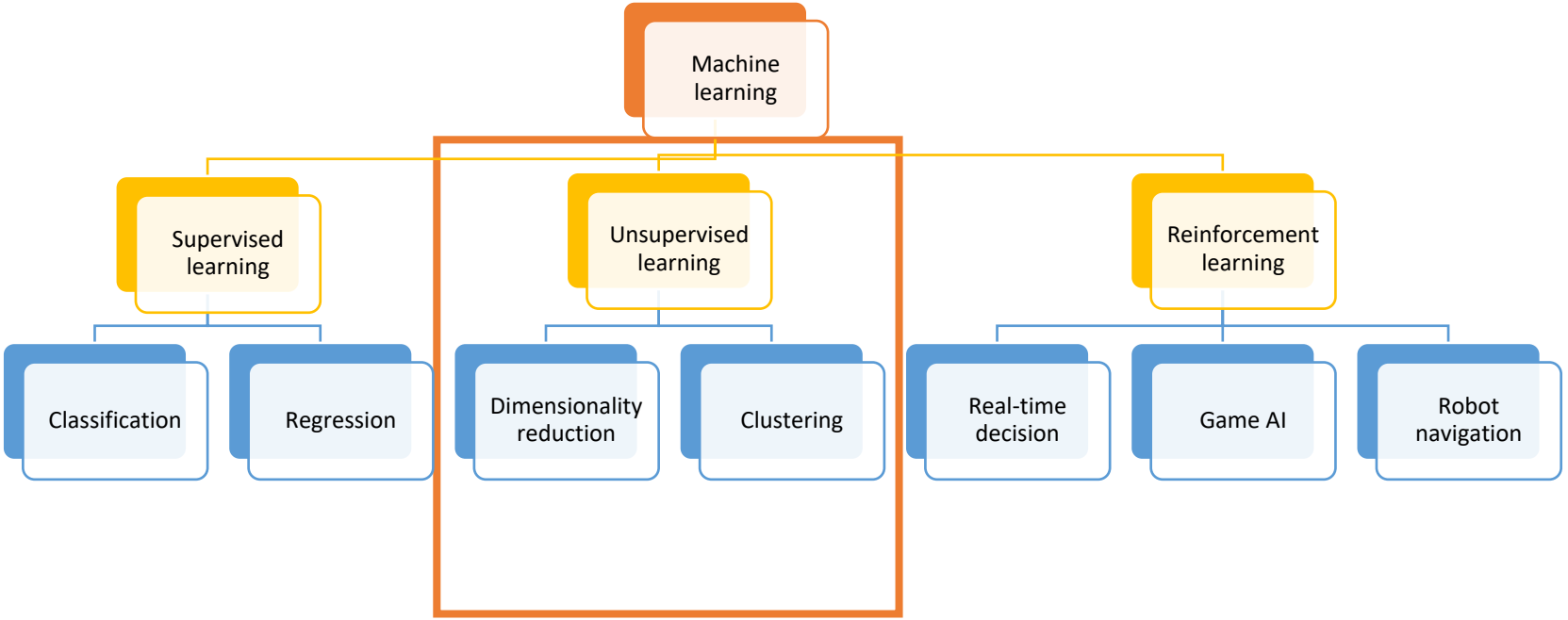
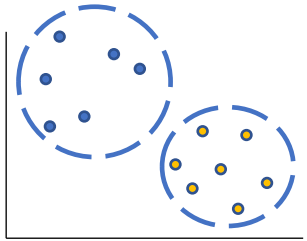


Clustering (unsupervised)

