Neural Network

A beginners guide

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Learn with Google AI | Explore ML

Agenda

- AI-ML-DL
  - The misconception
  - Old is gold
  - DL the new fuel
- Neural Network
  - Should you jump into Neural Network
  - The motivation behind NN
  - Overview of NN, the black box model
  - Simple mathematical concepts
  - Learning
- Tips going ahead…..

AI-ML-DL

“AI began with the ancient wish to forge the GOD.”

-Pamela McCorduck

“There are differences between learning and awareness. Learning to perform a task is not AI, rather machine learning.”

-Ayush

“DL is the today’s white fuel of machine learning.”

-Ayush

AI-ML-DL

Thinking Humanly	Thinking Rationally
"The exciting new effort to make computers think . . . *machines with minds*, in the full and literal sense." (Haugeland, 1985) "[The automation of] activities that we associate with human thinking, activities such as decision-making, problem solving, learning . . ." (Bellman, 1978)	"The study of mental faculties through the use of computational models." (Charniak and McDermott, 1985) "The study of the computations that make it possible to perceive, reason, and act." (Winston, 1992)
Acting Humanly	**Acting Rationally**
"The art of creating machines that perform functions that require intelligence when performed by people." (Kurzweil, 1990) "The study of how to make computers do things at which, at the moment, people are better." (Rich and Knight, 1991)	"Computational Intelligence is the study of the design of intelligent agents." (Poole *et al.*, 1998) "AI . . . is concerned with intelligent behavior in artifacts." (Nilsson, 1998)

Figure 1.1 Some definitions of artificial intelligence, organized into four categories.

Souce: http://aima.cs.berkeley.edu/

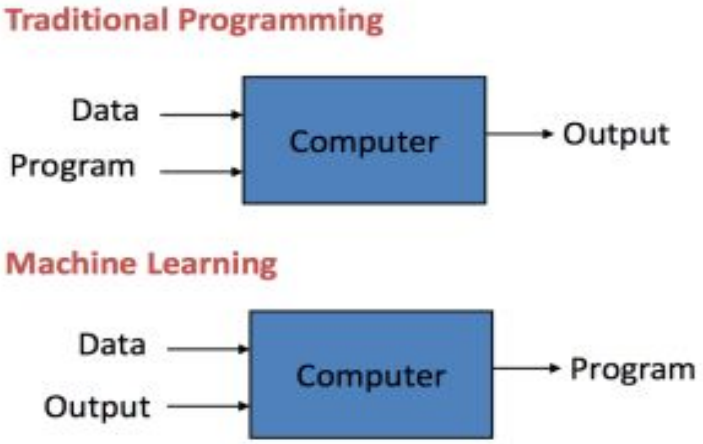
- The definitions on **top** are concerned with **thought processes** and reasoning, whereas the ones on the **bottom** address **behavior**.
- The definitions on the **left measure success** in terms of fidelity to **human performance**, whereas the ones on the **right measure** against an **ideal performance measure, called rationality.**

Old is Gold

What *type* of thing is machine learning? [edit]

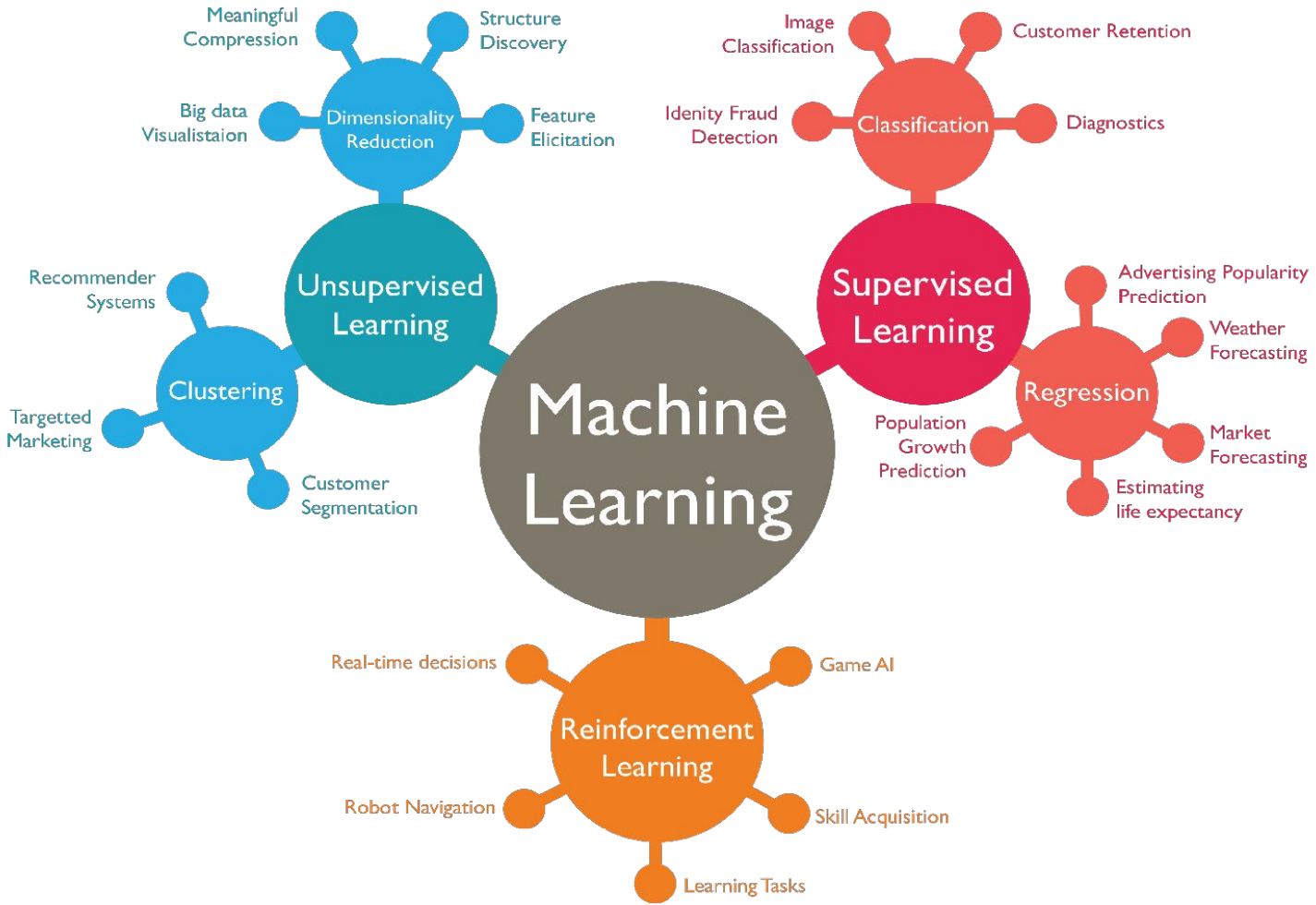
- An academic discipline
- A branch of science
  - An applied science
    - A subfield of computer science
      - A branch of artificial intelligence
      - A subfield of soft computing

