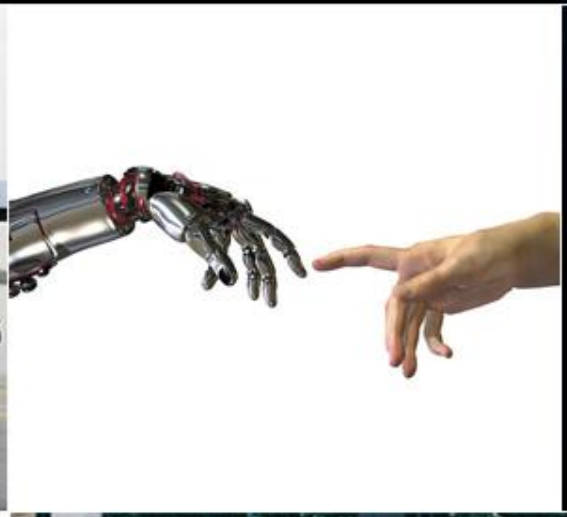

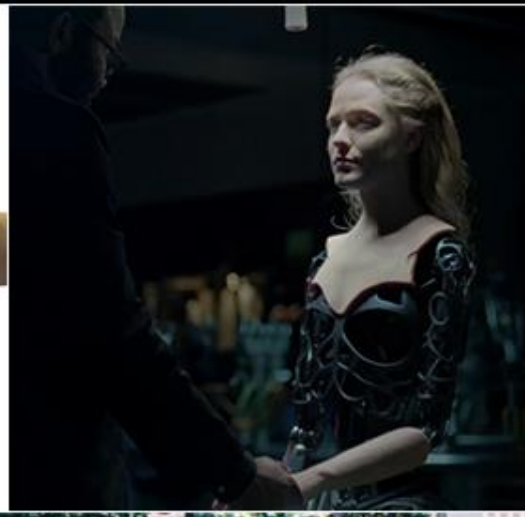

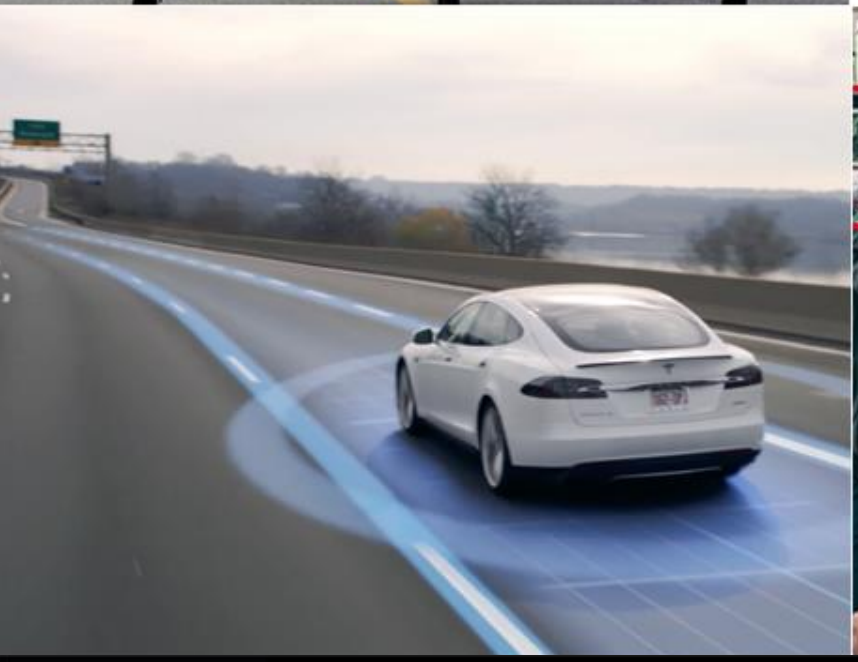

What The Fuzz Is All About

Presented By

http://iam.akbarali.co.in

WHO IS THIS GUY

Akbar Ali

Programmer / Ops

Mostly JS and Python

@AkbarHere

http://akbarali.co.in

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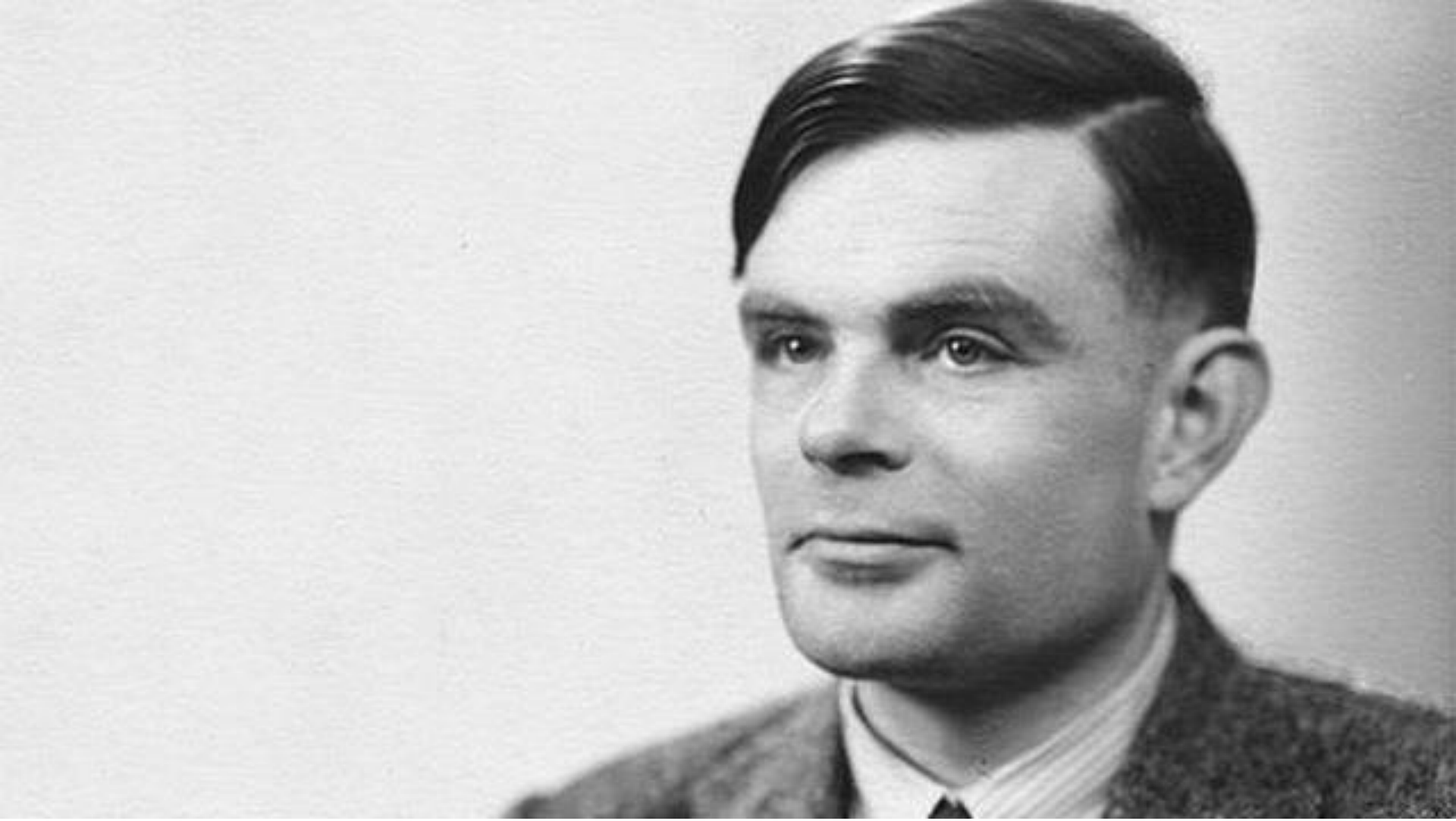

Alan Turing (23/06/12 – 07/06/54)

Father of theoretical computer science and artificial intelligence

Turing Test

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The New York Times

July 8, 1958

The Navy revealed the embryo of an electronic computer today that it expects will be able to walk, talk, see, write, reproduce itself and be conscious of its existence…. Dr Frank Rosenblatt, a research psychologist at the Cornell Aeronautical Laboratory, Bufallo, said Perceptrons might be fired to the planets as mechanical space explorers

NOT JUST US

Volvo Drive Me

NOT JUST US

Volvo Drive Me

Asus ZenFone 5Z

AI charging

AI Display

AI Ringtone

The two terms are not synonymous no matter what marketing teams might think, and a slew of crappy “AI” products will soon ruin any remaining good will

The Most Confusing Term, AI

the term "artificial intelligence" is applied when a machine mimics "cognitive" functions that humans associate with other human minds such as "learning" and "problem solving".

The scope of AI is disputed: as machines become increasingly capable, tasks considered as requiring "intelligence" are often removed from the definition, a phenomenon known as the AI Effect, leading to the quip "AI is whatever hasn't been done yet."

COMPUTER BEATS HUMAN !!!

How many countries in Africa does the equator cross ?

MORAVEC'S PARADOX

LINGUISTIC THEORY

>> 95% of our DNA matches with chimpanzees, so, what are the differences ?

>> there is no other species known to date that can express infinite ideas (sentences) with a limited set of symbols (speech sounds and words)