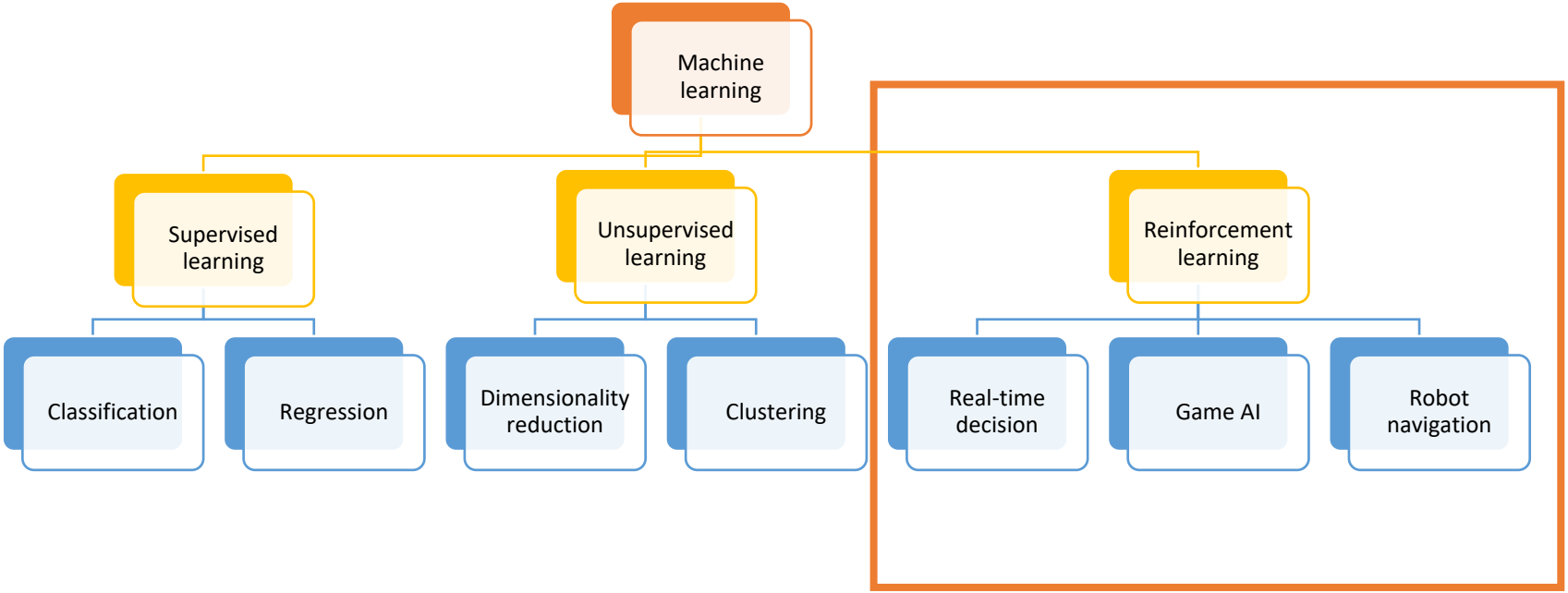
- Divide data points into groups

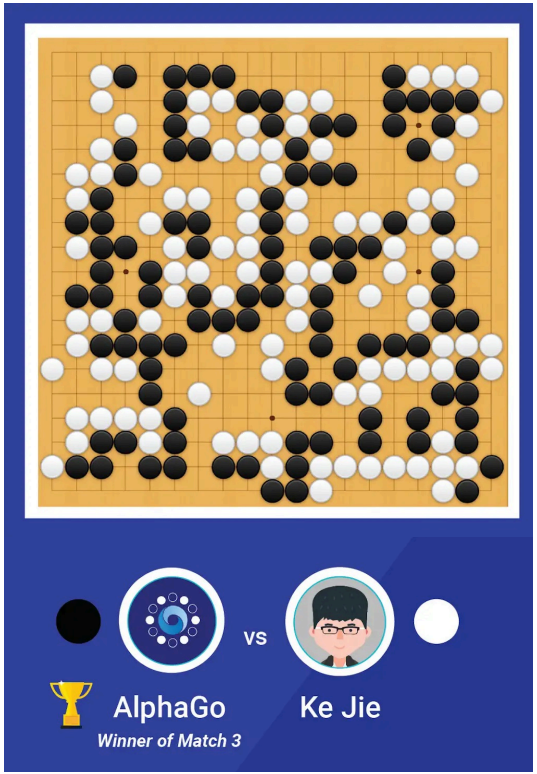


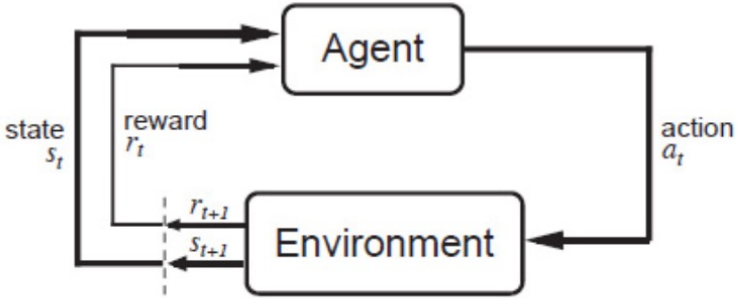
Dimensionality reduction (unsupervised)

- Transformation of data from a high-dimensional space into a low-dimensional space
- Why? The Curse of Dimensionality

