Deep Learning

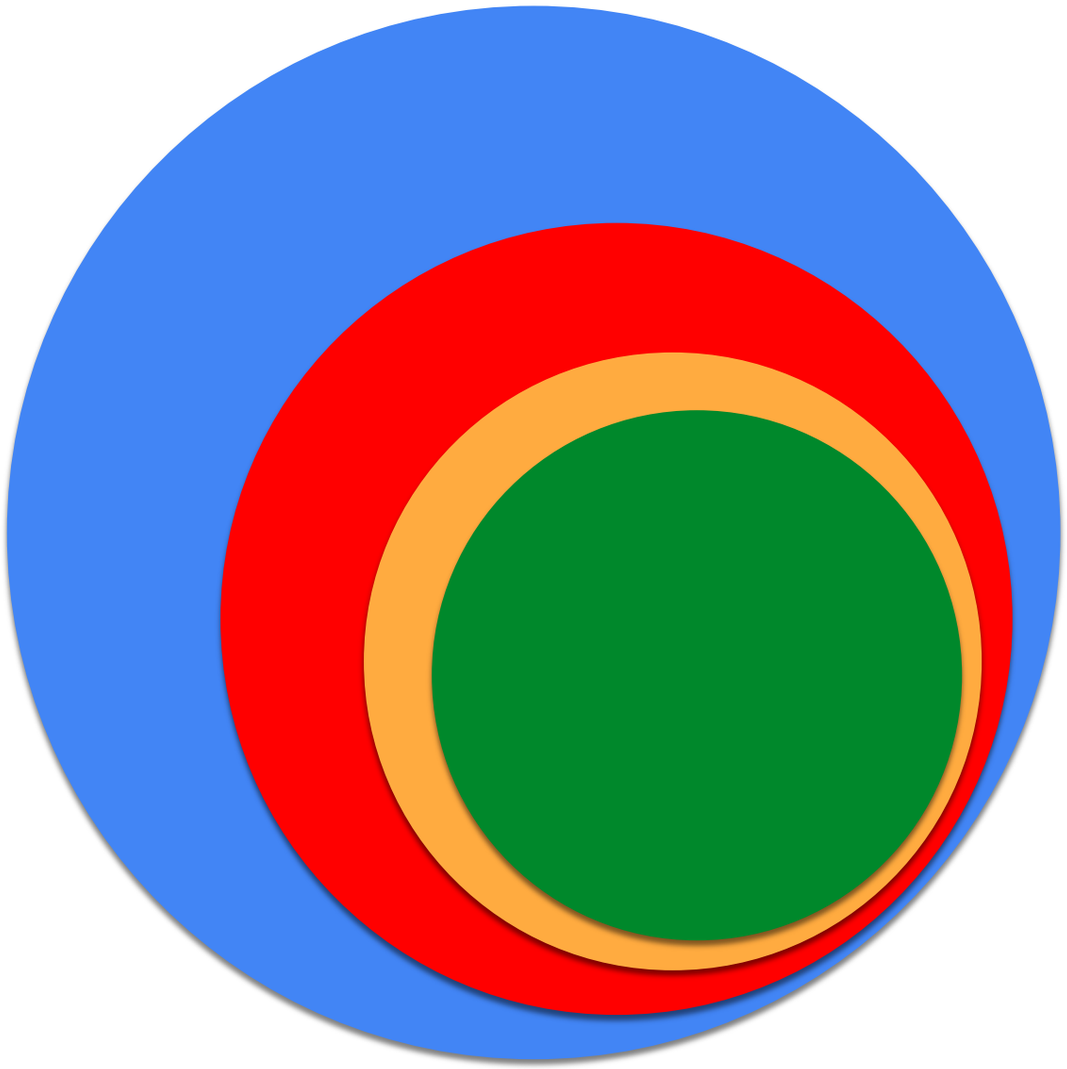
LM Computer Science, Data Science, Cybersecurity