>> Let you imagine things you never experienced

DRAWBACKS

>> Artificial General Intelligence

>> Lack of reasoning

>> Big Data

>> Supervised Data

>> Hyper Parameter tuning

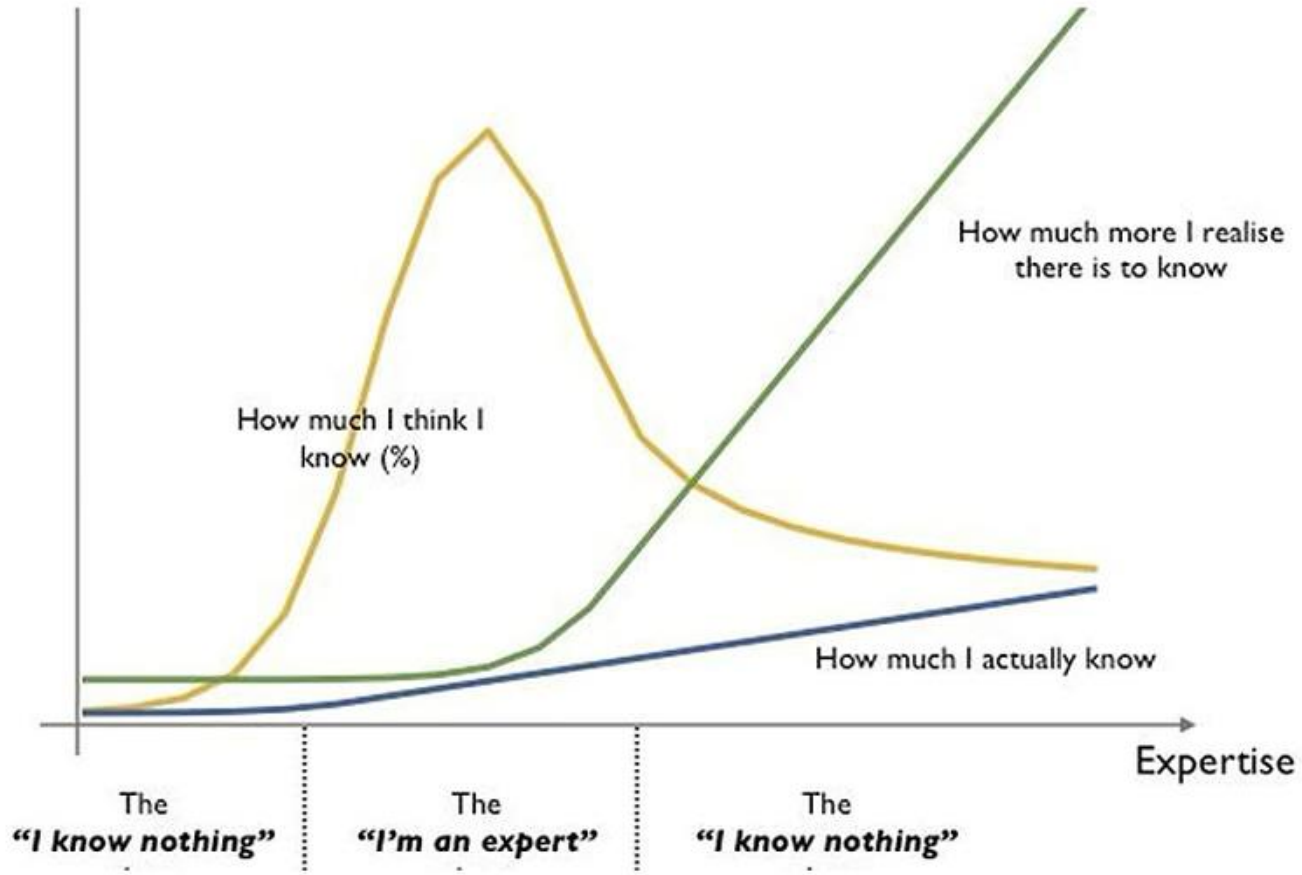
>> Network Architecture

>> ~ 100 - 1000 Trillian synapse in a human, 10 Billion for ANN

>> Good reward function is hard


SCORE
1000
LAPS
–/3
TIME
0:08
TURBO
MORE GAMES

Neural Networks: Proceed with Caution



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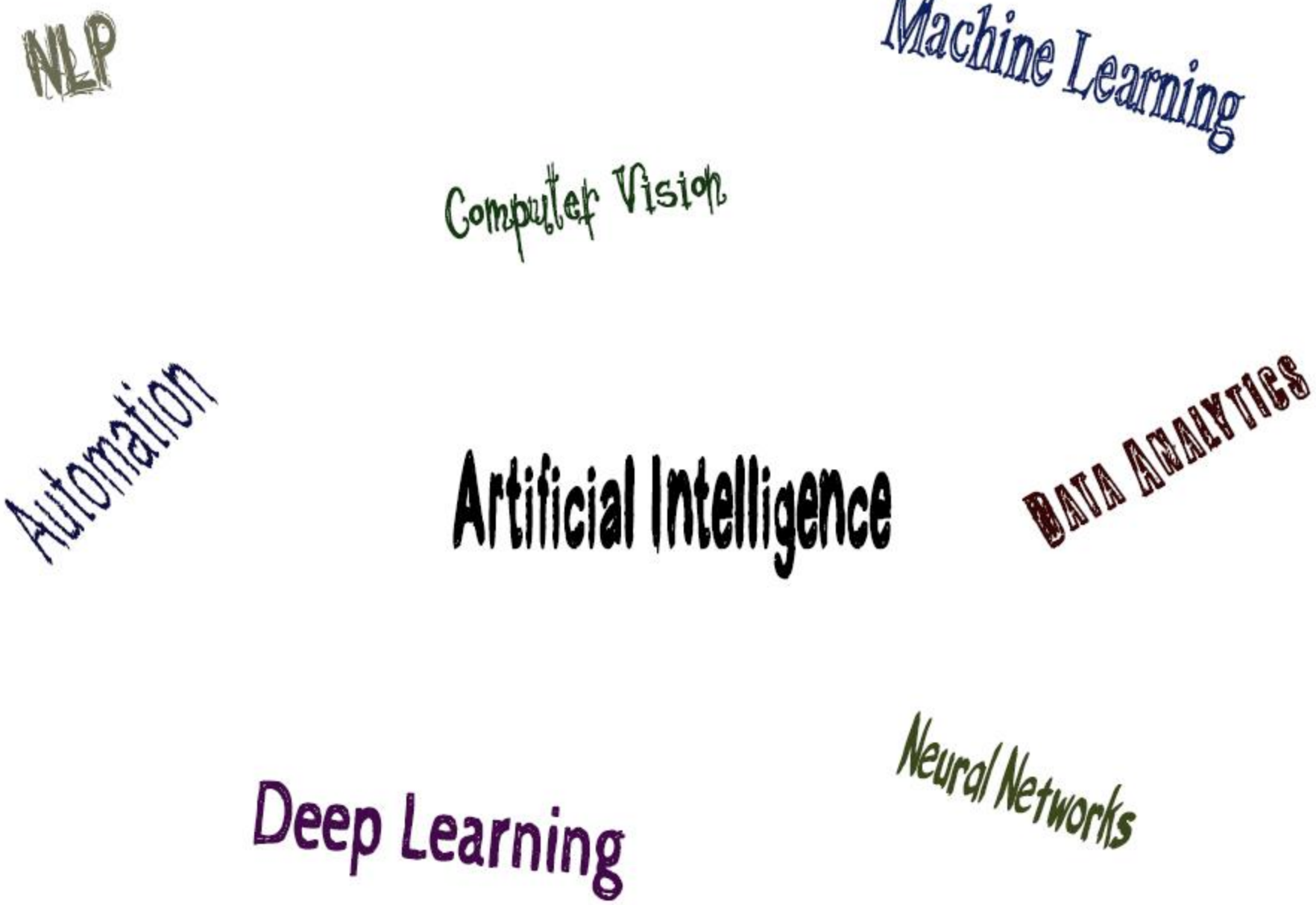
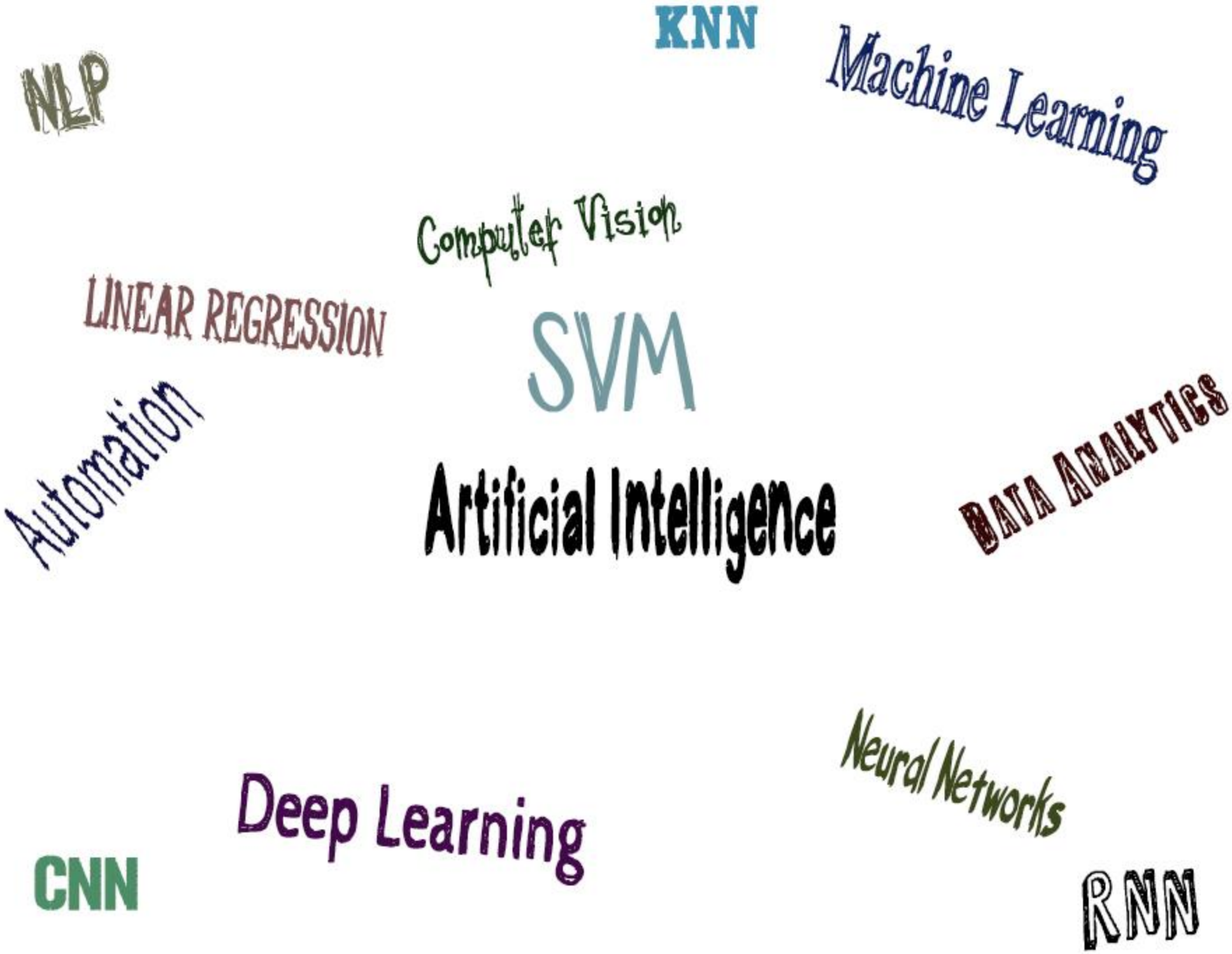
Artificial Intelligence