Machine Learning Algorithm



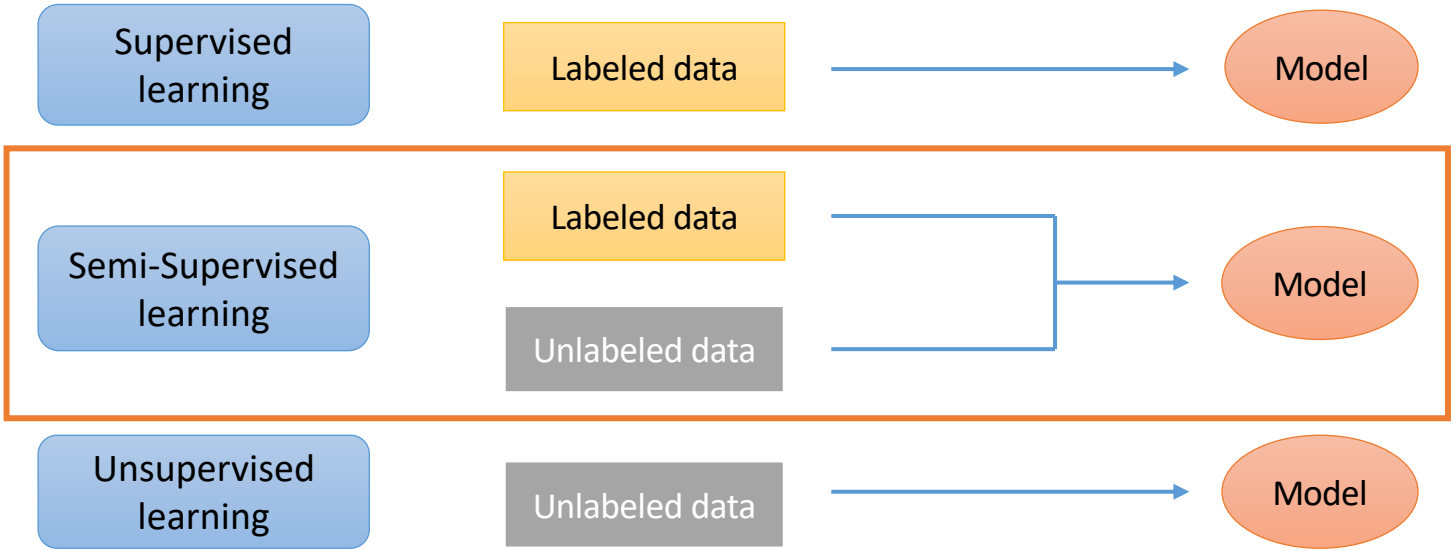




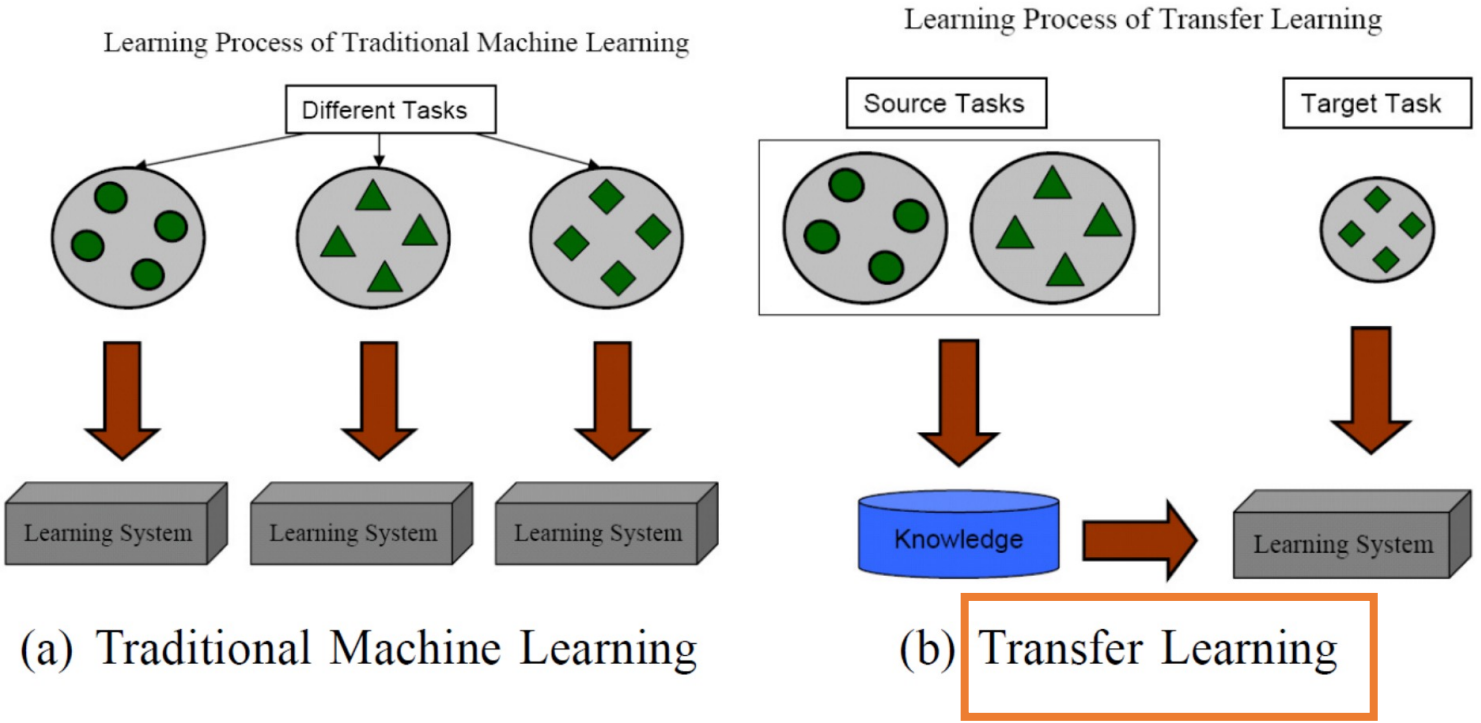
AlphaGo

https://deepmind.com

Semi-supervised learning

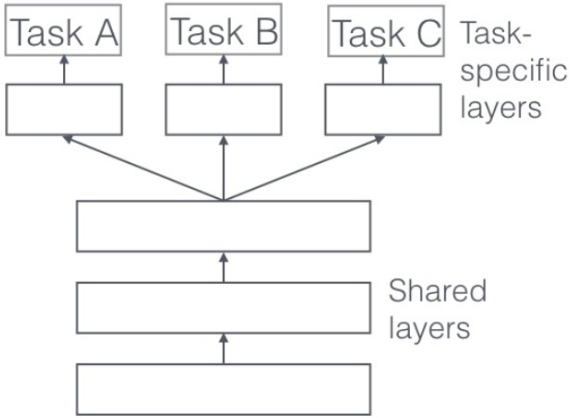