Source: https://en.wikipedia.org/wiki/Outline_of_machine_learning

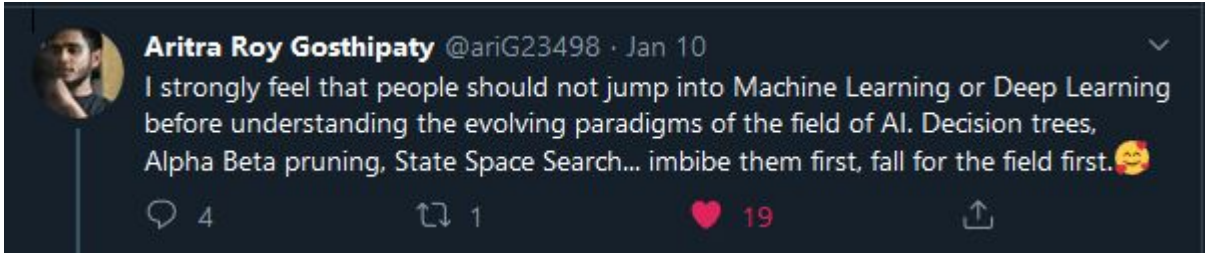


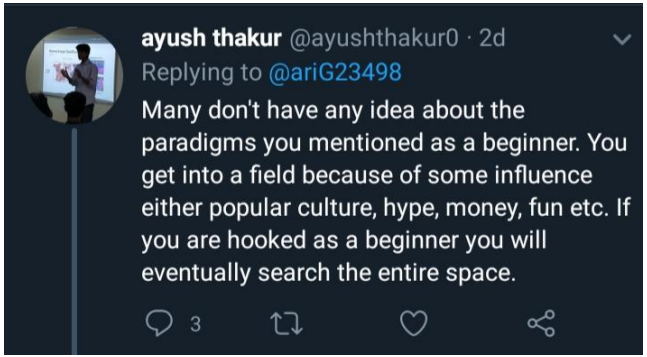
Source: https://tinyurl.com/y7ckyxcr

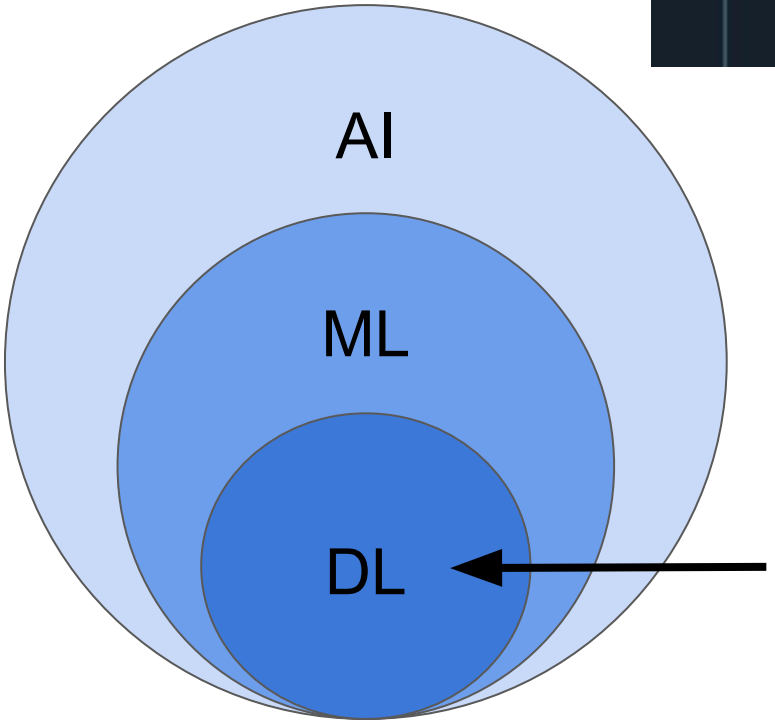
Old is Gold


Machine Learning
Unsupervised Learning
Dimensionality Reduction
Meaningful Compression
Structure Discovery
Big data Visualistaion
Feature Elicitation
Clustering
Recommender Systems
Targetted Marketing
Customer Segmentation
Supervised Learning
Classification
Image Classification
Customer Retention
Idenity Fraud Detection
Diagnostics
Regression
Advertising Popularity Prediction
Weather Forecasting
Population Growth Prediction
Market Forecasting
Estimating life expectancy
Reinforcement Learning
Real-time decisions
Game AI
Robot Navigation
Skill Acquisition
Learning Tasks