NLP
Machine Learning
Computer Vision
Automation
Artificial Intelligence
Data Analytics
Deep Learning
Neural Networks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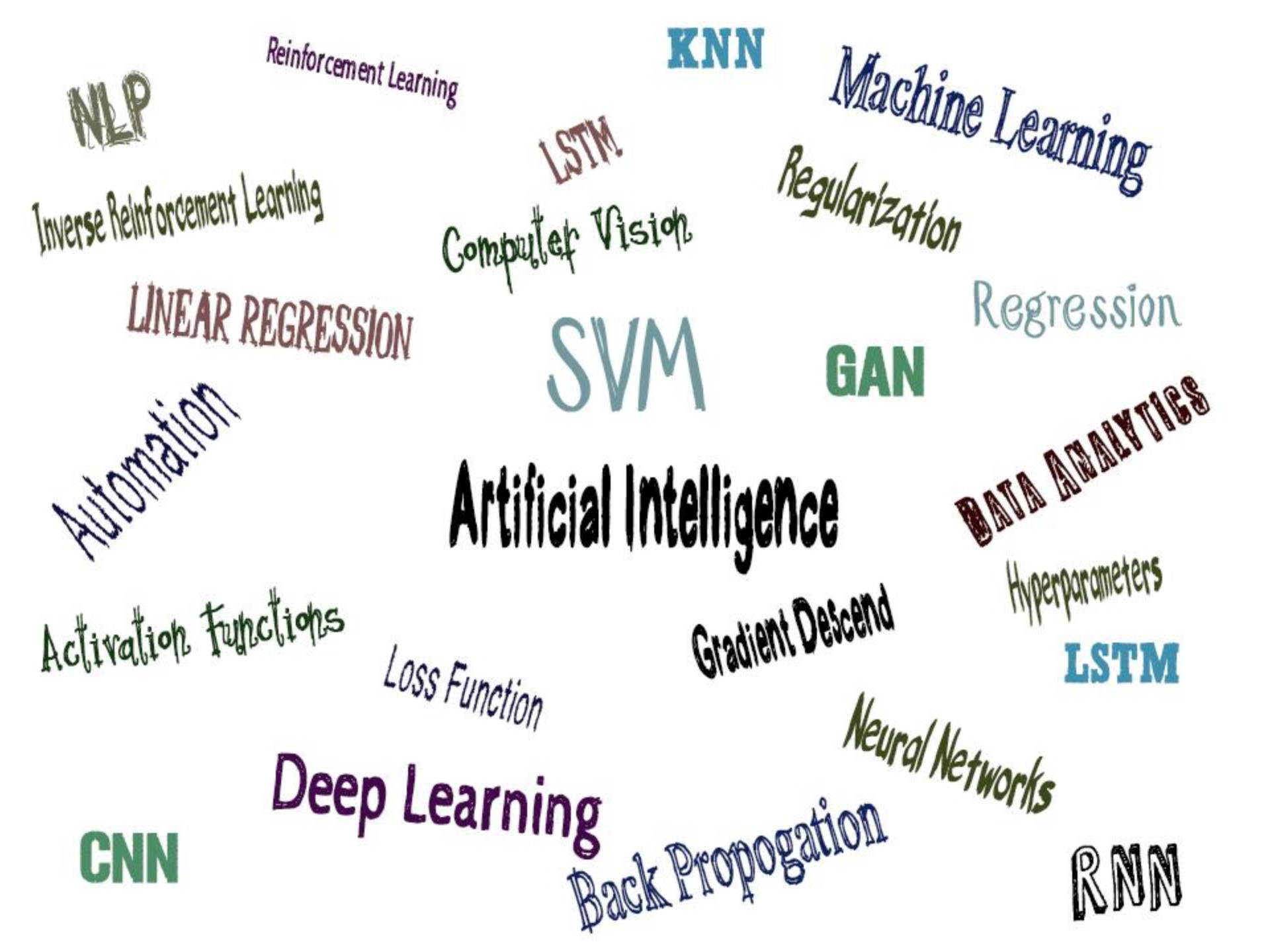
Artificial Intelligence
Data Analytics
Neural Networks
Deep Learning
CNN
RNN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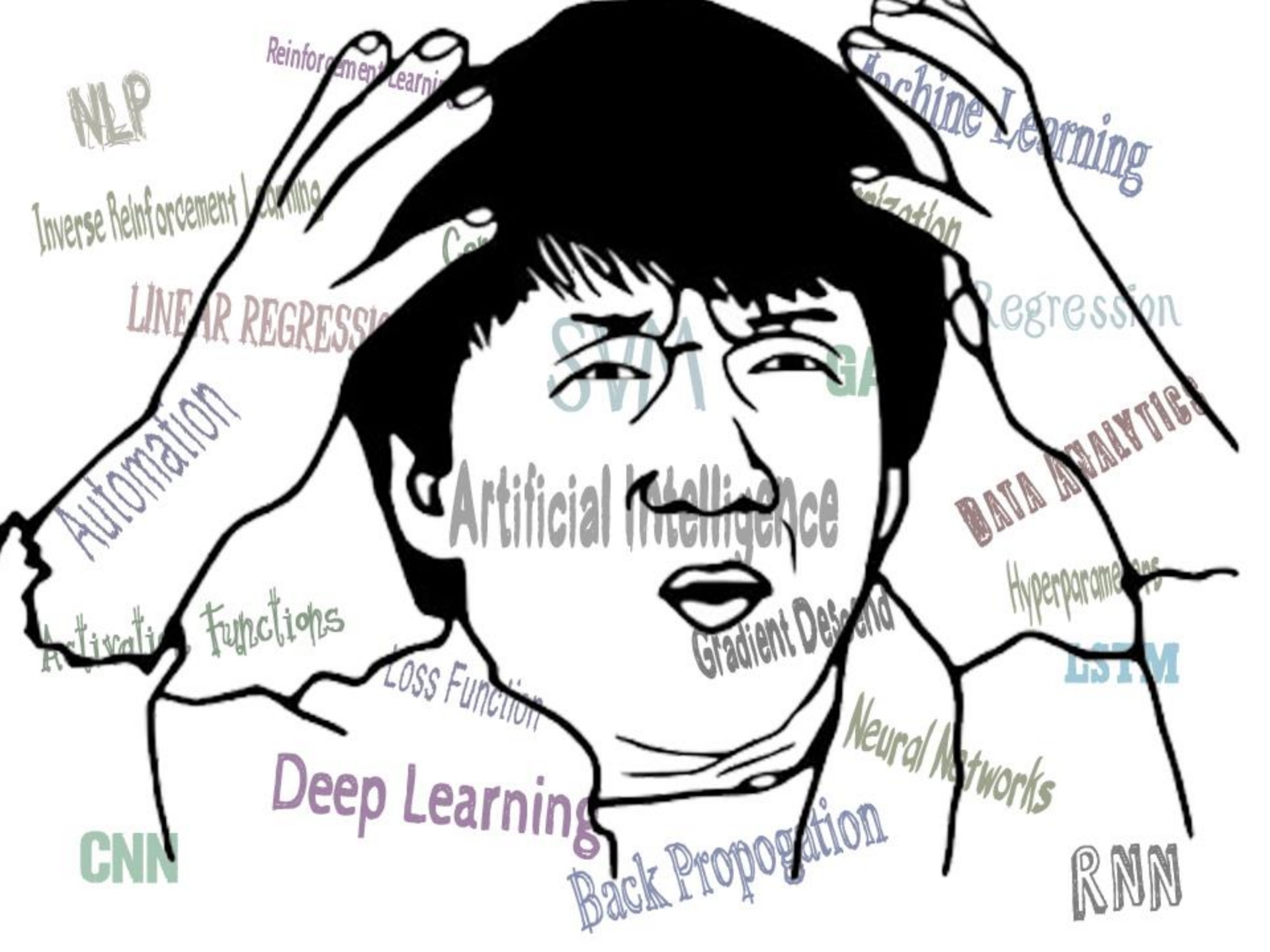
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RNN
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Regression
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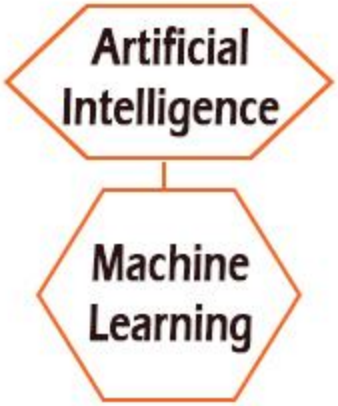
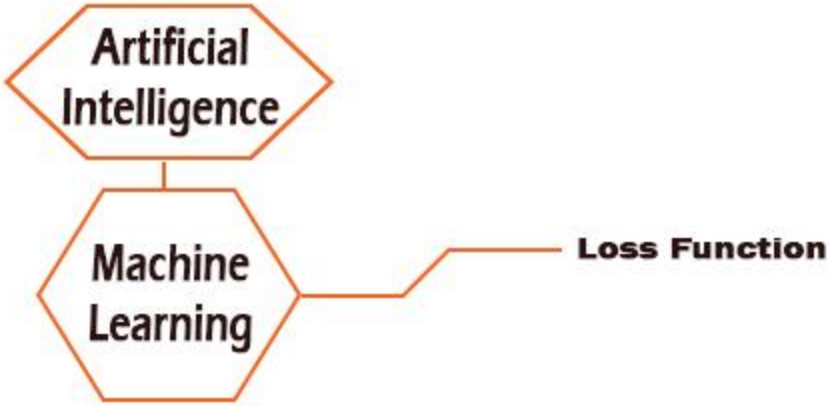
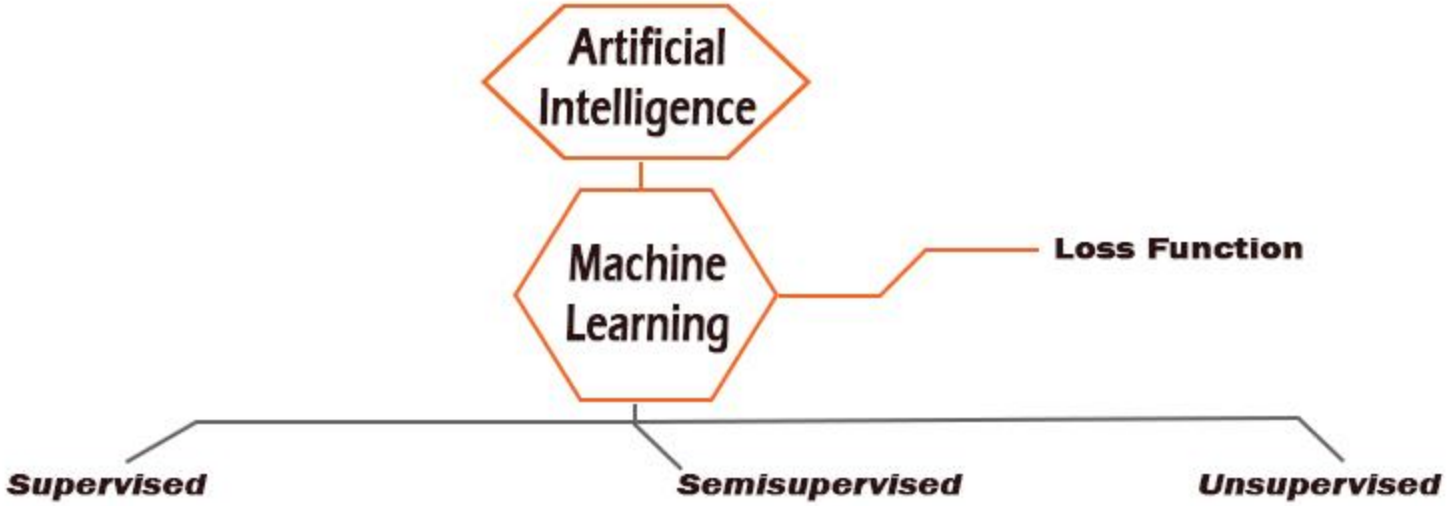
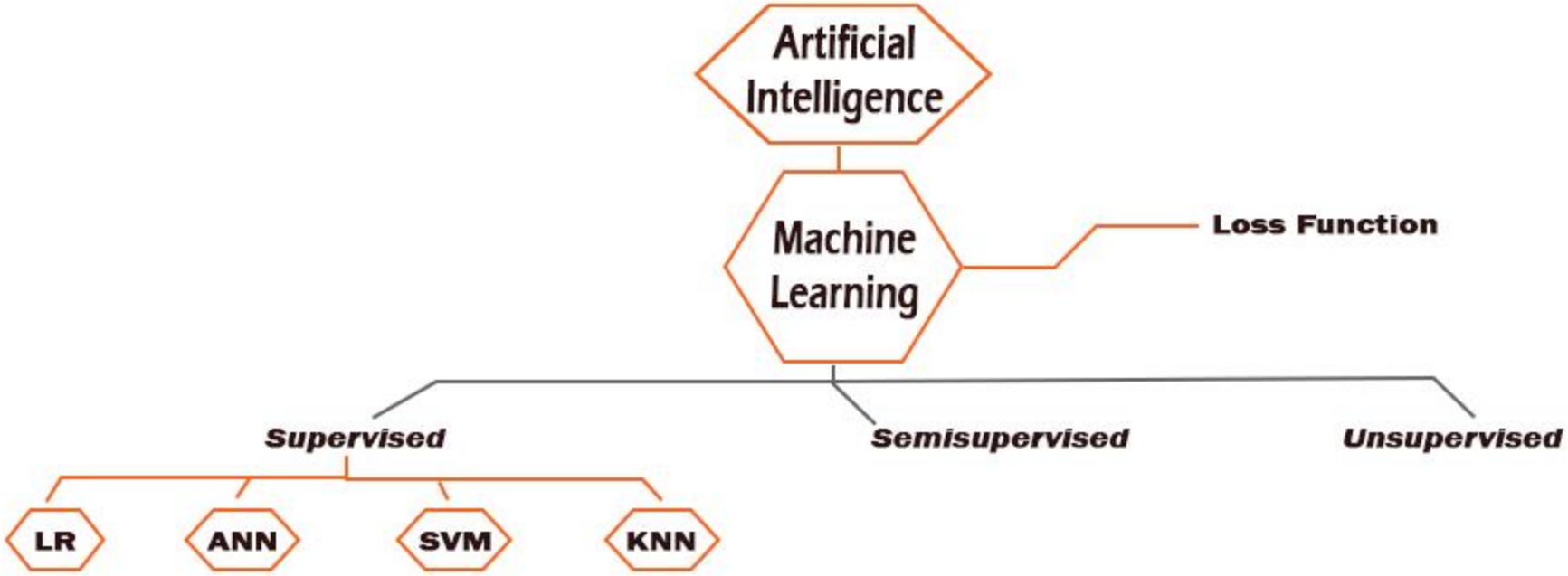
Machine Learning


Artificial
Intelligence


Artificial
Intelligence
Machine
Learning


Artificial Intelligence
Machine Learning
Loss Function


Artificial Intelligence
Machine Learning
Loss Function
Supervised
Semisupervised
Unsupervised


Artificial Intelligence
Machine Learning
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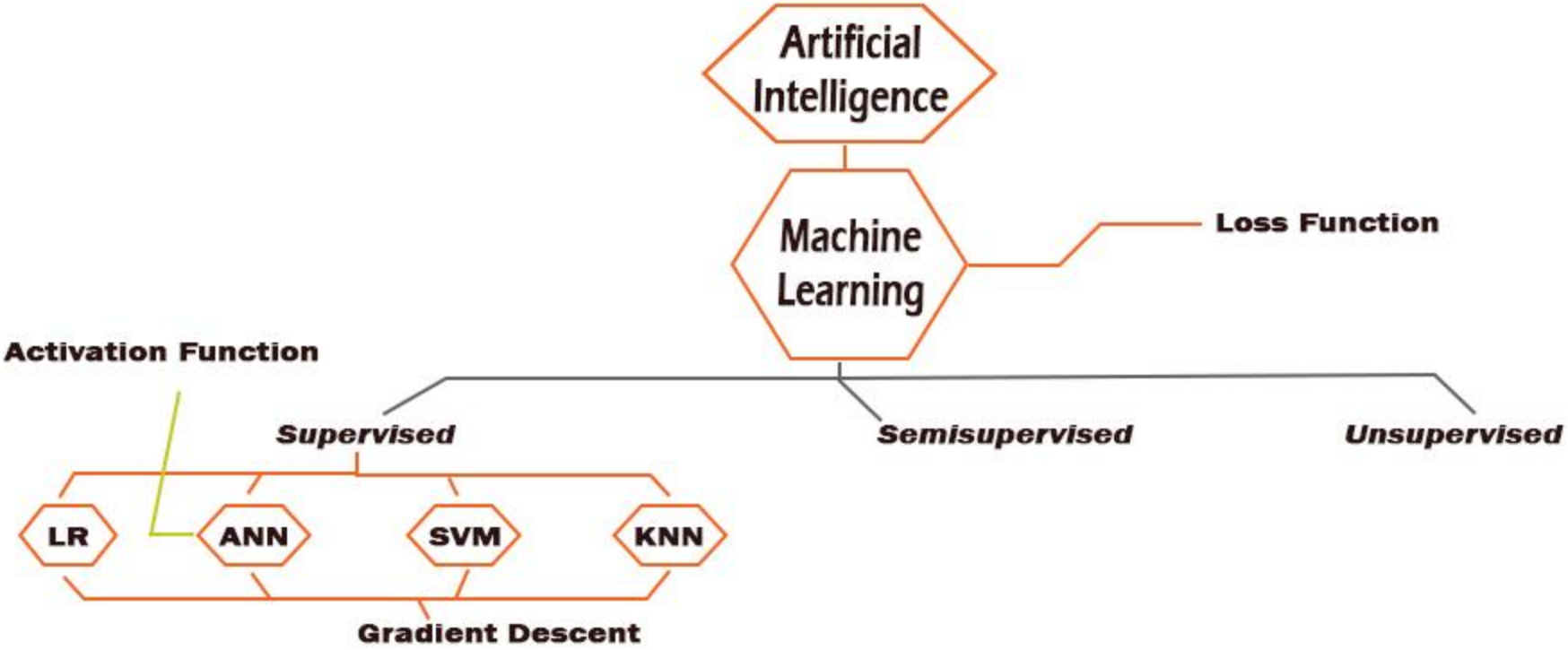
Supervised
Semisupervised
Unsupervised
LR
ANN
SVM
KNN