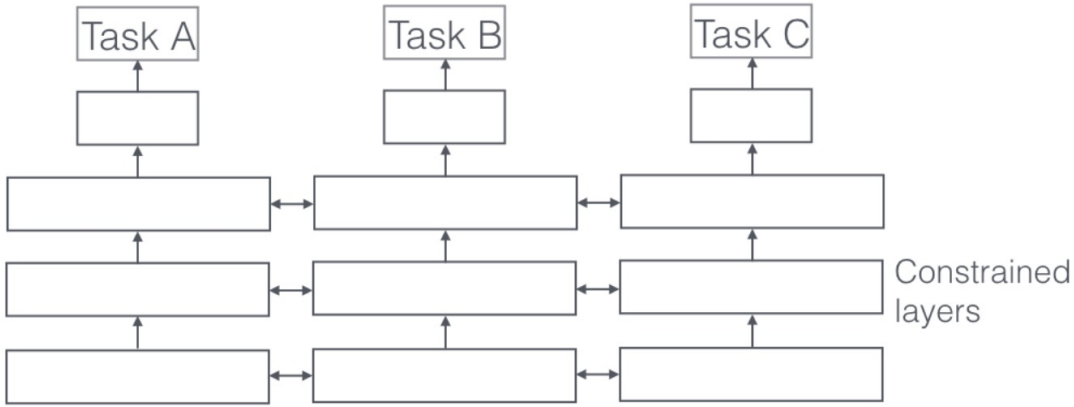
Transfer learning



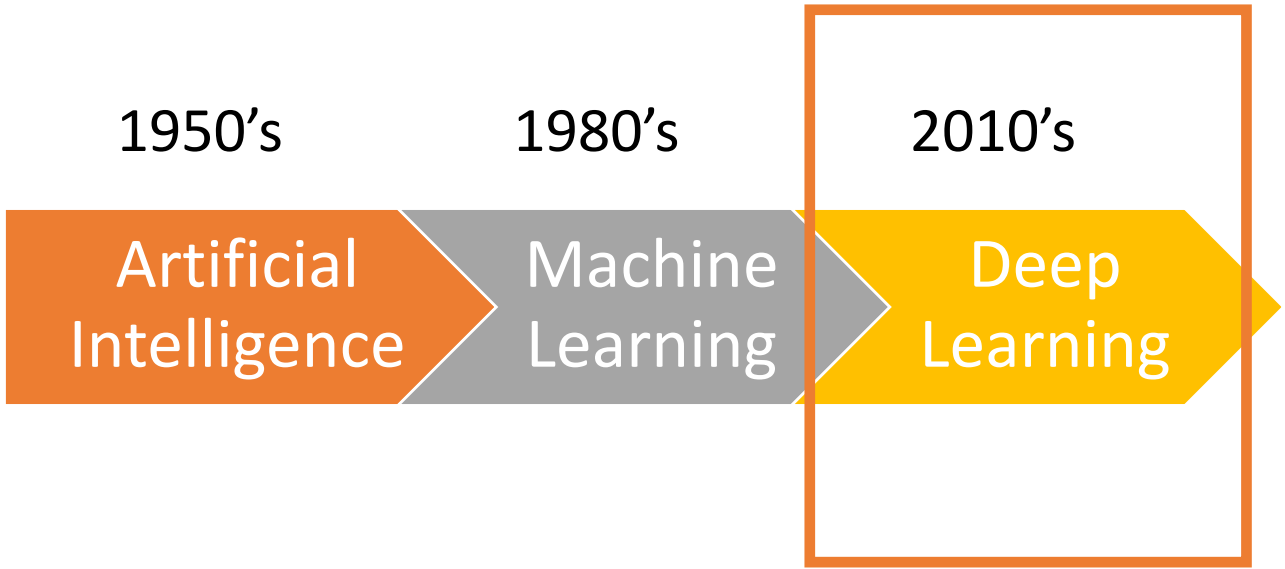
Kaboli, Mohsen. *A Review of Transfer Learning Algorithms*. Diss. Technische Universität München, 2017.