DL is the new fuel

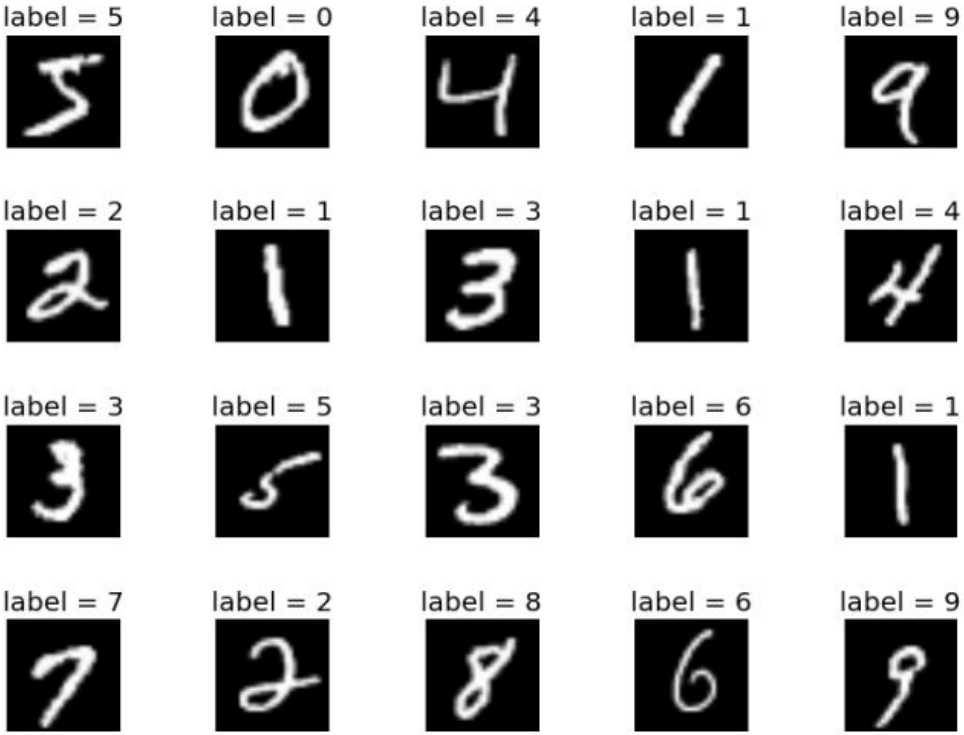






We shall focus here!

Neural Network



Source: https://tinyurl.com/shogcpk

Souce: https://tinyurl.com/w259z39

What is this strange whatever?
HOW!!!

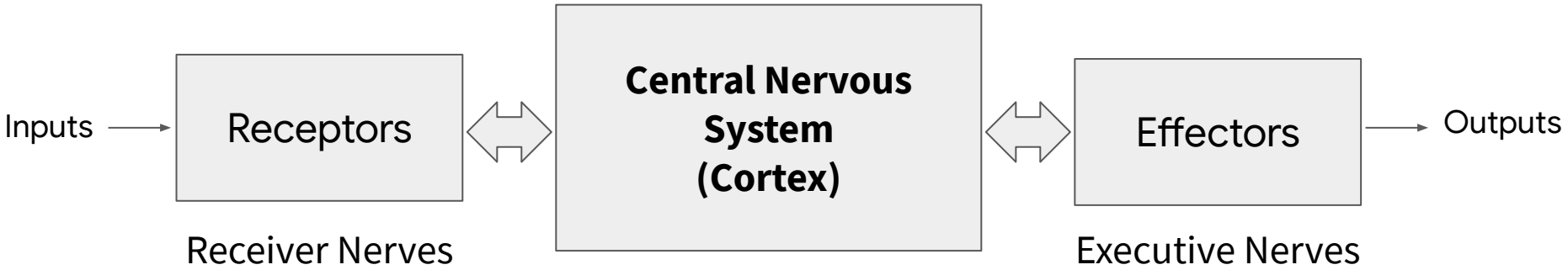
What are Neurons(Neural)?

How are they linked?