Artificial Intelligence
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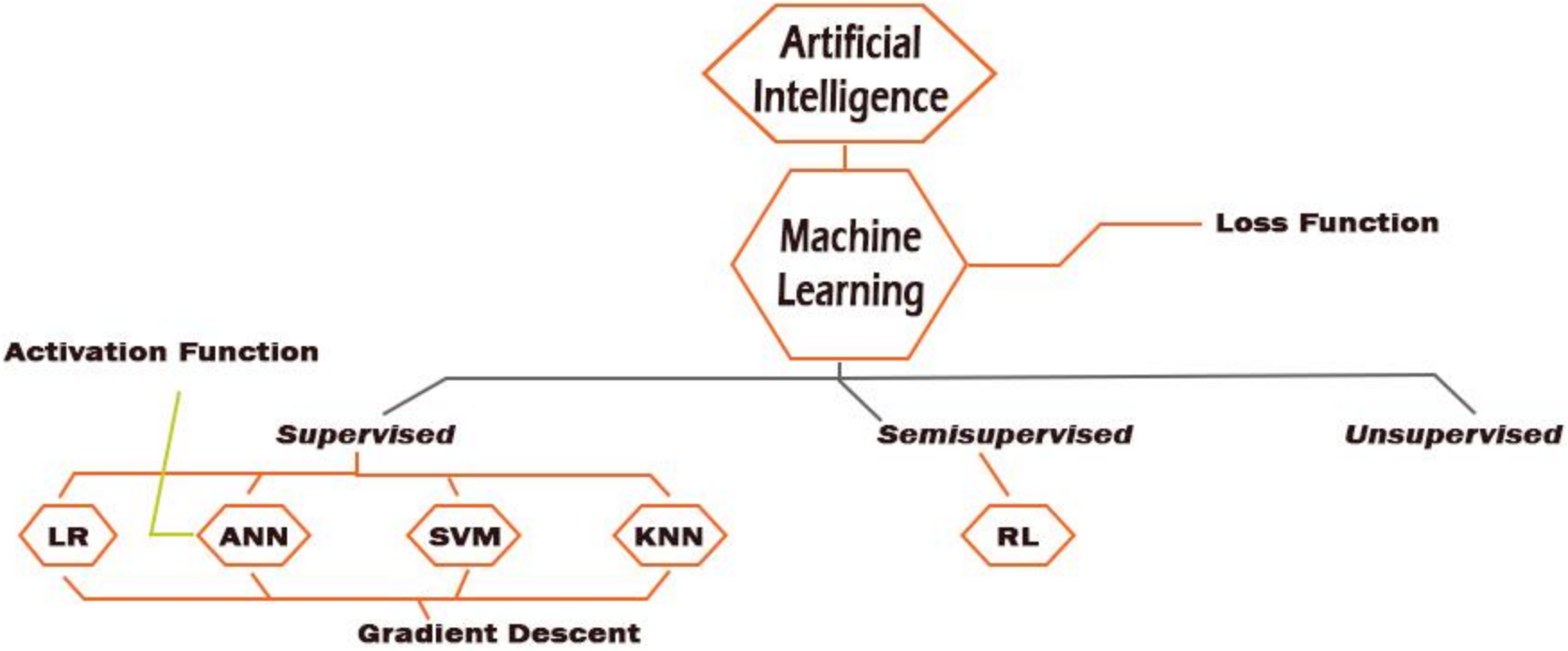
Gradient Descent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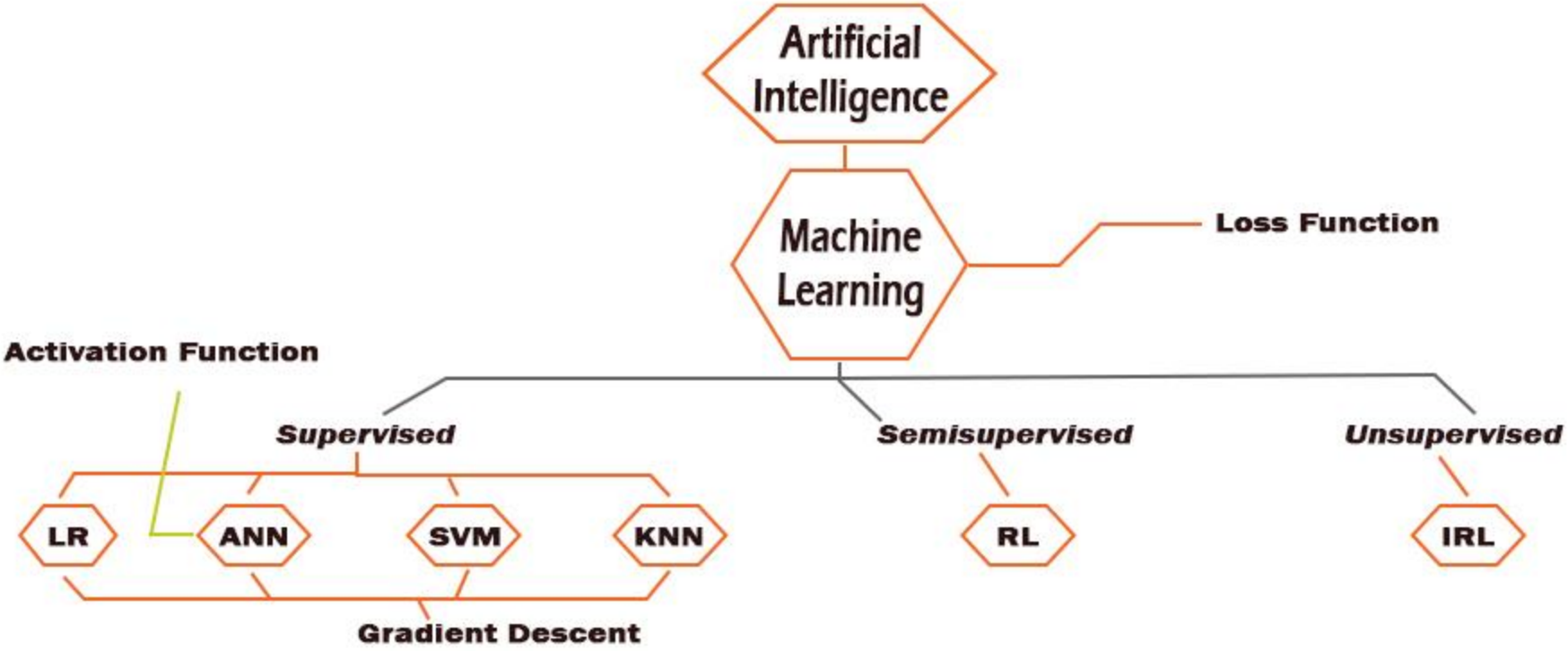
RL
Gradient Descent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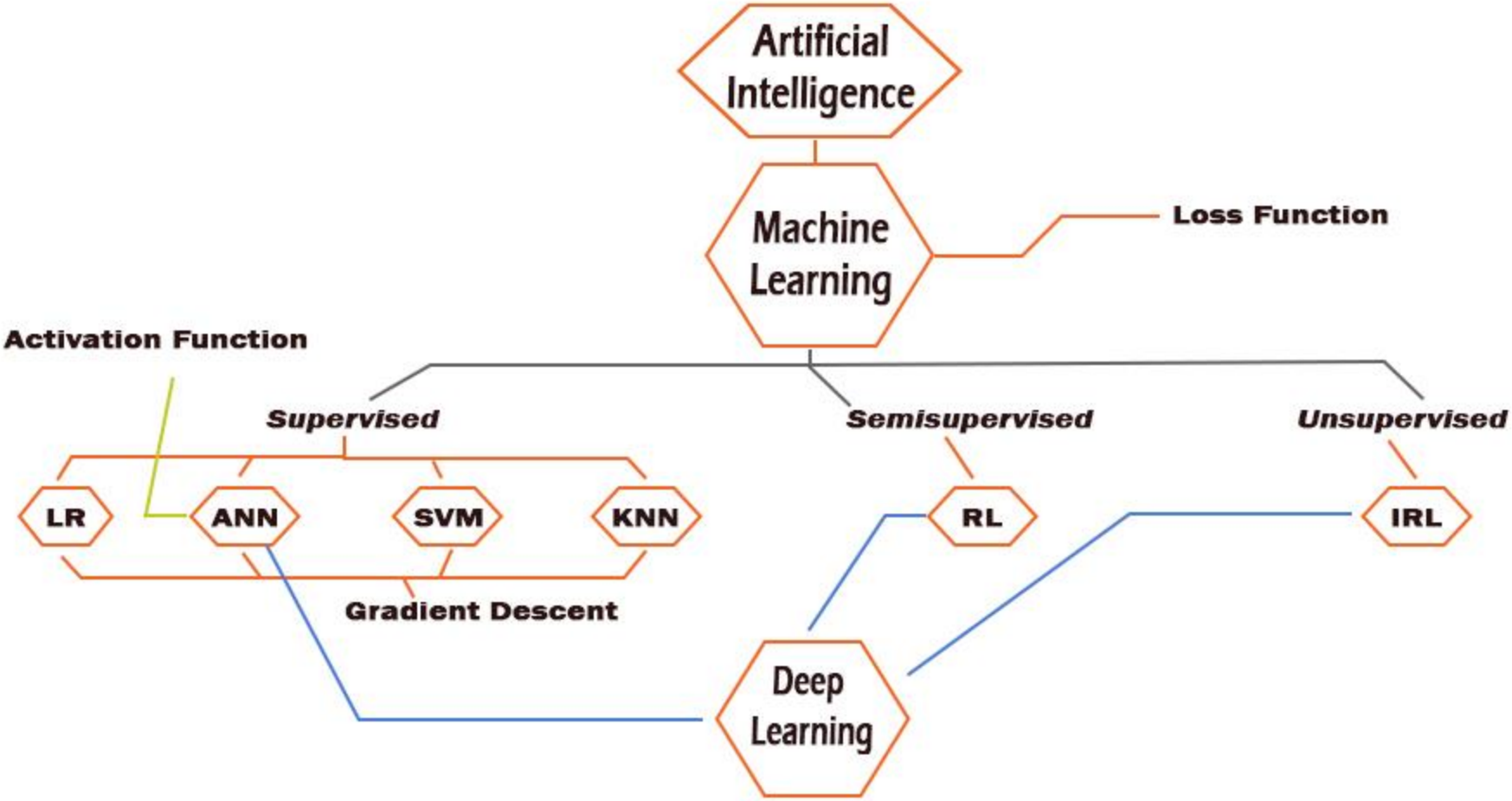
KNN
RL
IRL
Gradient Descent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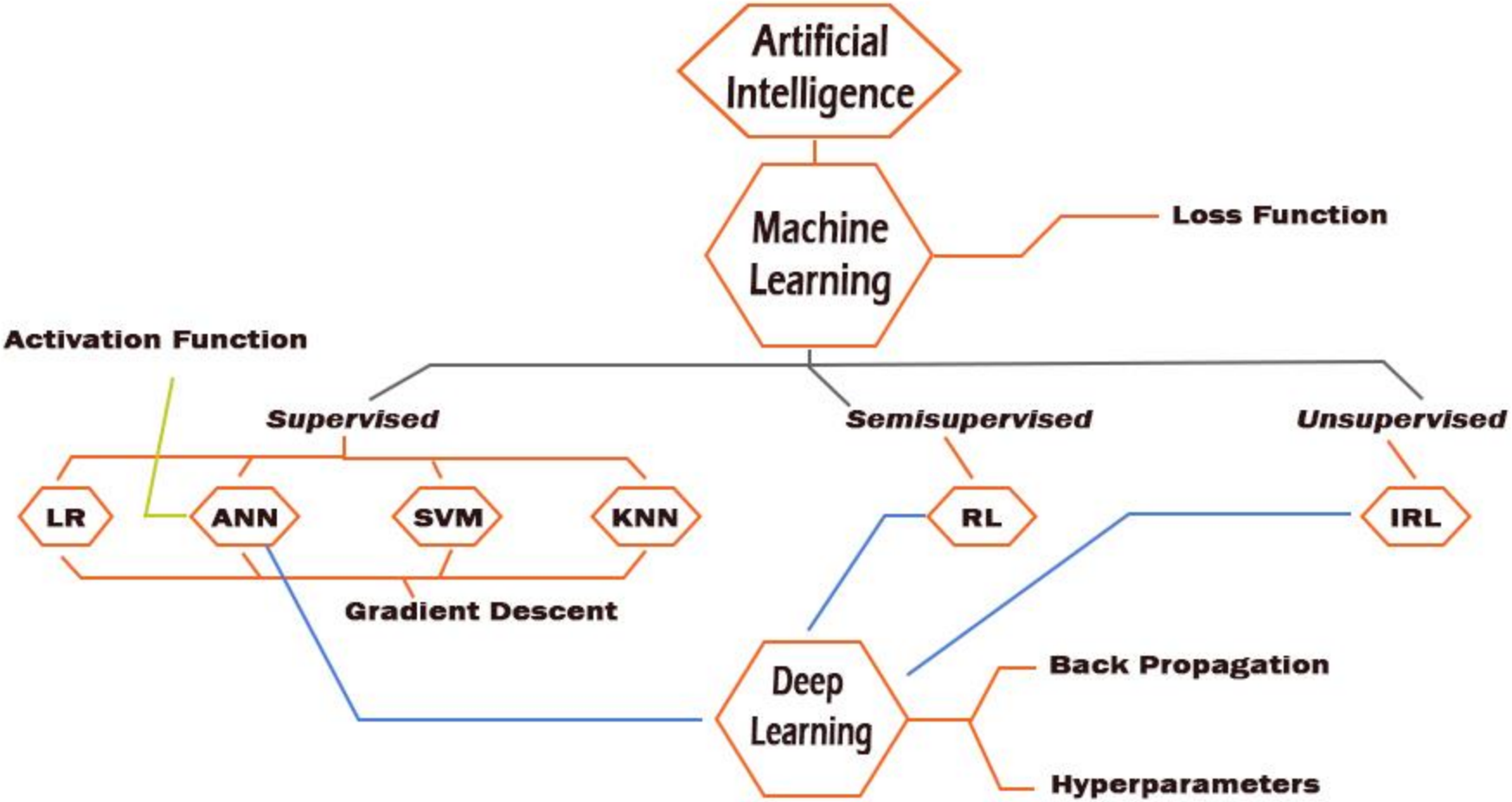
Deep Learning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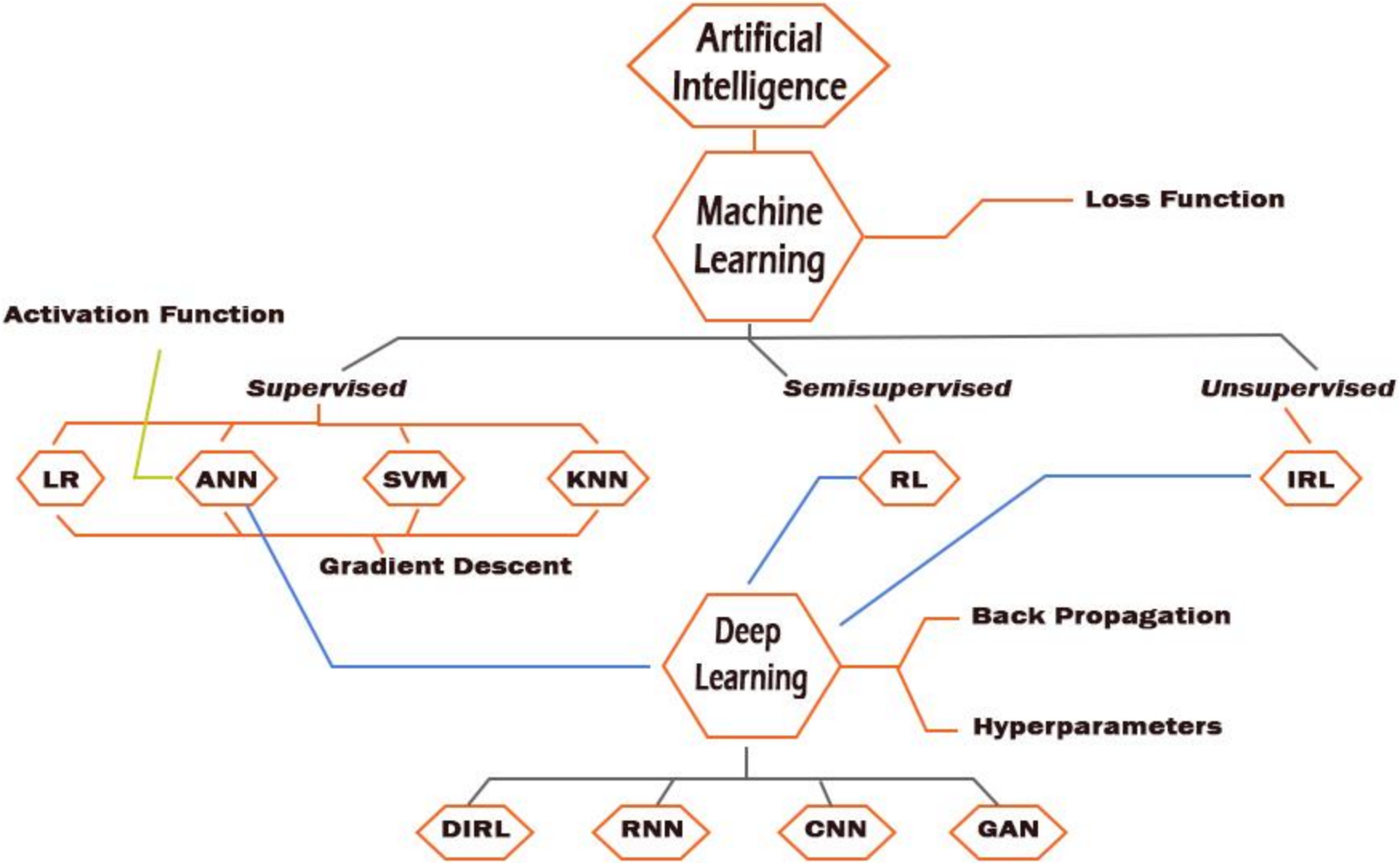