Multi-Task Learning





https://ruder.io/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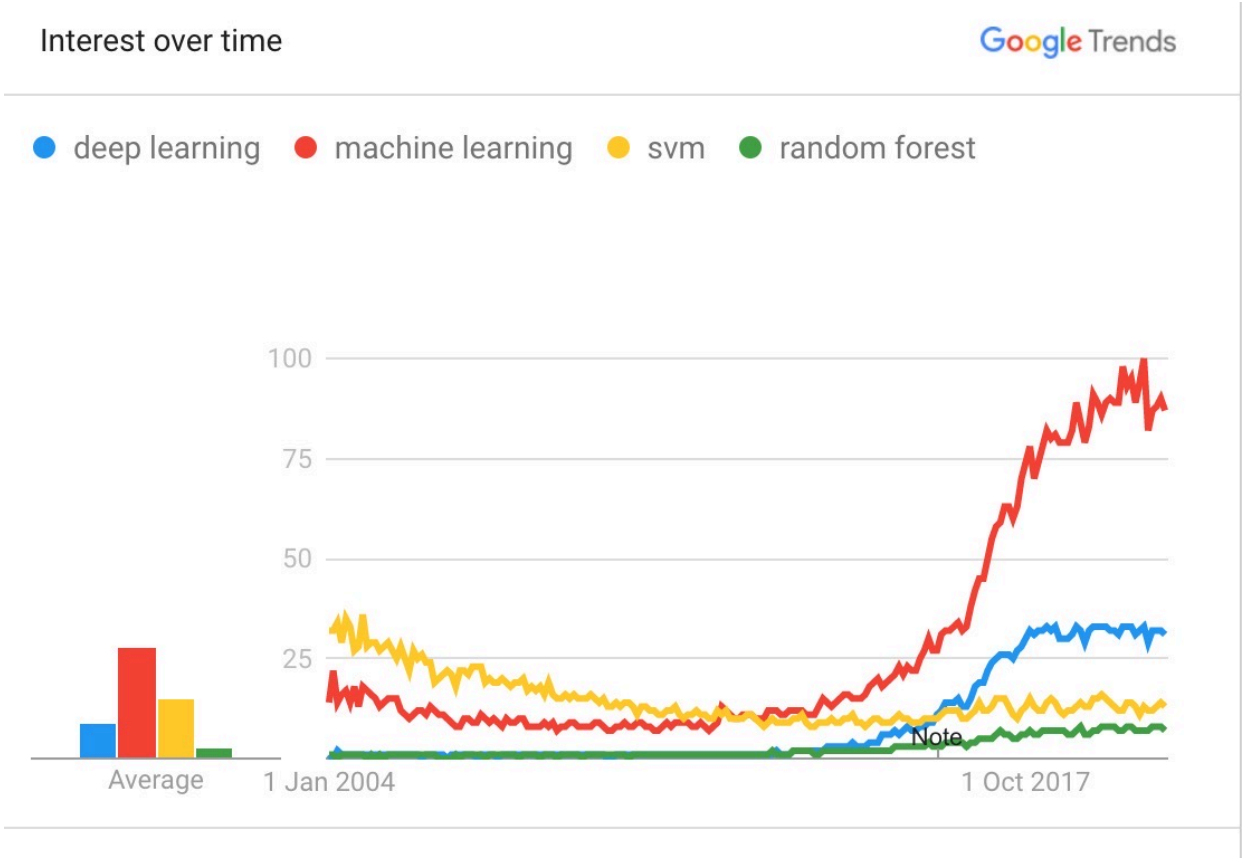
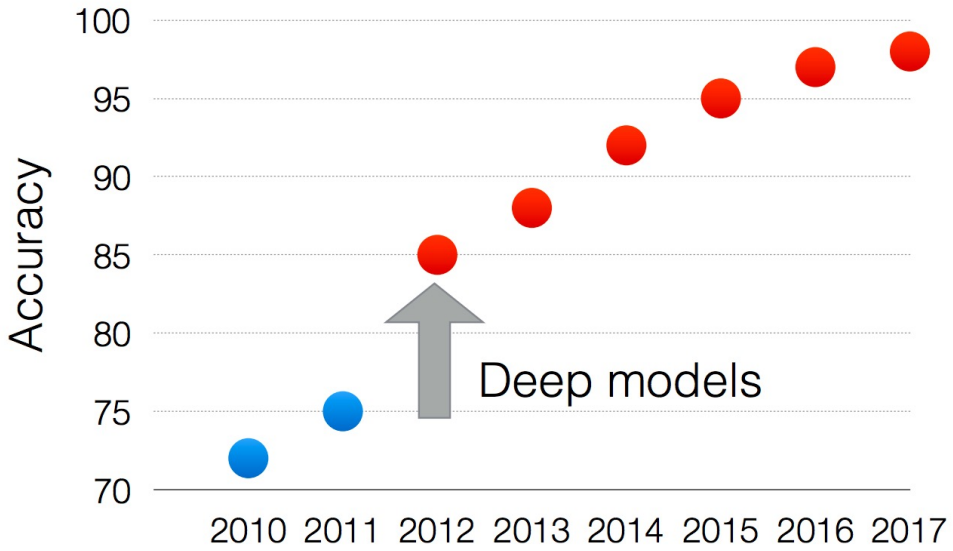
The wave of deep Learning