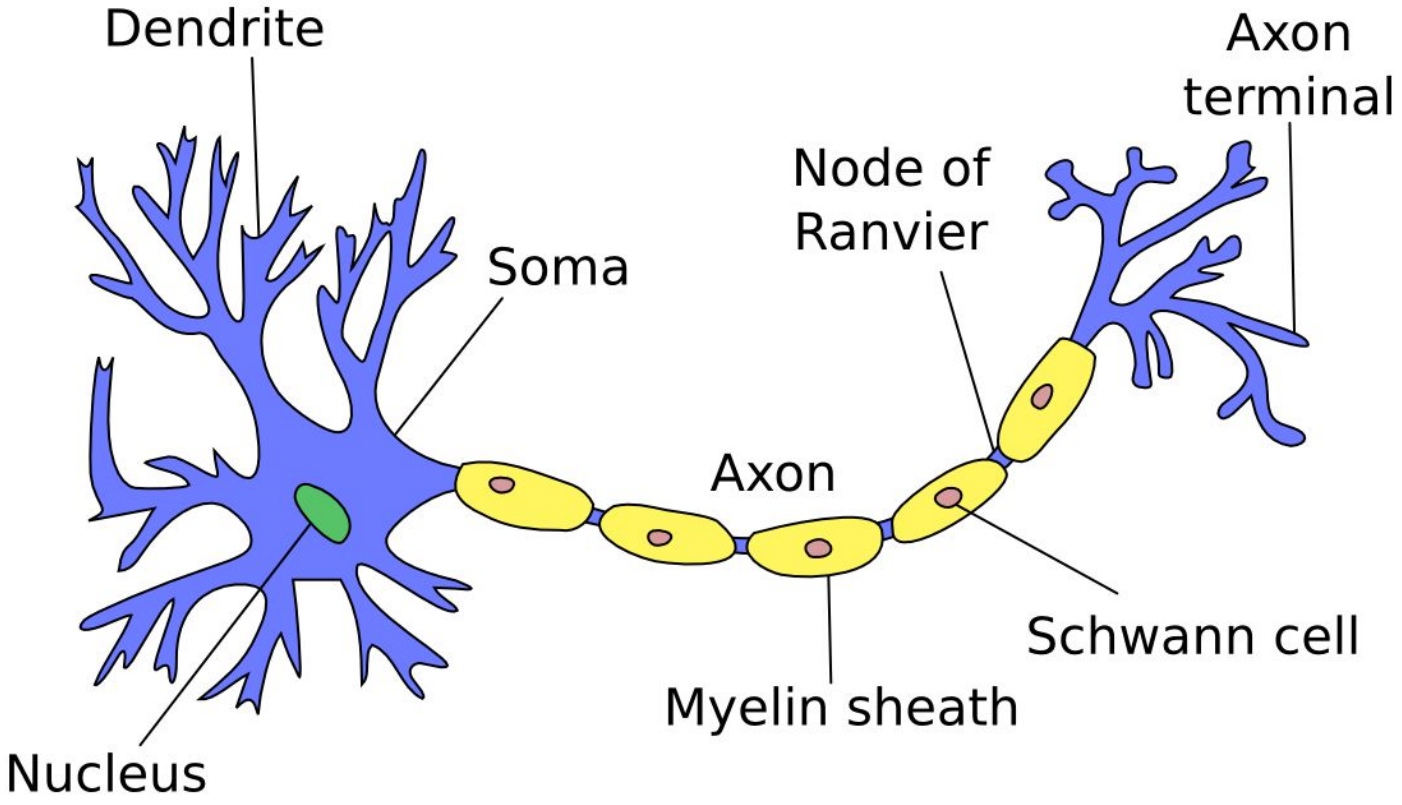
Neural Network

The Motivation Behind NN

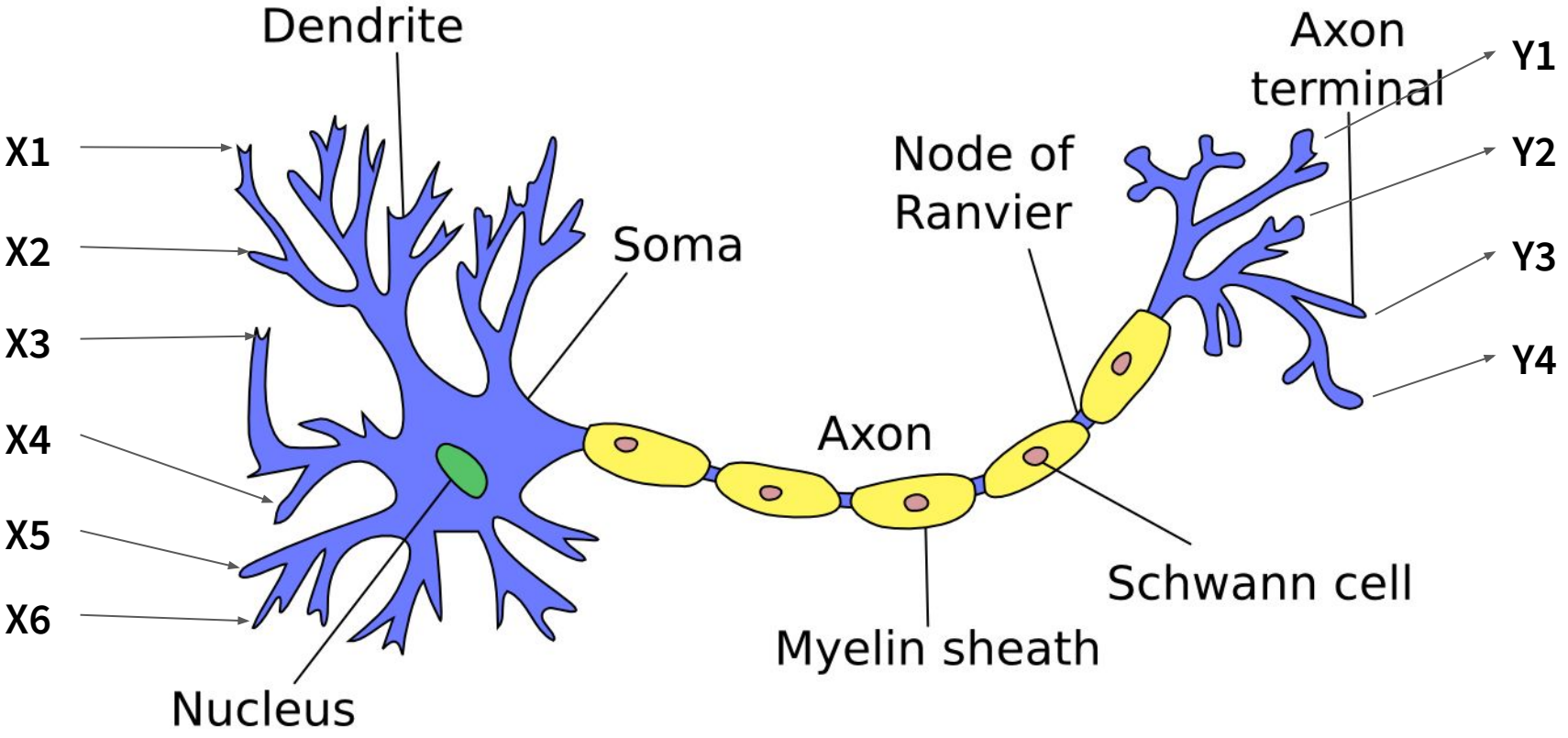
Human Nervous System



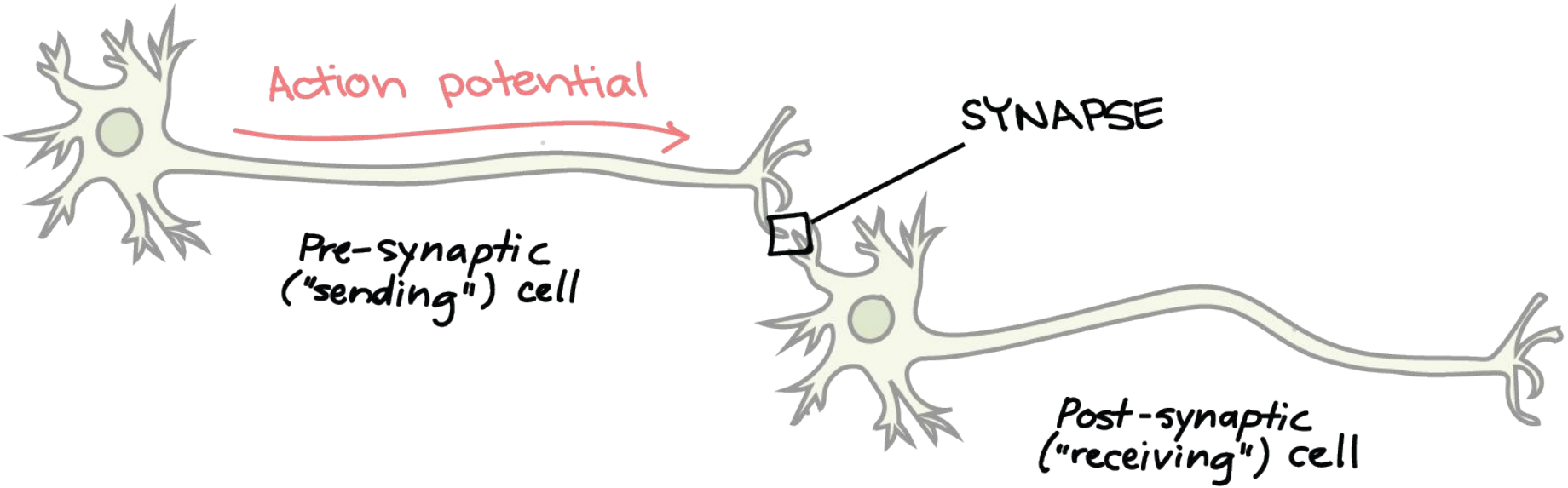
Biological Neurons



Biological Neurons



Connection Between Neurons

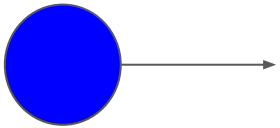


A **synapse** serves as a unique inter-neuron interface to transfer the information.