Hyperparameters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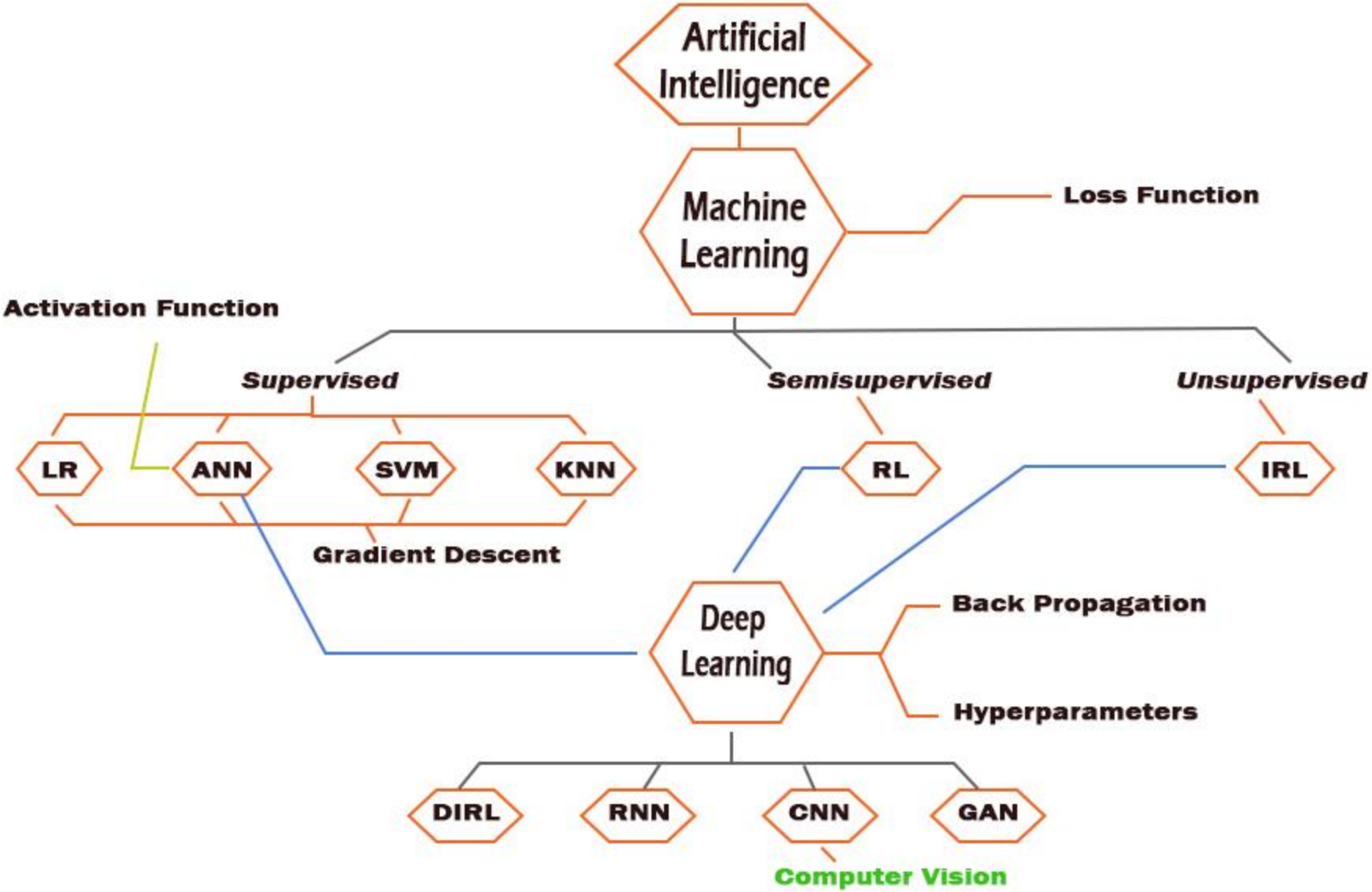
DIRL
RNN
CNN
GAN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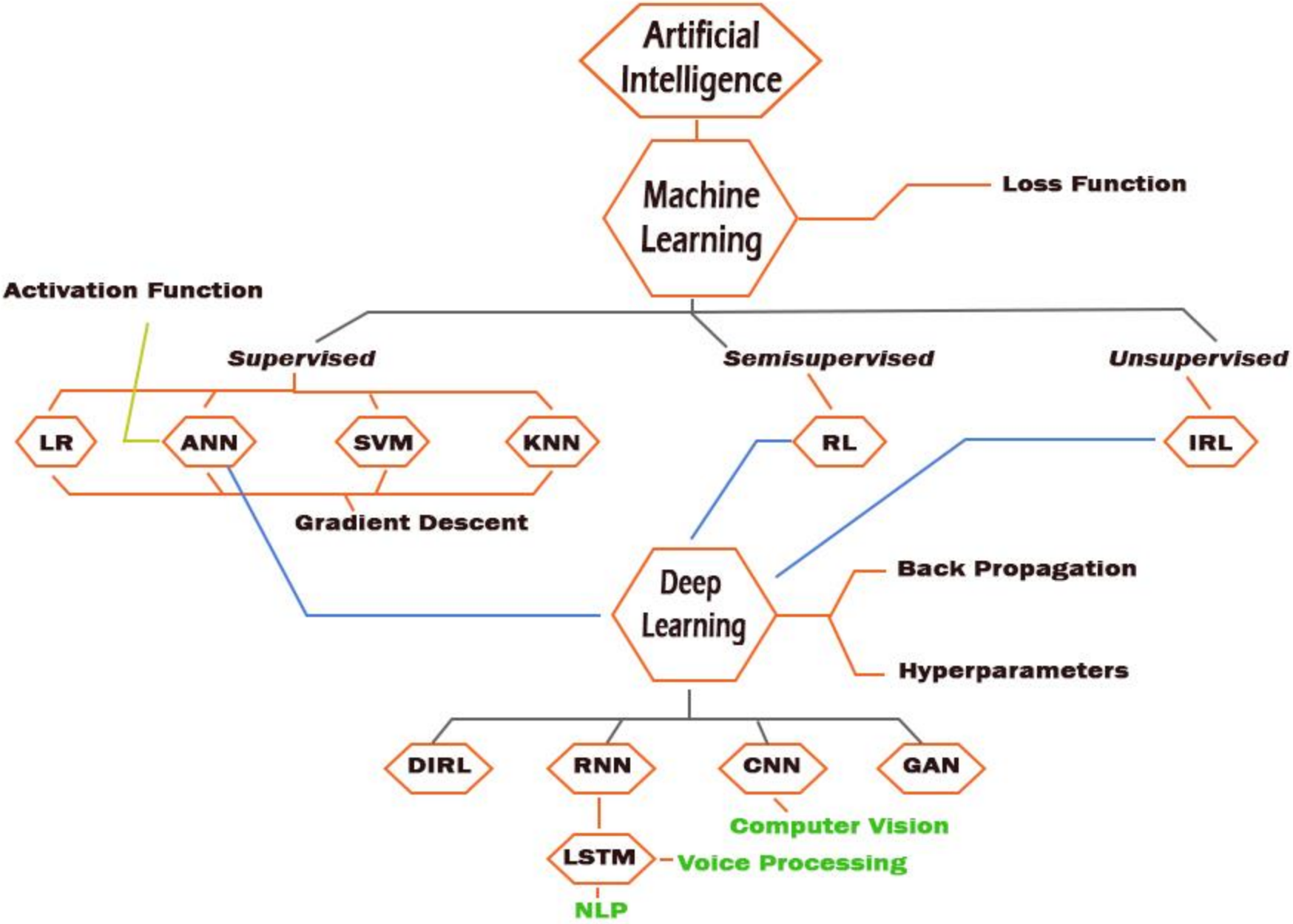
Computer Vision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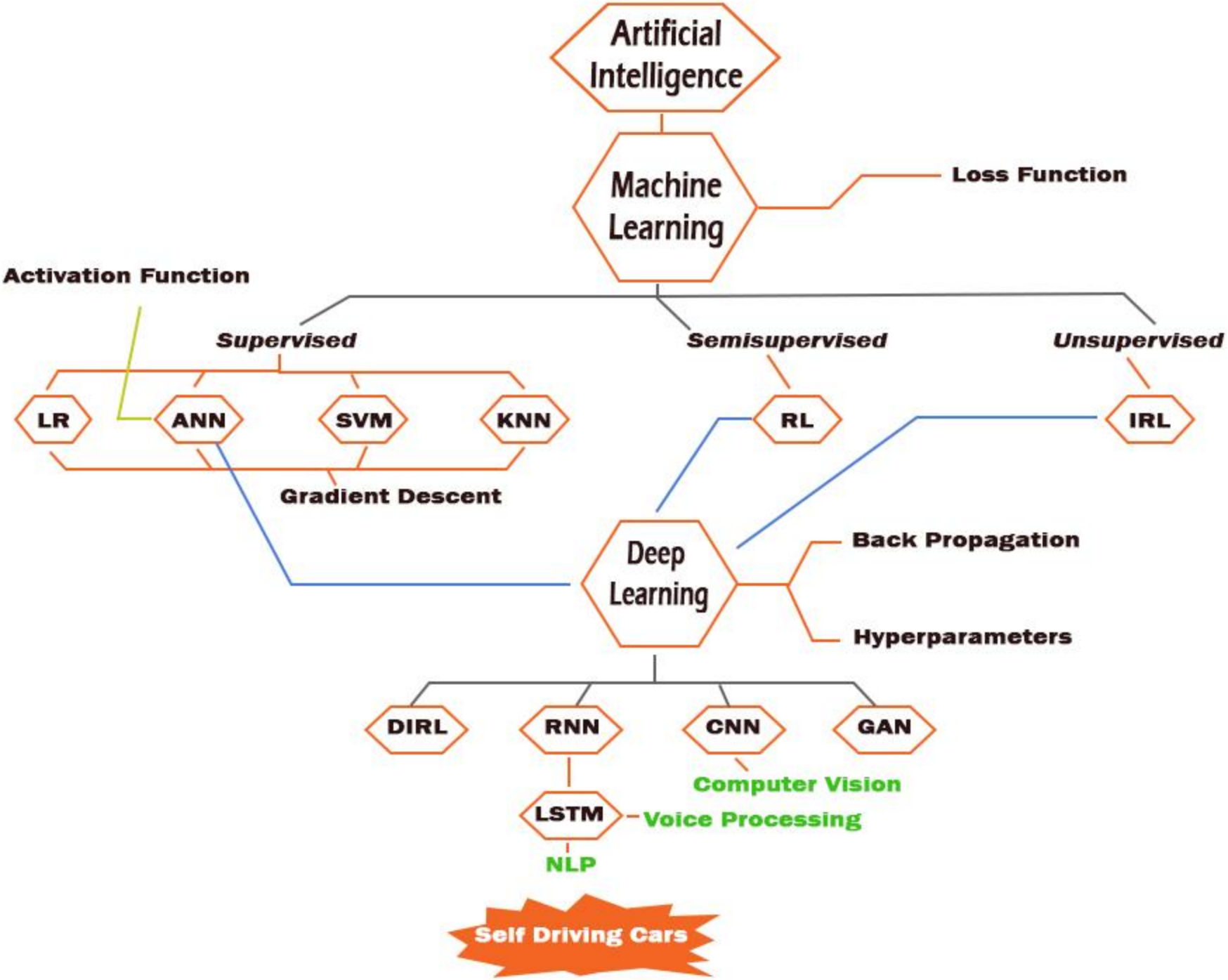
NLP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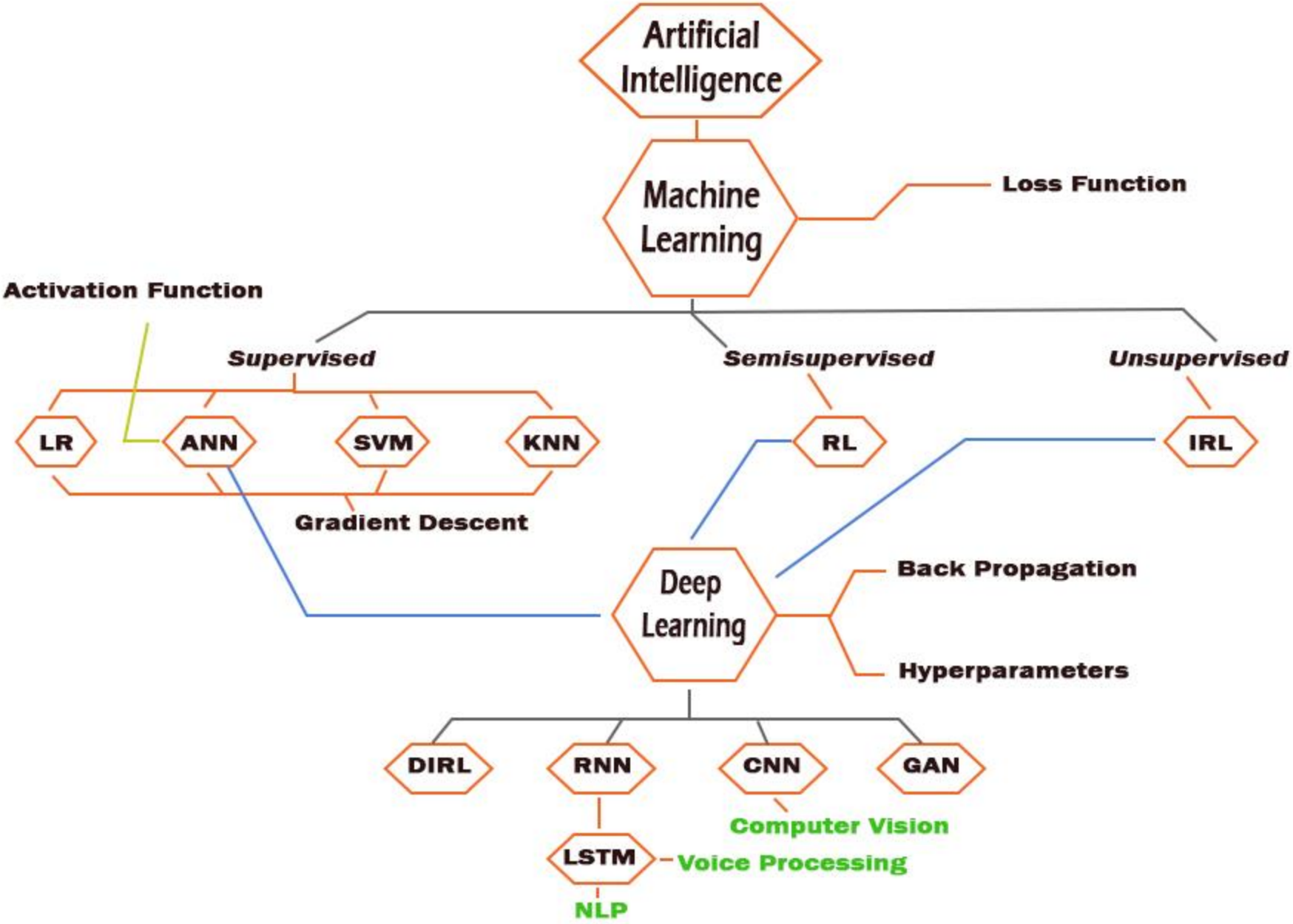
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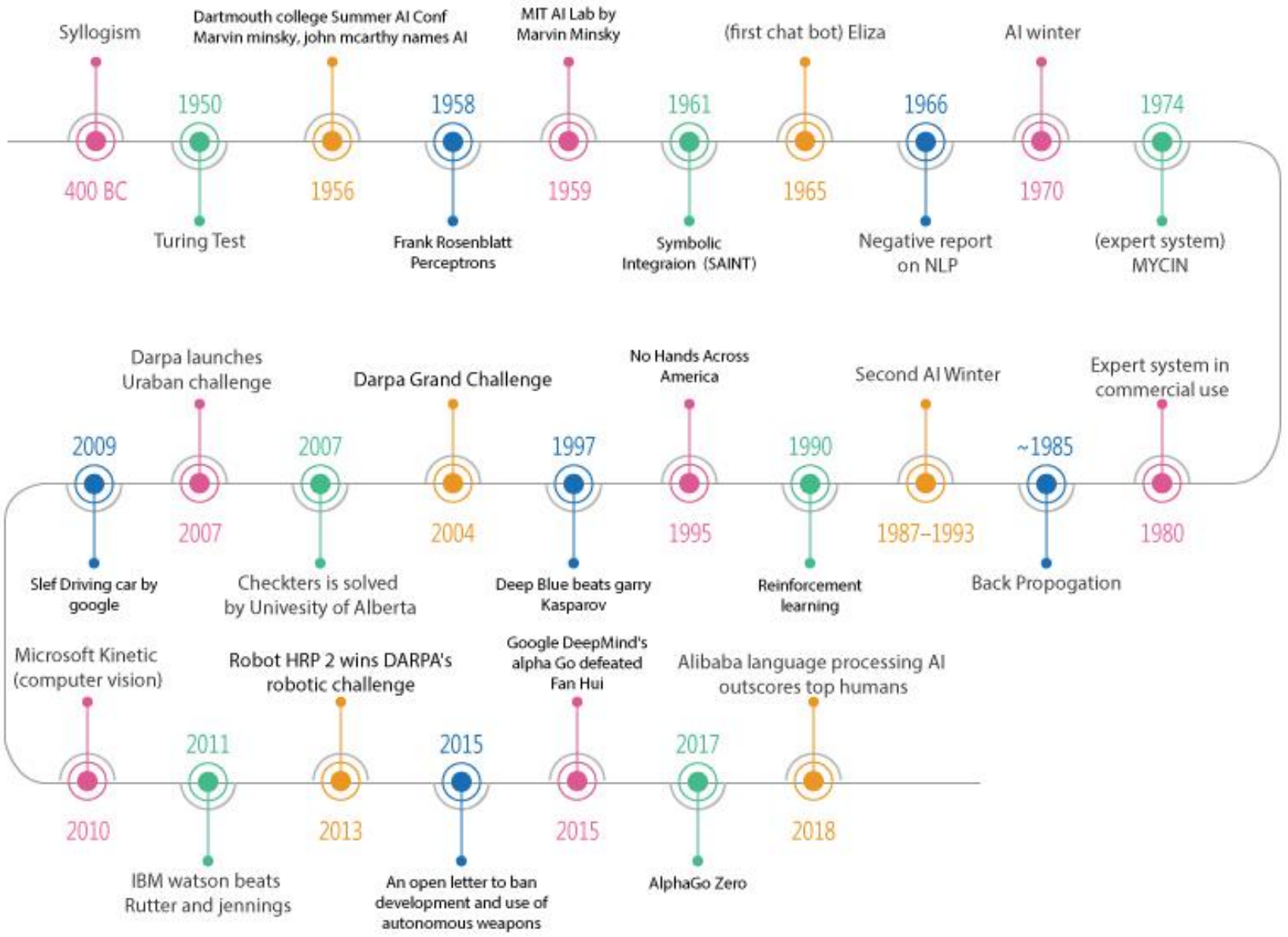
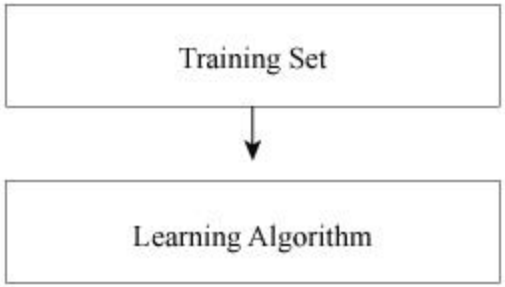
NLP