2nd semester - 6 CFU

Luca Pasa, Nicolò Navarin & Alessandro Sperduti

Introduction to Machine Learning

Artificial Intelligence and Deep Learning



Artificial Intelligence

- The science that make things smart

Machine Learning

- Building machines that can learn

Neural Networks

- A type of algorithms in machine learning

Deep Learning

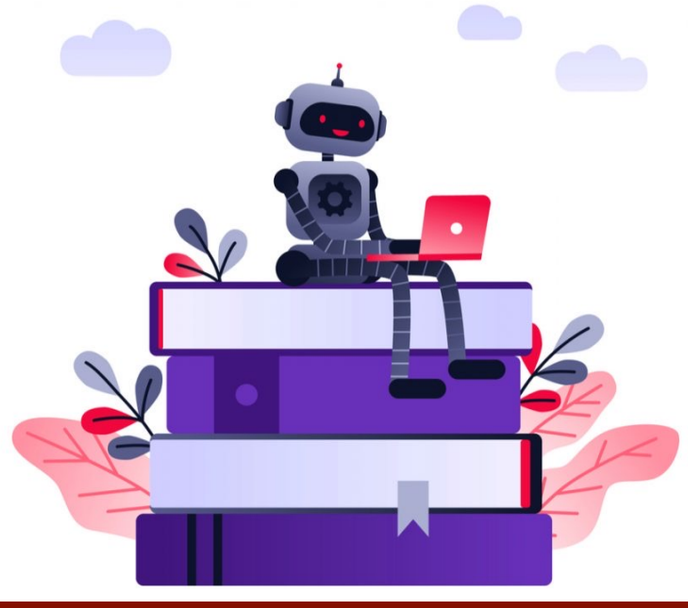
- Multi-layer neural networks

What Is Machine Learning?

"Machine learning is a field of inquiry devoted to understanding and building methods that 'learn', that is, methods that leverage data to improve performance on some set of tasks"

"**Machine learning** is a branch of Artificial Intelligence and computer science which focuses on the use of data and algorithms to imitate the way that humans learn, gradually improving its accuracy"

"**Machine learning** is an application of AI that enables systems to learn and improve from experience without being explicitly programmed."

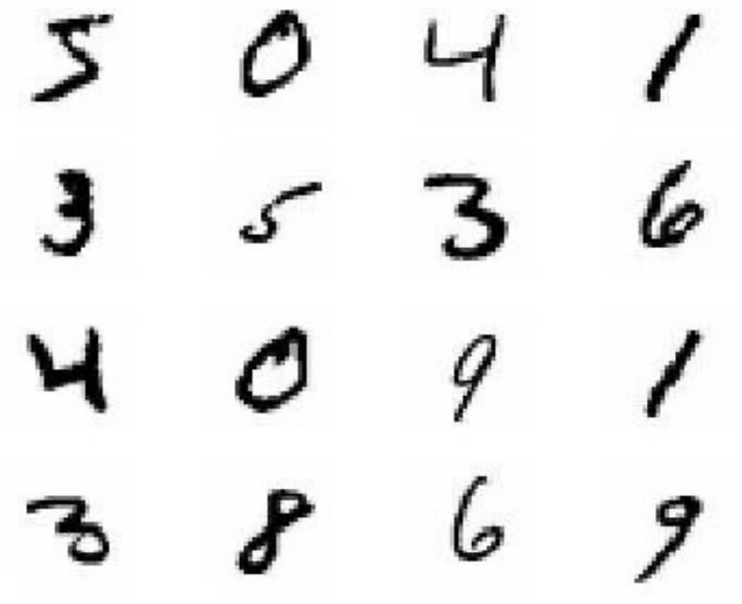


"A computer program is said to learn from **experience E** with respect to some class of **tasks T** and **performance measure P** if its performance at tasks in T, as measured by P, improves with experience E"

Some examples

A **checkers** learning problem:

- Task **T**: playing checkers
- Performance measure **P**: percent of games won against opponents
- Experience **E**: playing practice games against itself



A **handwriting recognition** learning problem:

- Task **T**: recognizing and classifying handwritten words within images
- Performance measure ***P :*** percent of words correctly classified
- Experience **E**: a database of handwritten words with given classifications