At the early stage of the human brain development (the first two years from birth) about 1 million synapses (hard-wired connections) are formed per second.

Synapses are then modified through the learning process.

Artificial Neuron



Something that holds value

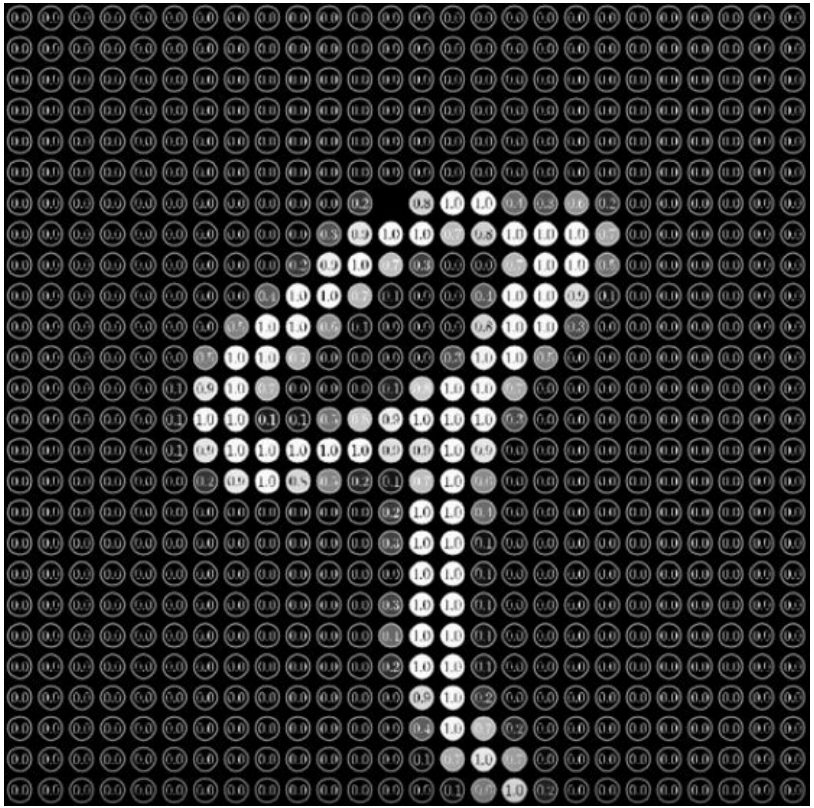
MNIST handwritten dataset:

28*28 pixels = 784 such neurons as inputs

Scaled down between 0-1

Let’s call them **activation**. (activate something!)