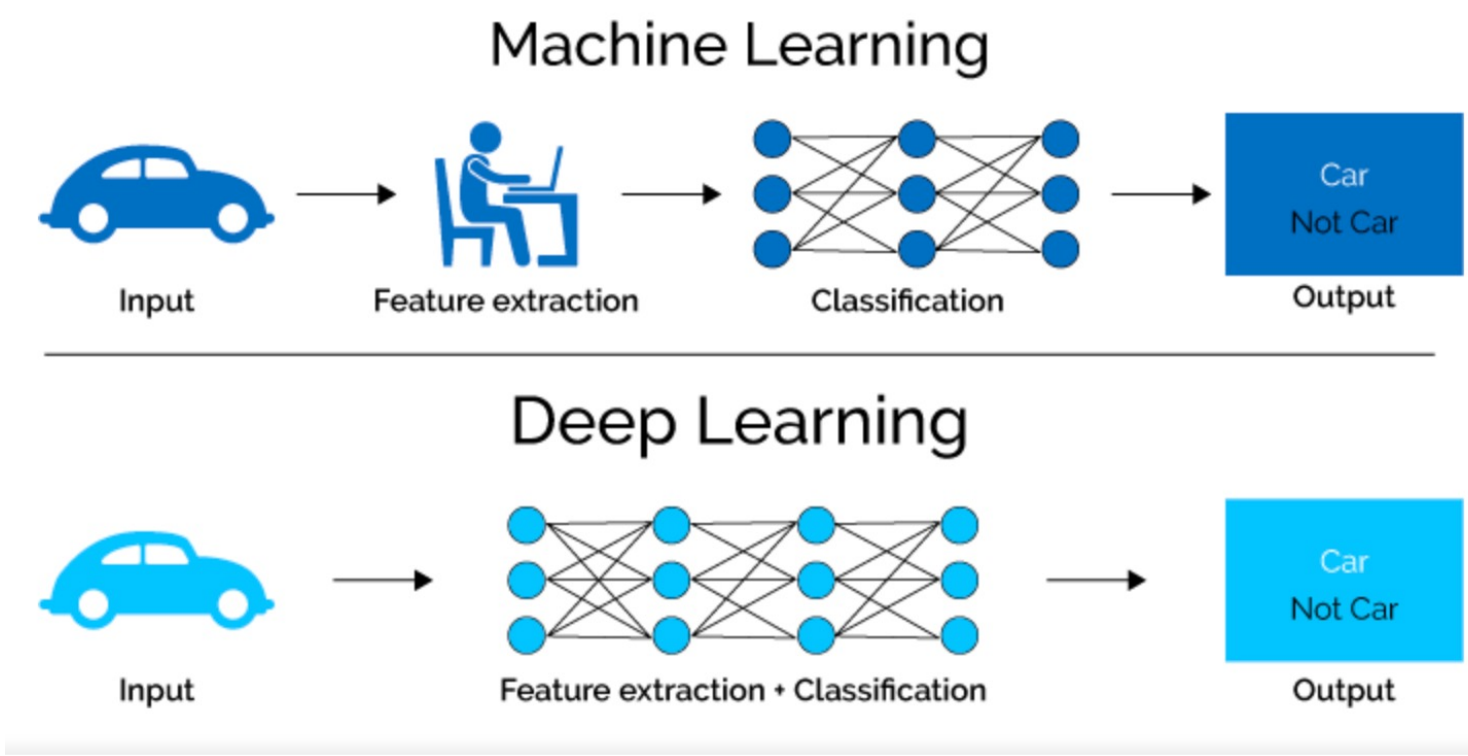


The wave of deep Learning

More than 14 million images have been hand-annotated

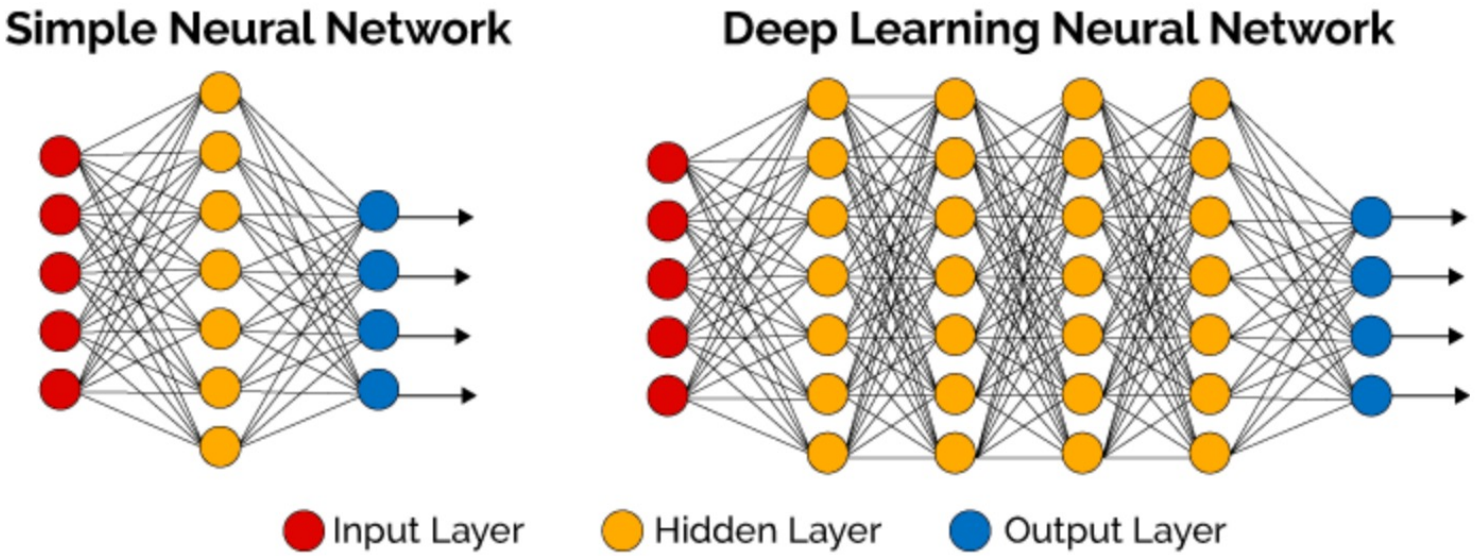