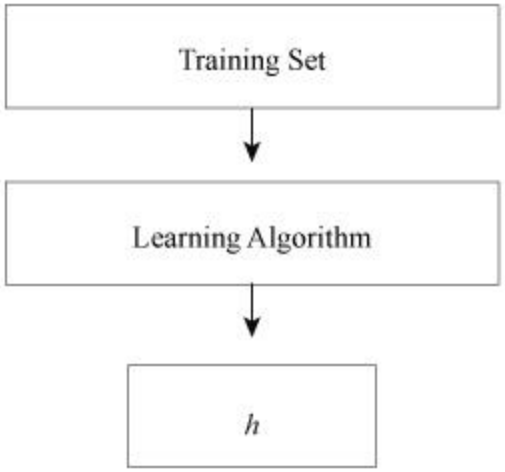
TIMELINE

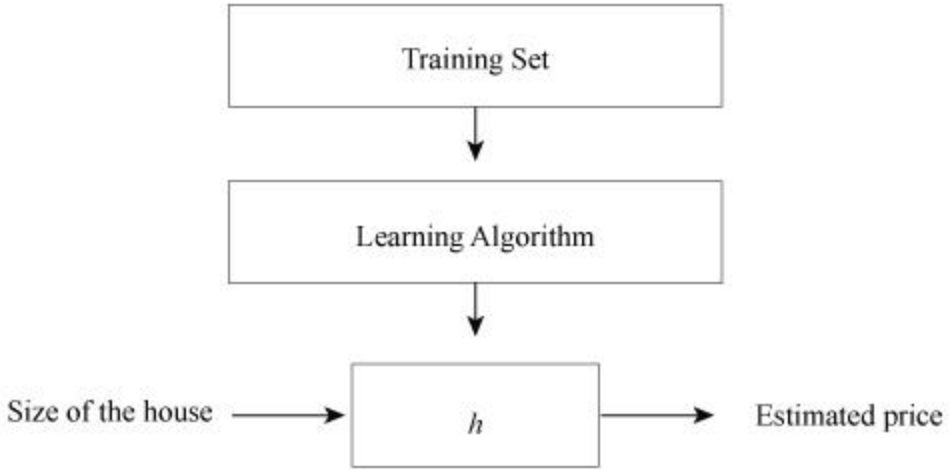

Syllogism
400 BC
1950
Turing Test
Dartmouth college Summer AI Conf
Marvin minsky, john mcarthy names AI
1956
1958
Frank Rosenblatt
Perceptrons
MIT AI Lab by
Marvin Minsky
1959
1961
Symbolic
Integraion (SAINT)
(first chat bot) Eliza
1965
1966
Negative report
on NLP
AI winter
1970
1974
(expert system)
MYCIN
Expert system in
commercial use
1980
~1985
Back Propogation
Second AI Winter
1987–1993
1990
Reinforcement
learning
No Hands Across
America
1995
1997
Deep Blue beats garry
Kasparov
Darpa Grand Challenge
2004
2007
Checkters is solved
by Univesity of Alberta
Darpa launches
Uraban challenge
2007
2009
Slef Driving car by
google
Microsoft Kinetic
(computer vision)
2010
2011
IBM watson beats
Rutter and jennings
Robot HRP 2 wins DARPA's
robotic challenge
2013
2015
An open letter to ban
development and use of
autonomous weapons
Google DeepMind's
alpha Go defeated
Fan Hui
2015
2017
AlphaGo Zero
Alibaba language processing AI
outscores top humans
2018