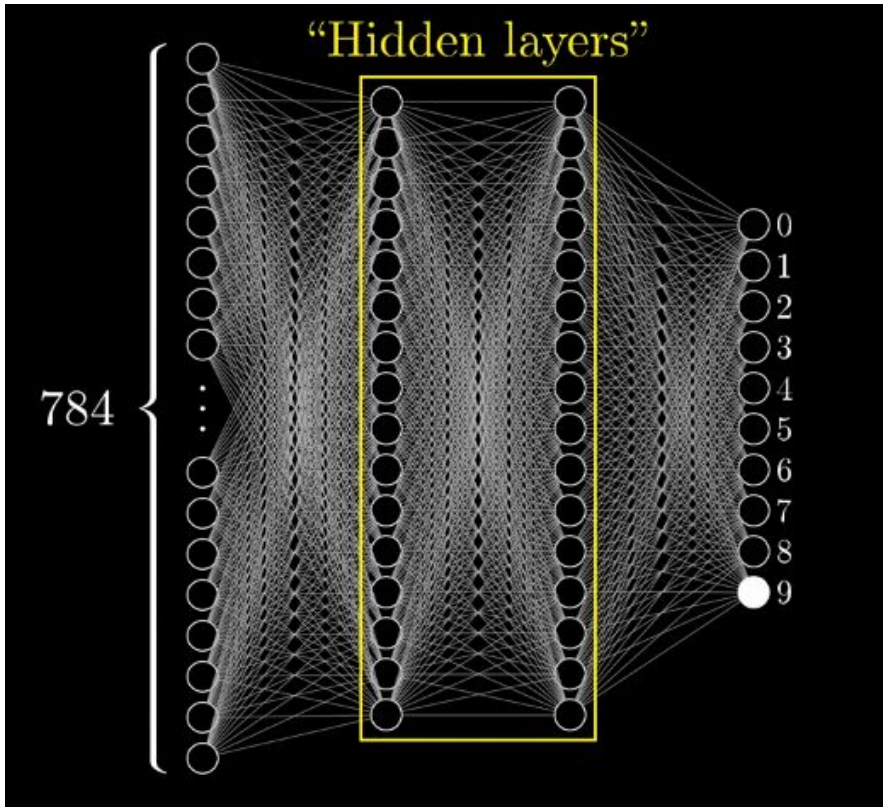
You can **flatten** them.



Souce: https://tinyurl.com/w259z39

NN Structure

Input Layer

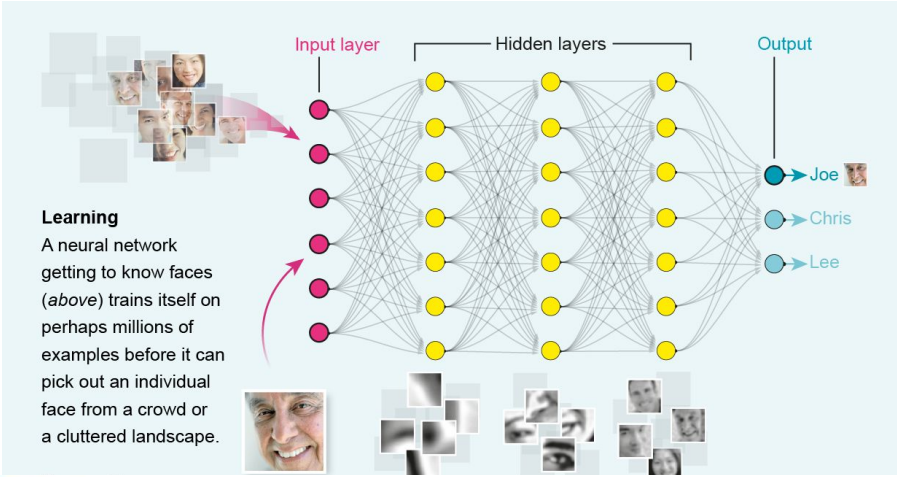


Output Layer

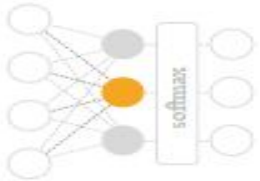
Souce: https://tinyurl.com/w259z39

What's is really happening in this structure? What is being learned? How it's learning?

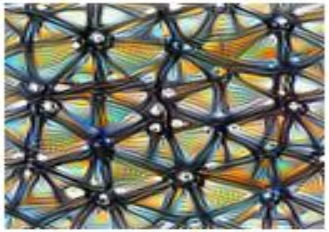
What is it looking at?



Learning
A neural network getting to know faces (*above*) trains itself on perhaps millions of examples before it can pick out an individual face from a crowd or a cluttered landscape.



Neuron
`layer_n[x,y,z]`



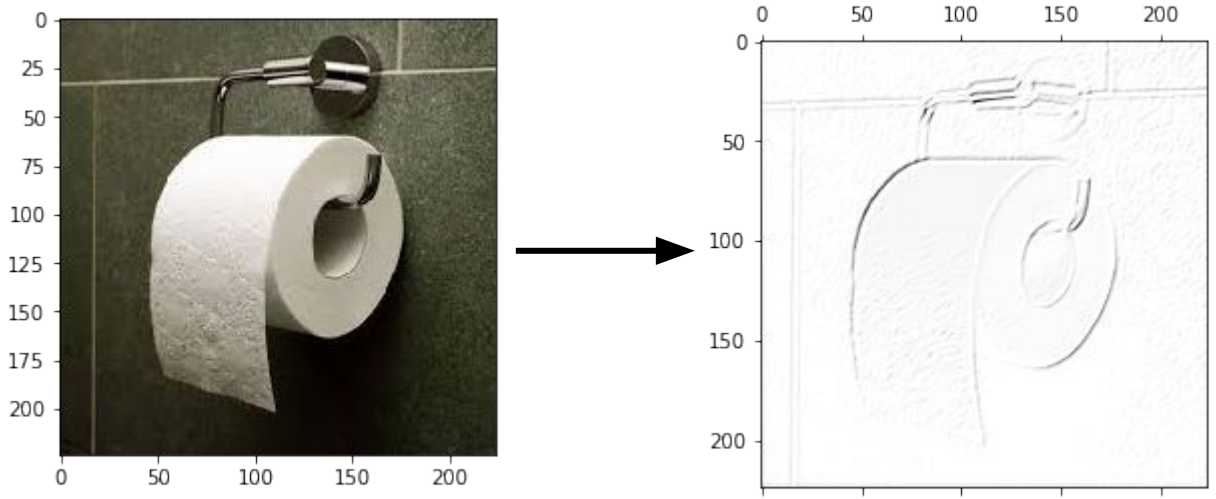
Channel
`layer_n[:,:,z]`

Layer/DeepDream
`layer_n[:,:,:]^2`

Class Logits
`pre_softmax[k]`

Class Probability
`softmax[k]`

What is it looking at?