Judy Hoffman et al. CVPR18



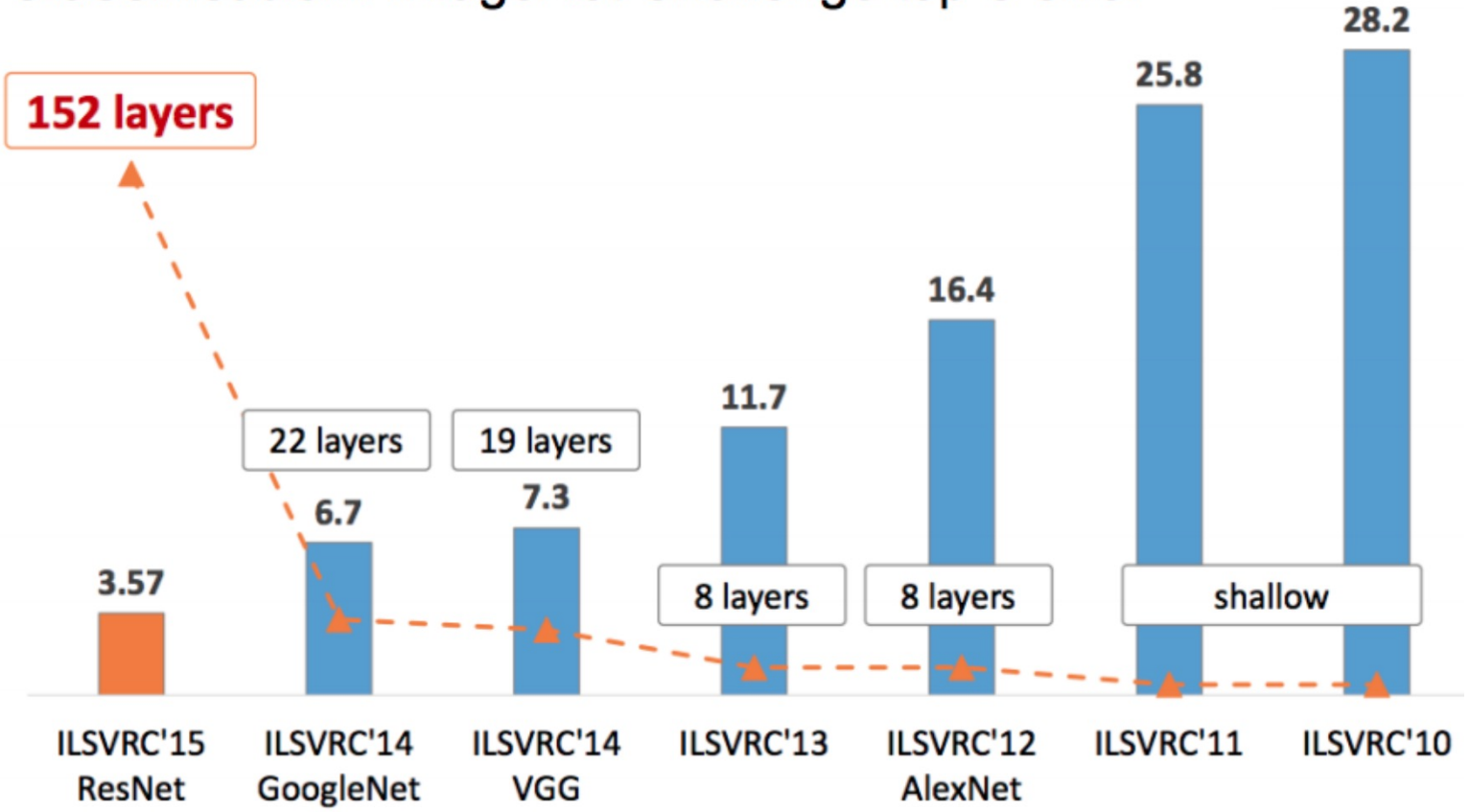
https://towardsdatascience.com/

What is Deep Learning?