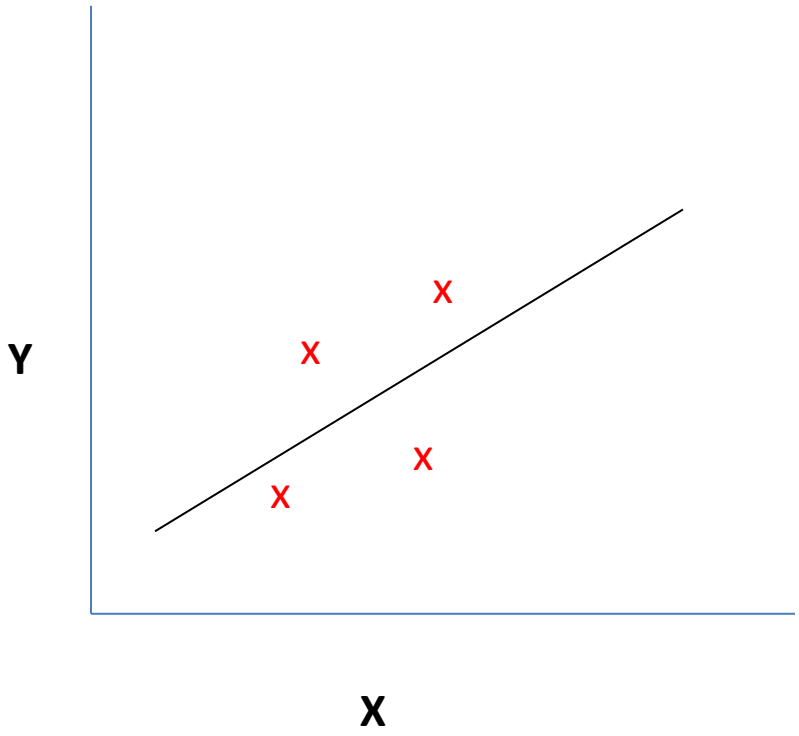
LINEAR REGRESSION


Training Set


Training Set
Learning Algorithm


Training Set
Learning Algorithm
h


Training Set
Learning Algorithm
Size of the house
h
Estimated price

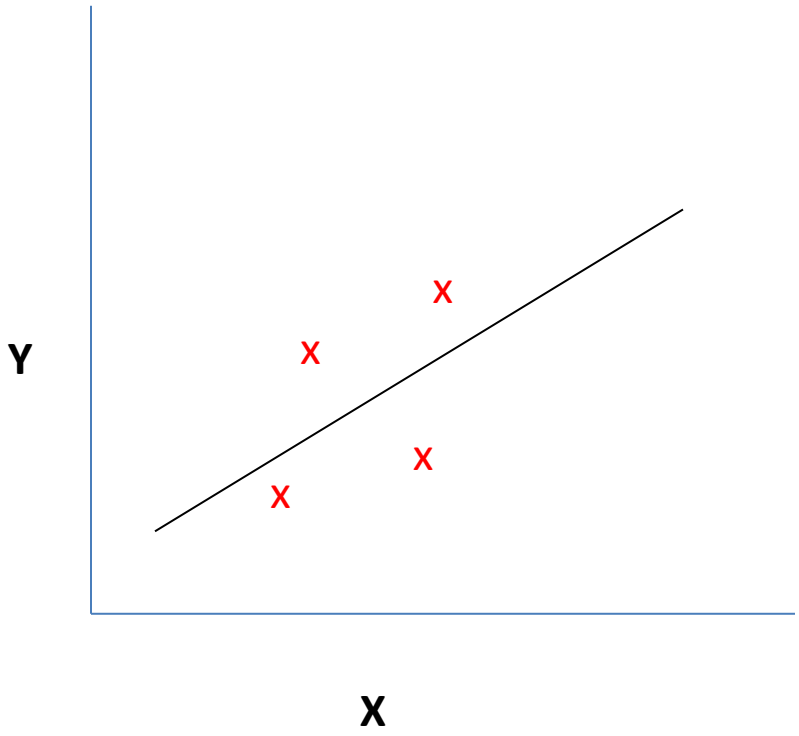


size	price
2104	460
1416	232
1534	315
852	178

$y' = a + bx$

$$a = \frac{(\sum y)(\sum x^2) - (\sum x)(\sum xy)}{n(\sum x^2) - (\sum x)^2}$$

$$b = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2}$$



size	price
2104	460
1416	232
1534	315
852	178

$h(x) = \theta_0 + \theta_1 x$

Find θ_0 and θ_1 so that h(x) is close to y in the training example (x, y)

$$h(x)-y$$

$$\sum_{i=1}^{m}\left(h(x^{i})-y^{i}\right)$$

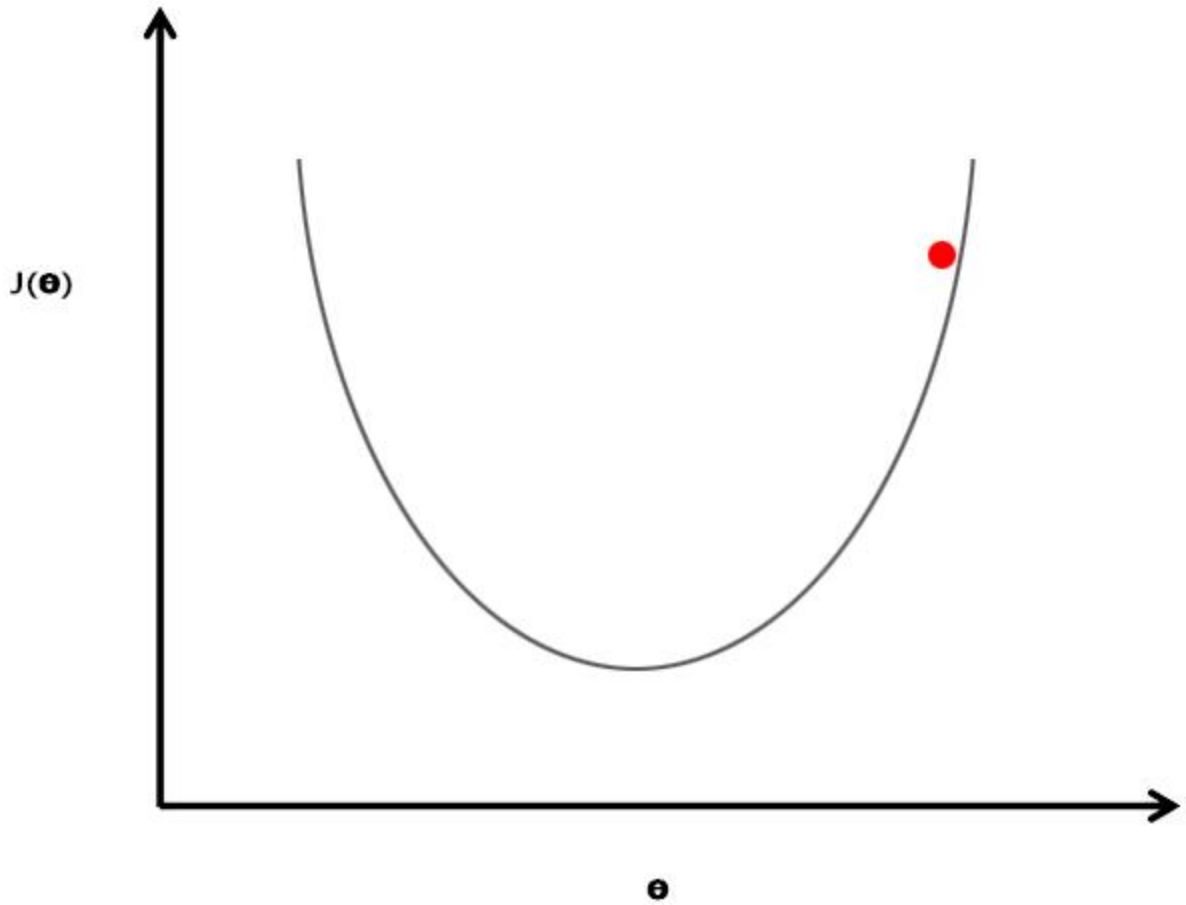
$$\frac{1}{m}\sum_{i=1}^{m}\left(h(x^{i})-y^{i}\right)$$

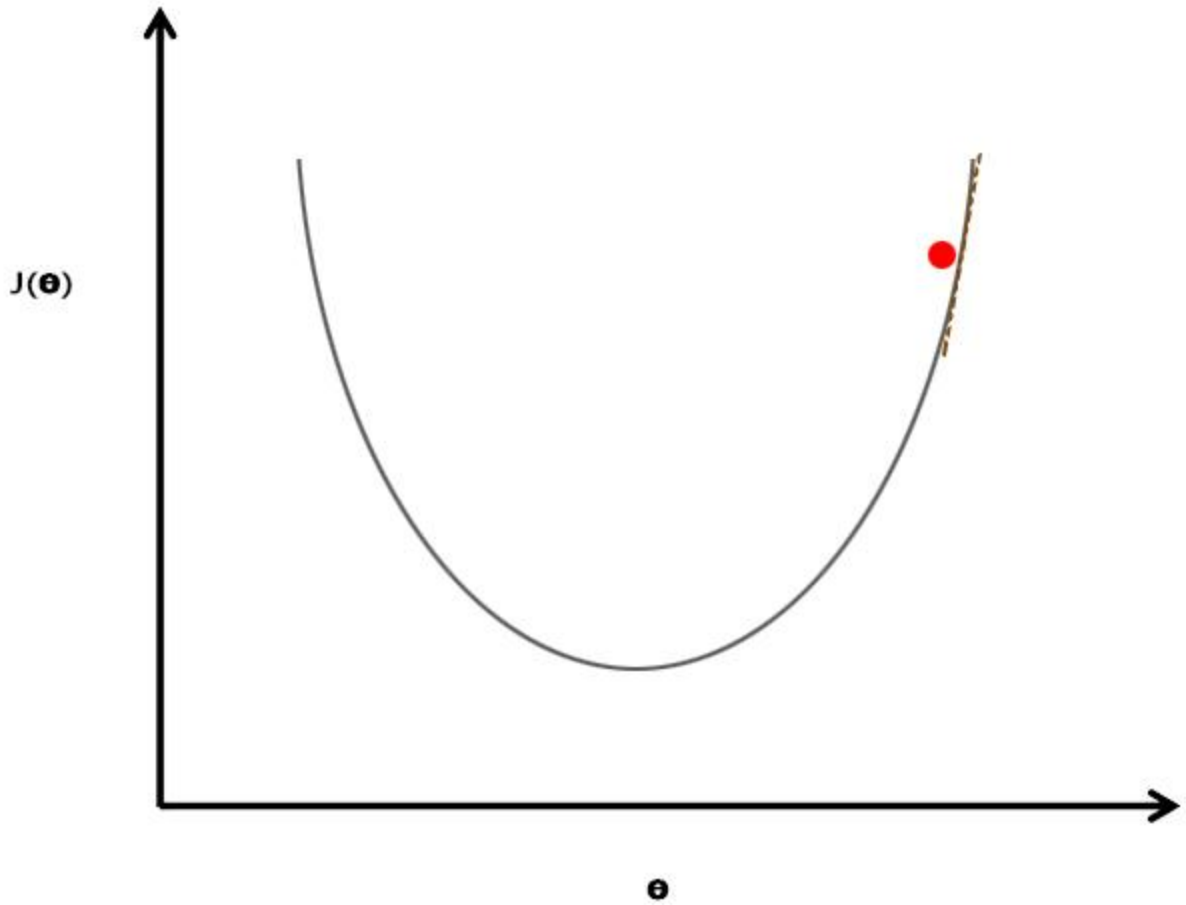
$$\frac{1}{m}\sum_{i=1}^{m}\left(h(x^{i})-y^{i}\right)^{2}$$