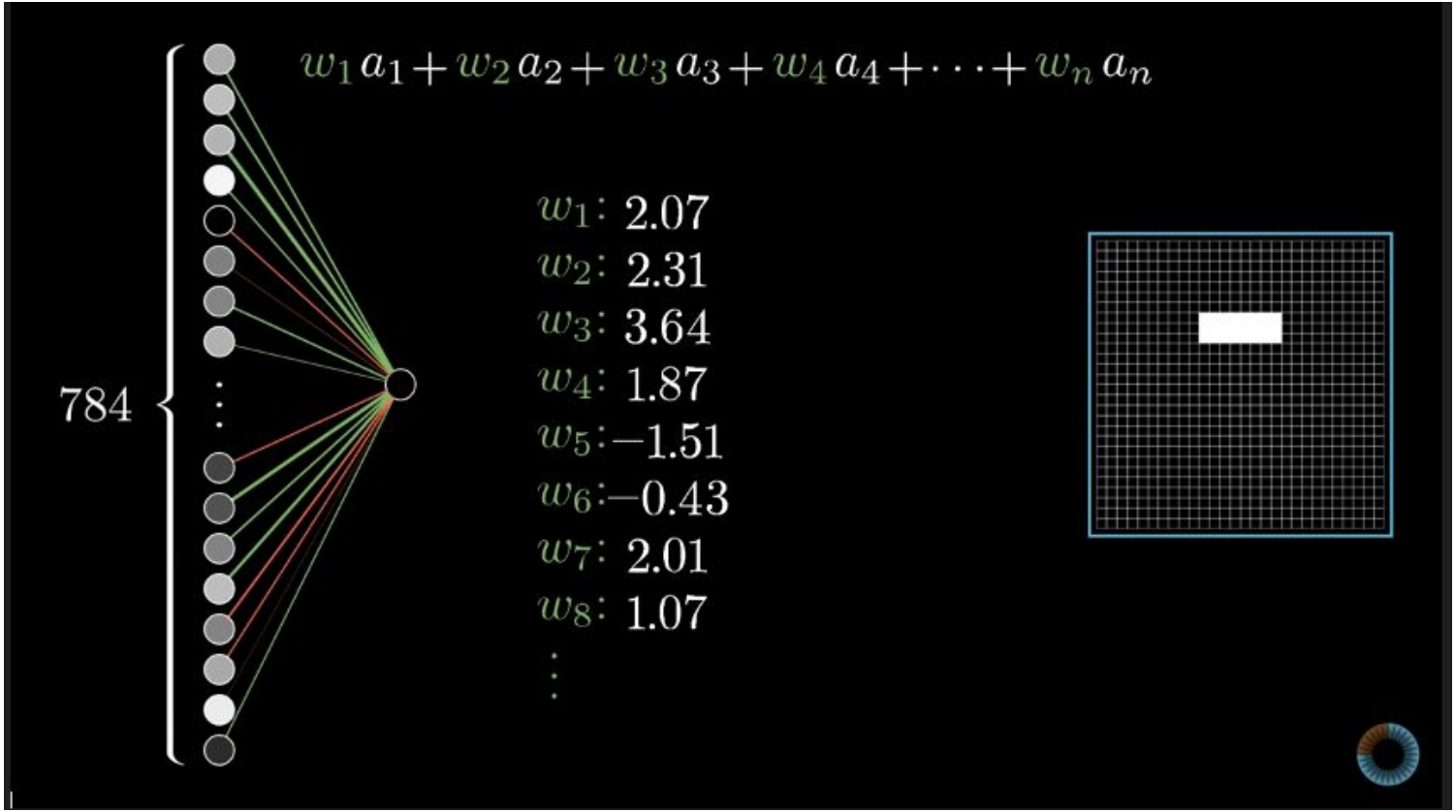


Input Image

First Layer

Recommended: https://github.com/ayulockin/Adventures_in_Image_Processing_with_TF

What is actually learned?