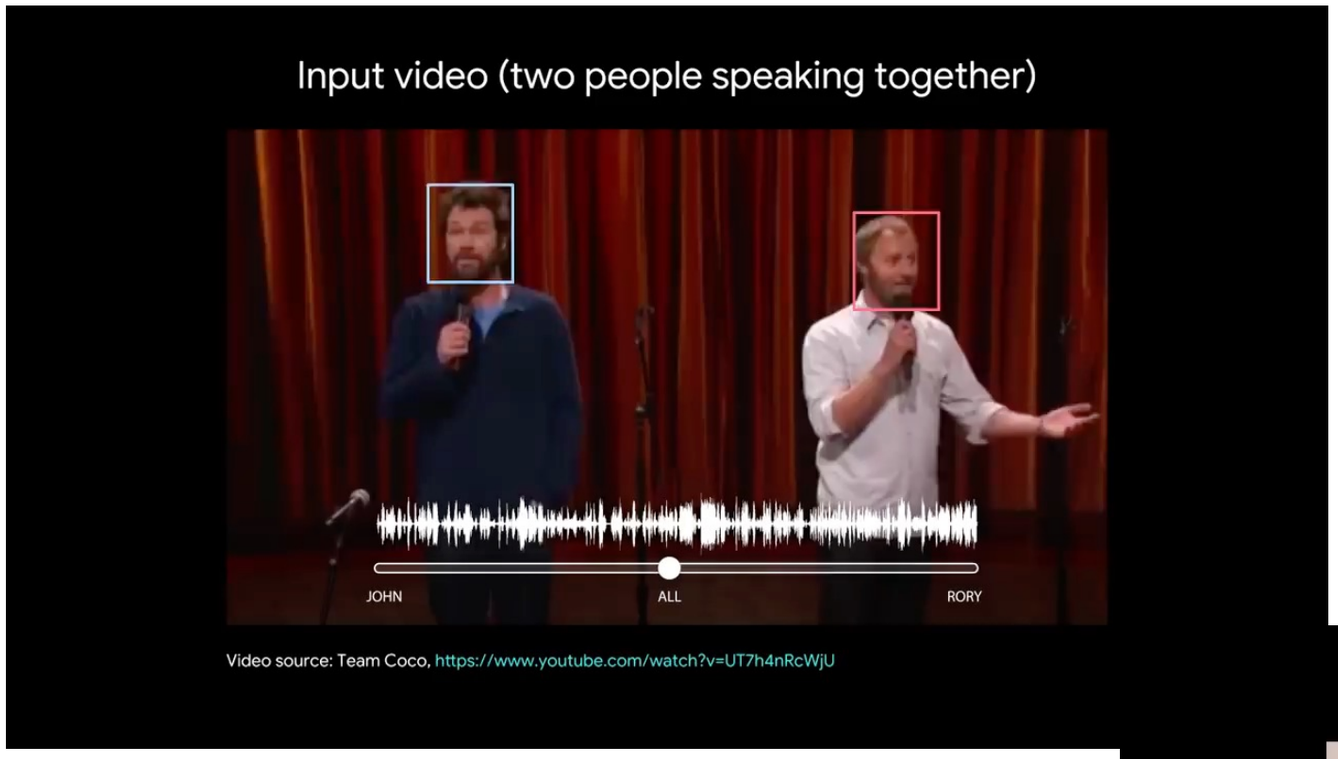
AlphaGo


TWO MINUTE
PAPERS
WITH KÁROLY ZSOLNAI-FEHÉR (KZF)
NEW DEEPMIND AI
BEATS ALPHAGO 100-0
Disclaimer: I was not part of this research project, I am merely providing commentary on this work.

AlphaStar

DALL·E 2

Looking to Listen



COVID-19

New #DeepLearning model detects #coronavirus pneumonia from #CT scans with comparable performance to expert radiologists #COVID19 This #AI could help improve evaluation efficiency & diagnosis. Preprint: lnkd.in/gNyYURD #TechForGood #artificialintelligence #healthcare

medRxiv
THE PREPRINT SERVER FOR HEALTH SCIENCES

Cold Spring Harbor Laboratory · BMJ · Yale

HOME | ABOUT | SUBMIT | ALERTS / RSS

Search

Advanced Search

Comment on this paper

Deep learning-based model for detecting 2019 novel coronavirus pneumonia on high-resolution computed tomography: a prospective study

Jun Chen, Lianlian Wu, Jun Zhang, Liang Zhang, Dexin Gong, Yilin Zhao, Shan Hu, Yonggui Wang, Xiao Hu, Biqing Zheng, Kuo Zhang, Huiling Wu, Zehua Dong, Youming Xu, Yijie Zhu, Xi Chen, Lilei Yu, Honggang Yu

doi: https://doi.org/10.1101/2020.02.25.20021568

This article is a preprint and has not been peer-reviewed [what does this mean?]. It reports new medical research that has yet to be evaluated and so should *not* be used to guide clinical practice.