https://becominghuman.ai/

Classification: ImageNet Challenge top-5 error



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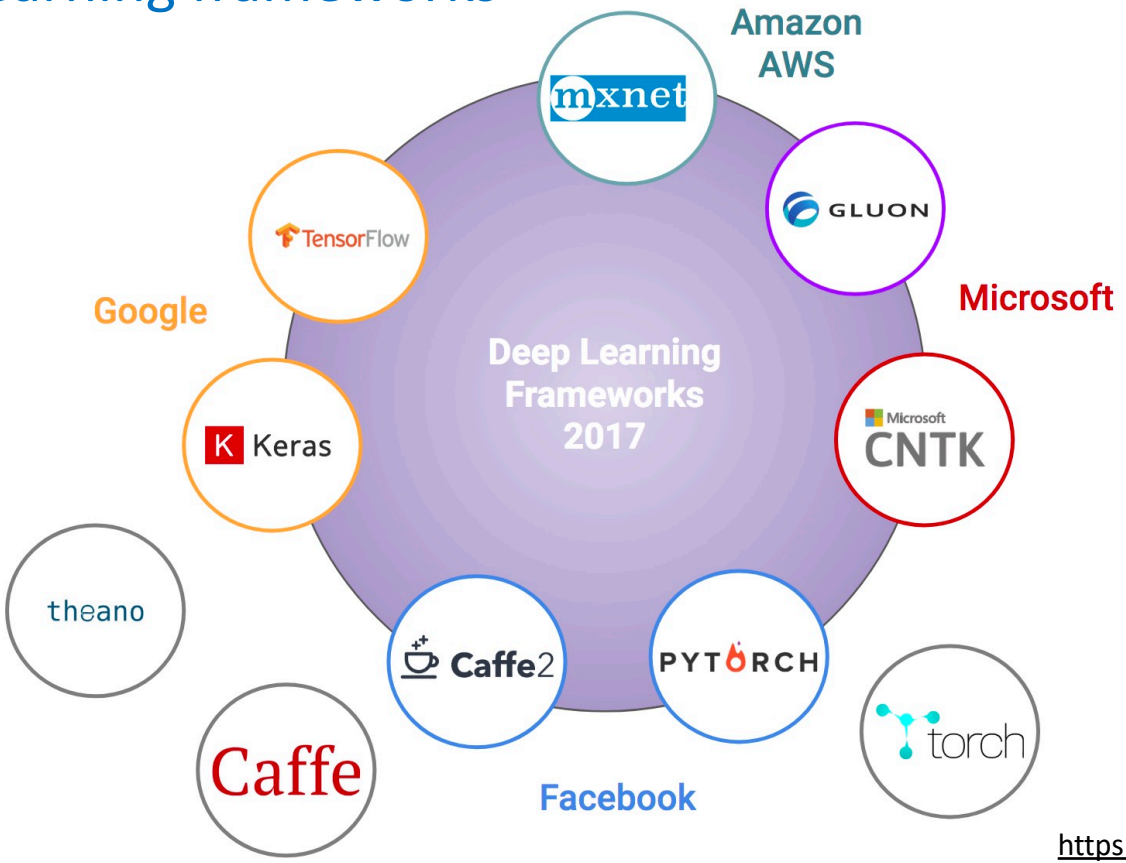
Deep learning frameworks



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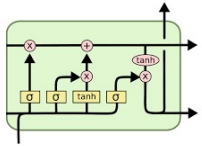
Deep Learning Timeline

1997 LSTM



IMAGENET

2012 AlexNet wins ImageNet

1998
CNN for Handwritten Recognition

2006
Deep Belief Network

2014 GANs

The big data player

Venture Radar

Artificial Intelligence Startups

Augmenting knowledge work using AI

25% of all job-based tasks will be automated by 2019 - *Forrester Research*

Many experts believe that by 2050 machines will have reached human level intelligence

Hundreds of startups are already using AI to augment knowledge work

Law & Contracts

ROSS, kira, Kelson, LEGAL ROBOT, BEAGLE, DOXAI

Customer Service

FinGenius, DigitalGenius, CAPiTO SYSTEMS, COGNICOR, Wise.io

Sales

AVISO, CONVERSICA, re:infer

Personal Assistants

x.ai

Investing

VANARE, sensai, WEALTHARC, INOVANCE

Business Intelligence, Journalism, Research

agolo, NarrativeScience, SYNAPSIFY

Audit & Compliance

AppZen

Medical & Other Image Analysis

MetaMind, clarifai, enlitic, Tractable

Other Medical

Wired Informatics

Humans focus more on creativity, social intelligence, manual dexterity, and...

More: https://www.ventureradar.com/