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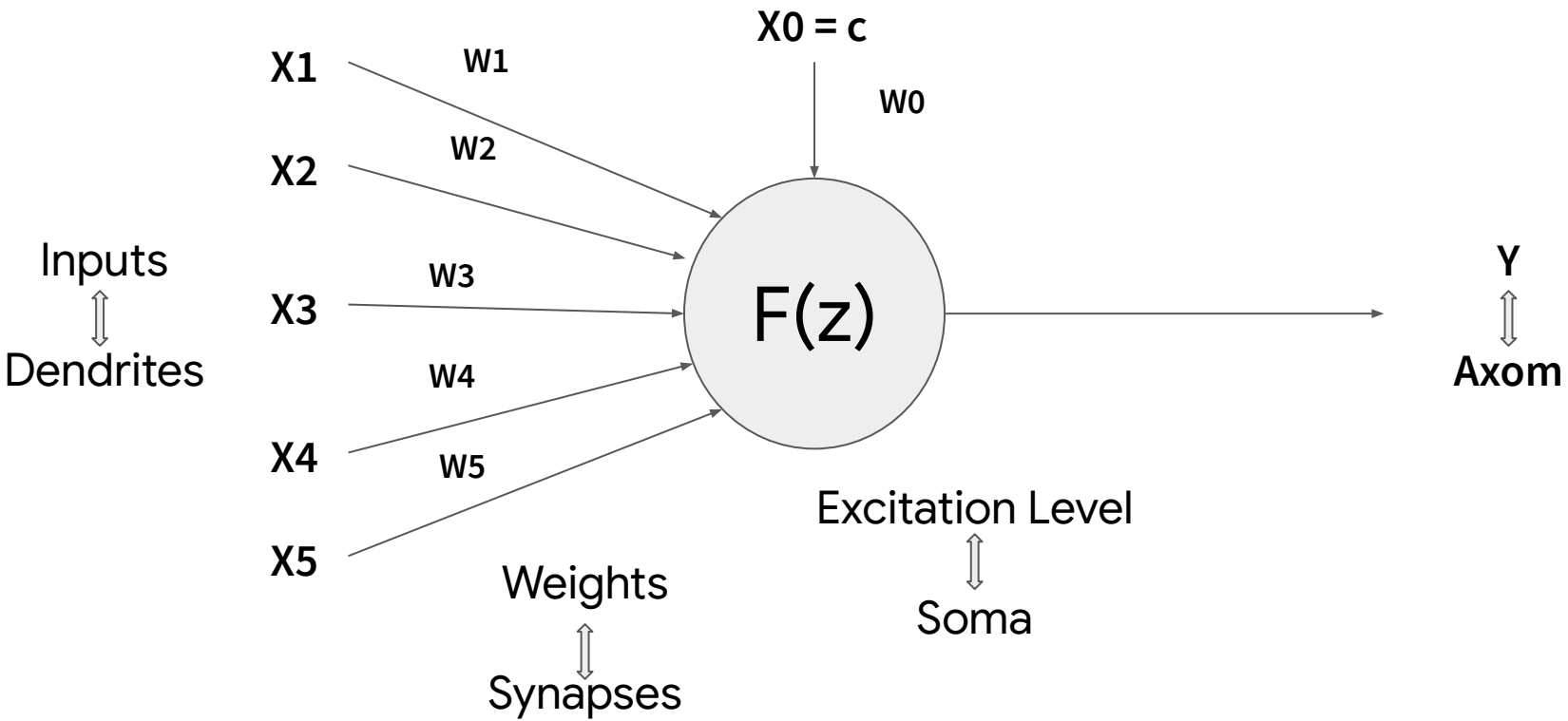
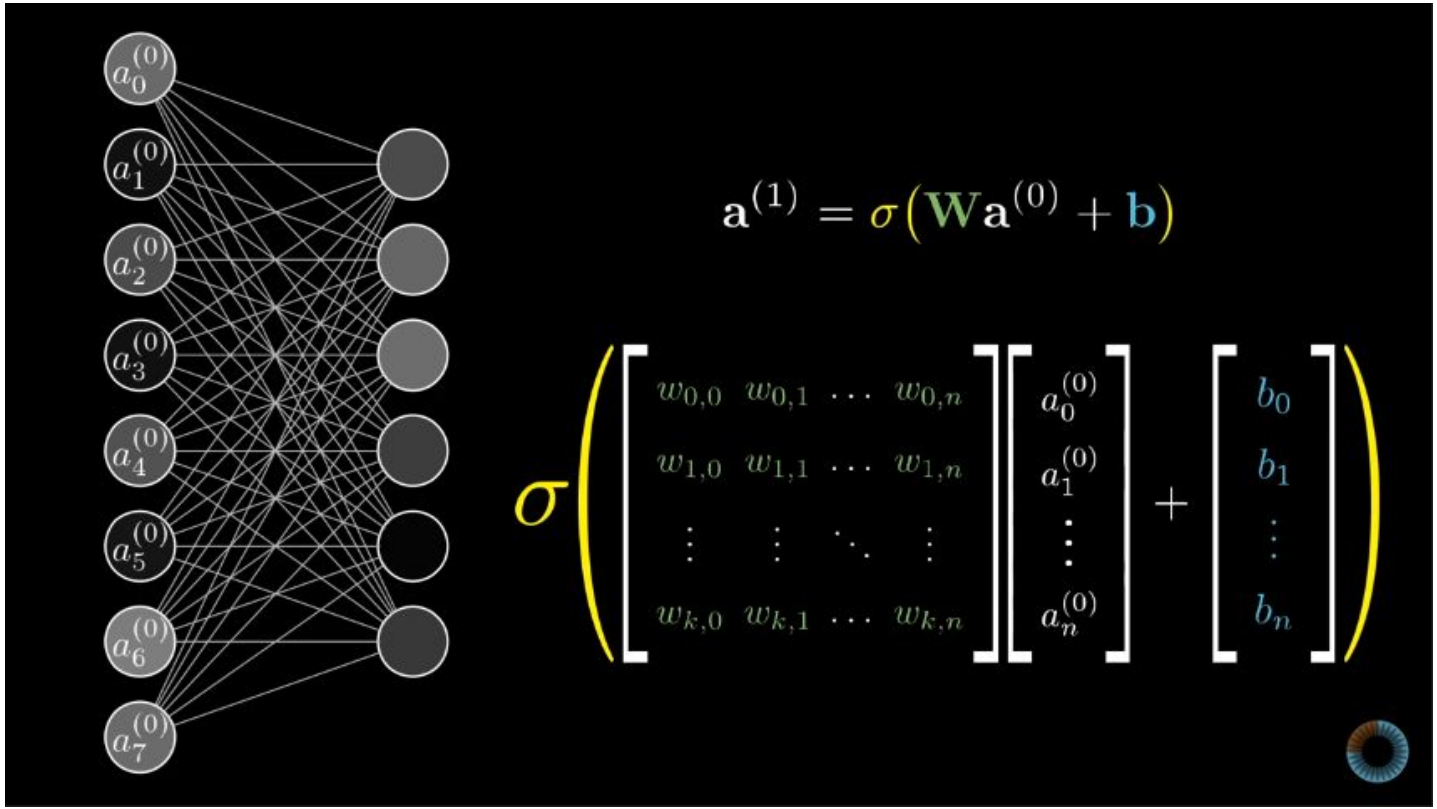
The model!


X0 = c
X1
W1
W0
X2
W2
Inputs
W3
X3
F(z)
Y
Dendrites
W4
Axom
X4
W5
Excitation Level
X5
Weights
Soma
Synapses

The model!



Souce: https://tinyurl.com/w259z39

Summary

Let’s try to decode it :P

Acknowledgement(s)

- 3 Blue 1 Brown: https://www.youtube.com/watch?v=aircAruvnKk&t=15s
- Aritra Roy
- Ritwik Raha

Shoot your questions!

Thank you <3

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