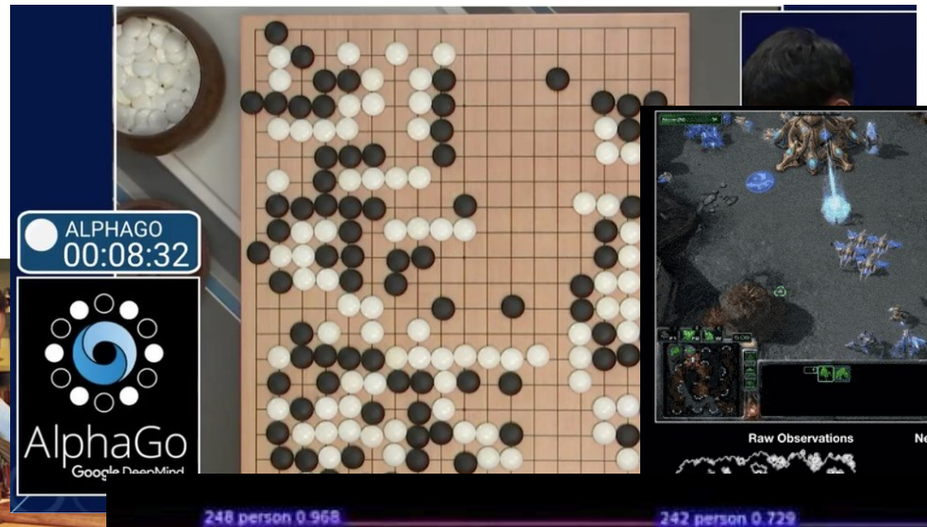
Abstract | Info/History | Metrics

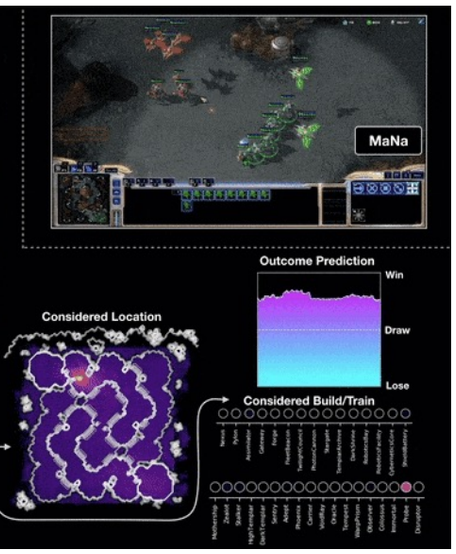
Preview PDF

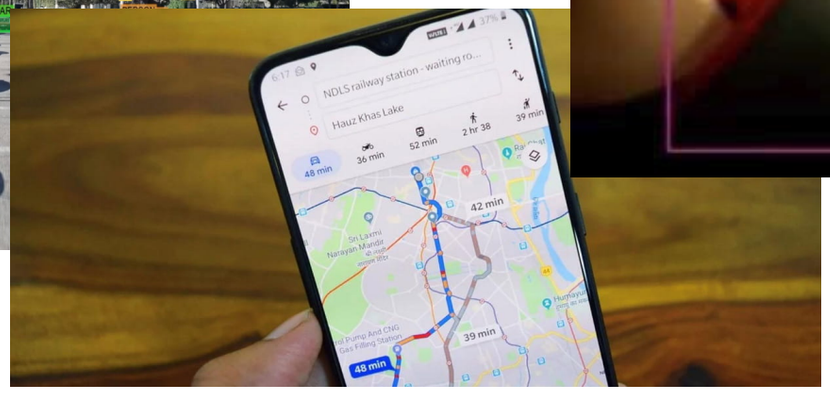
Abstract

Background: Computed tomography (CT) is the preferred imaging method for diagnosing 2019 novel coronavirus (COVID19) pneumonia. Our research aimed to construct a system based on deep learning for detecting COVID-19 pneumonia on high resolution CT, relieve working pressure of radiologists and contribute to the control of the epidemic. Methods: For model development and validation,

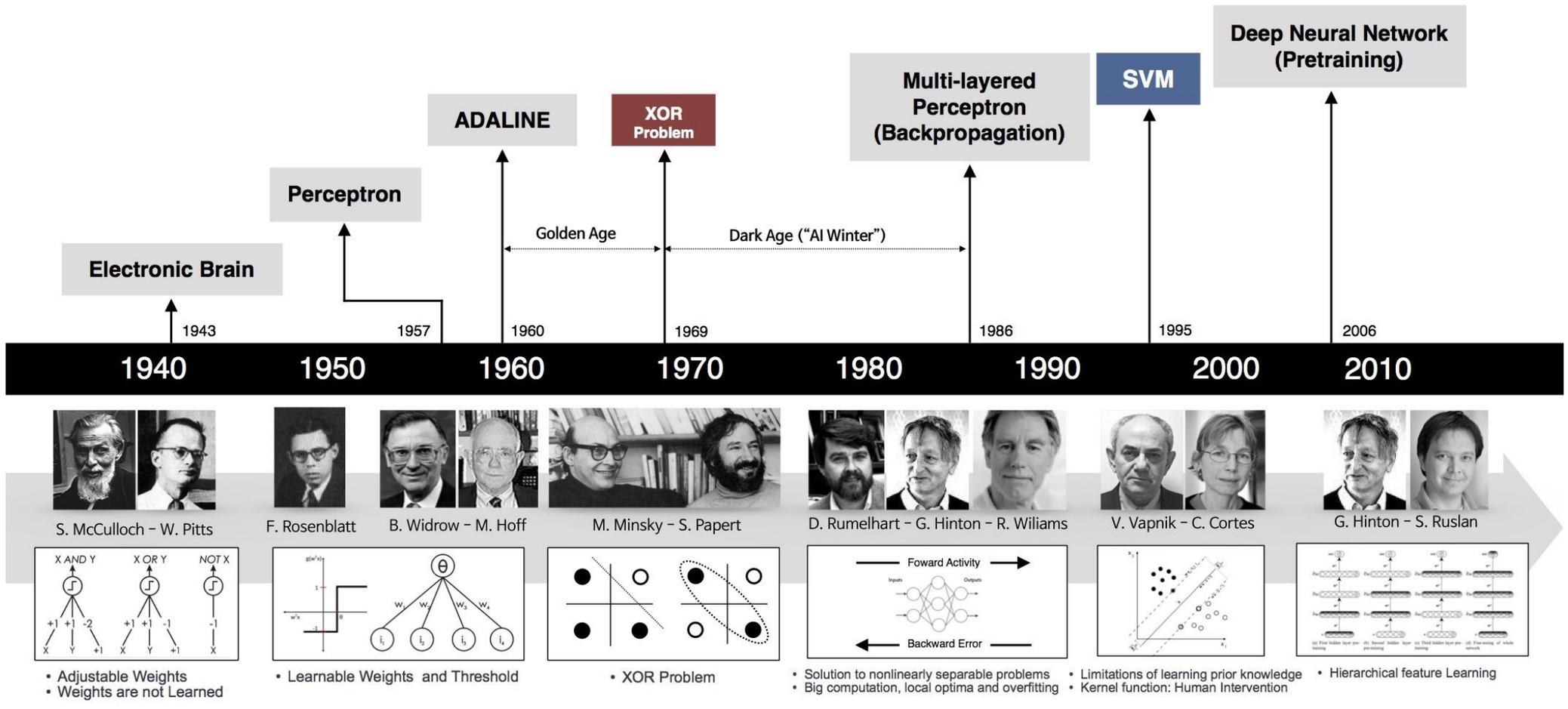
ML Applications







ML Time Line


Electronic Brain
1943
Perceptron
1957
ADALINE
1960
XOR Problem
1969
Golden Age
Dark Age ("AI Winter")
Multi-layered Perceptron (Backpropagation)
1986
SVM
1995
Deep Neural Network (Pretraining)
2006
1940
1950
1960
1970
1980
1990
2000
2010
S. McCulloch - W. Pitts
F. Rosenblatt
B. Widrow - M. Hoff
M. Minsky - S. Papert
D. Rumelhart - G. Hinton - R. Wiliams
V. Vapnik - C. Cortes
G. Hinton - S. Ruslan
X AND Y
X OR Y
NOT X
Foward Activity
Backward Error
• Adjustable Weights
• Weights are not Learned
• Learnable Weights and Threshold
• XOR Problem
• Solution to nonlinearly separable problems
• Big computation, local optima and overfitting
• Limitations of learning prior knowledge
• Kernel function: Human Intervention
• Hierarchical feature Learning