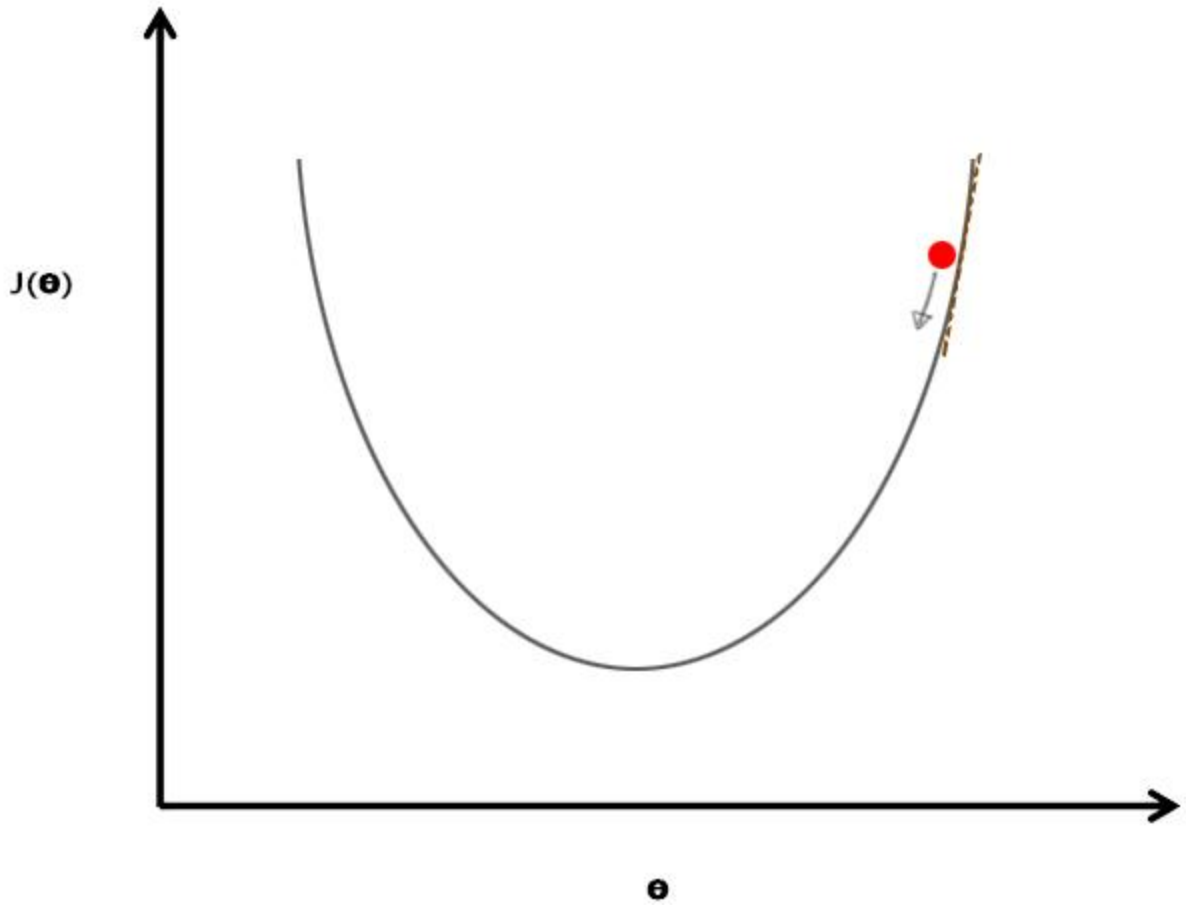
$$\frac{1}{2m}\sum_{i=1}^{m}\left(h(x^{i})-y^{i}\right)^{2}$$

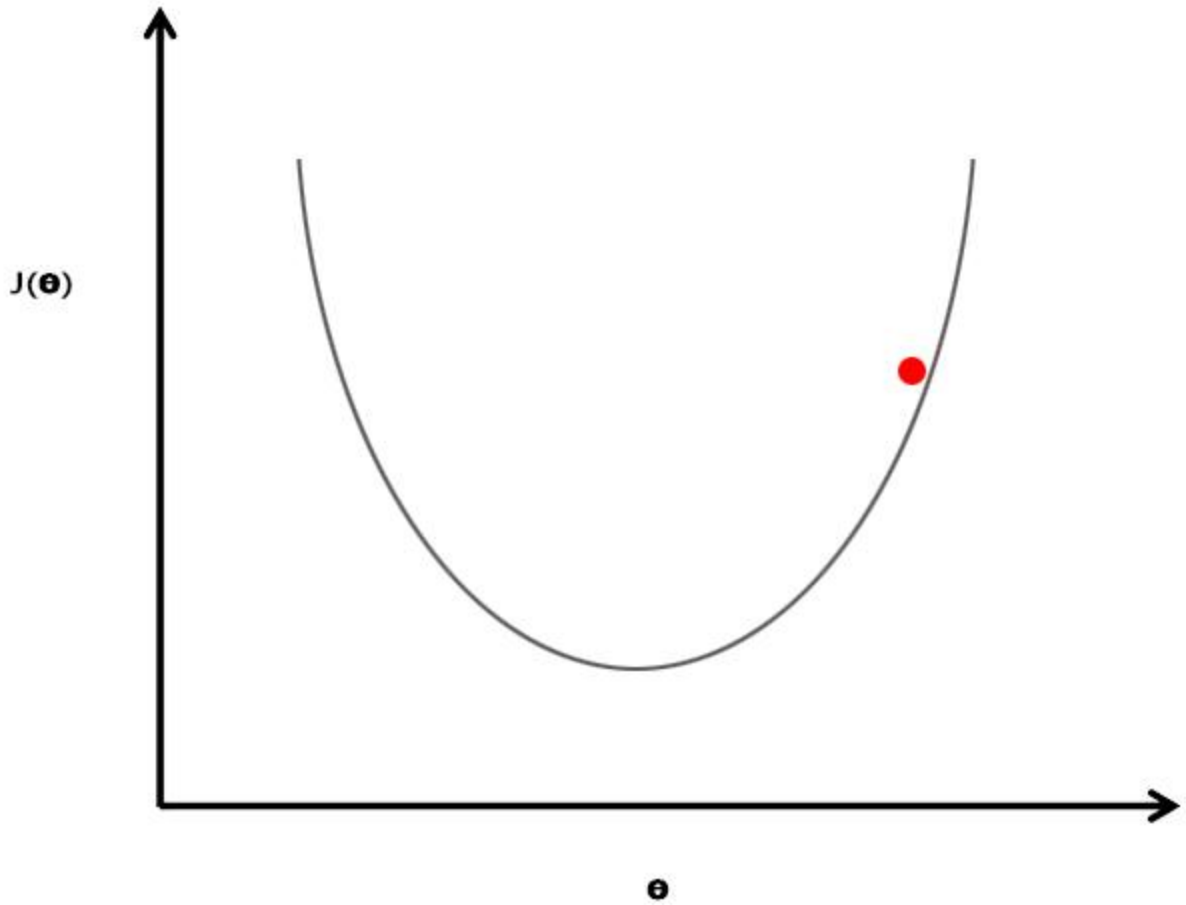
$$J(\theta_0 , \theta_1)$$

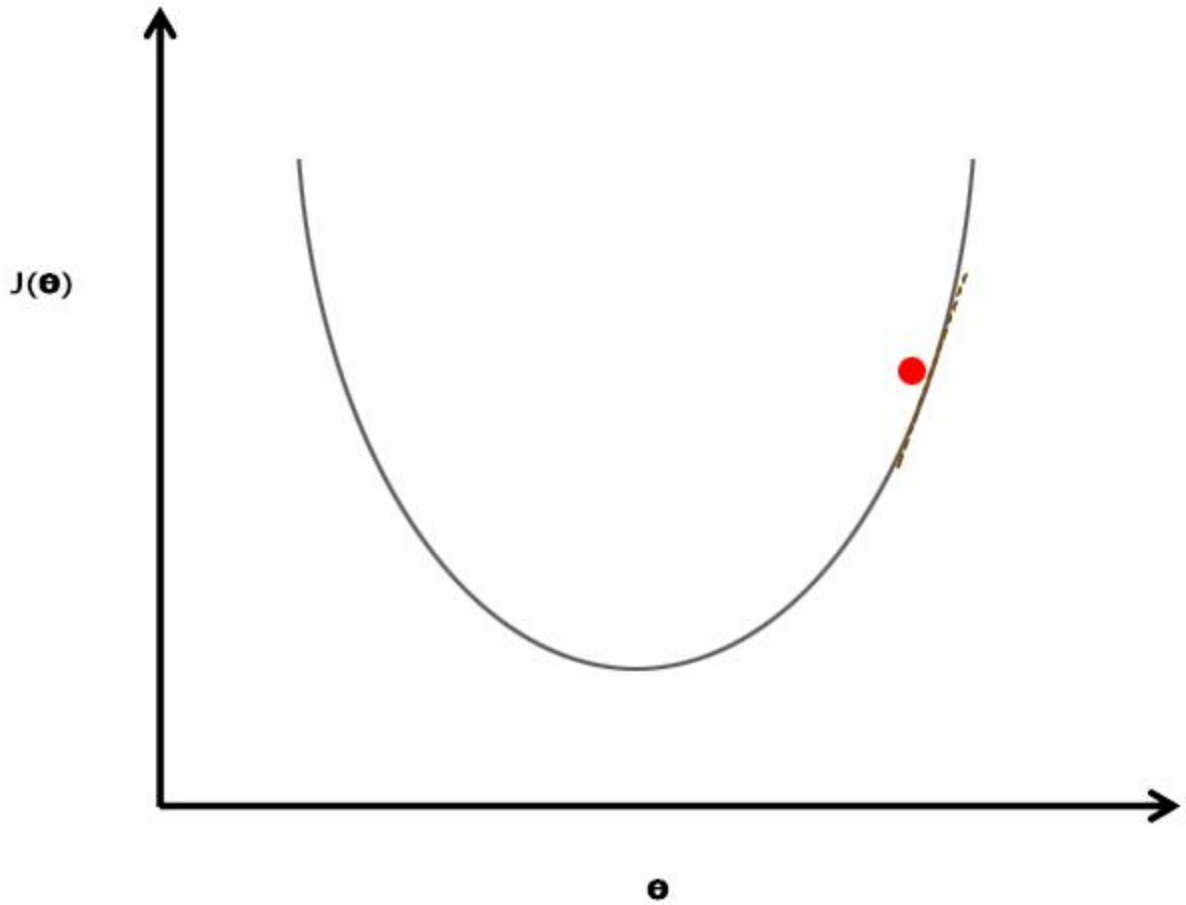
$$\frac{1}{2m} \sum_{i=1}^{m} \left(h(x^i) - y^i \right)^2$$

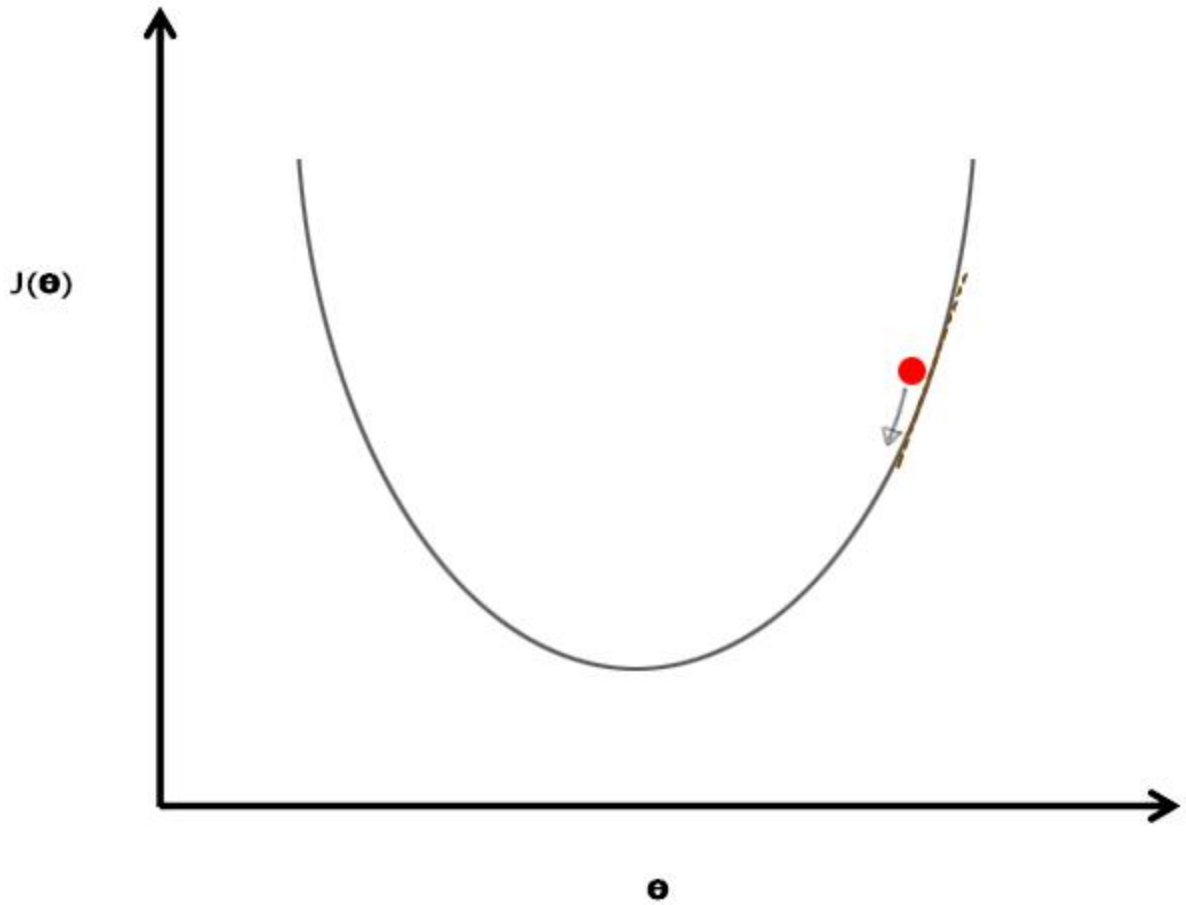

J(θ)
θ

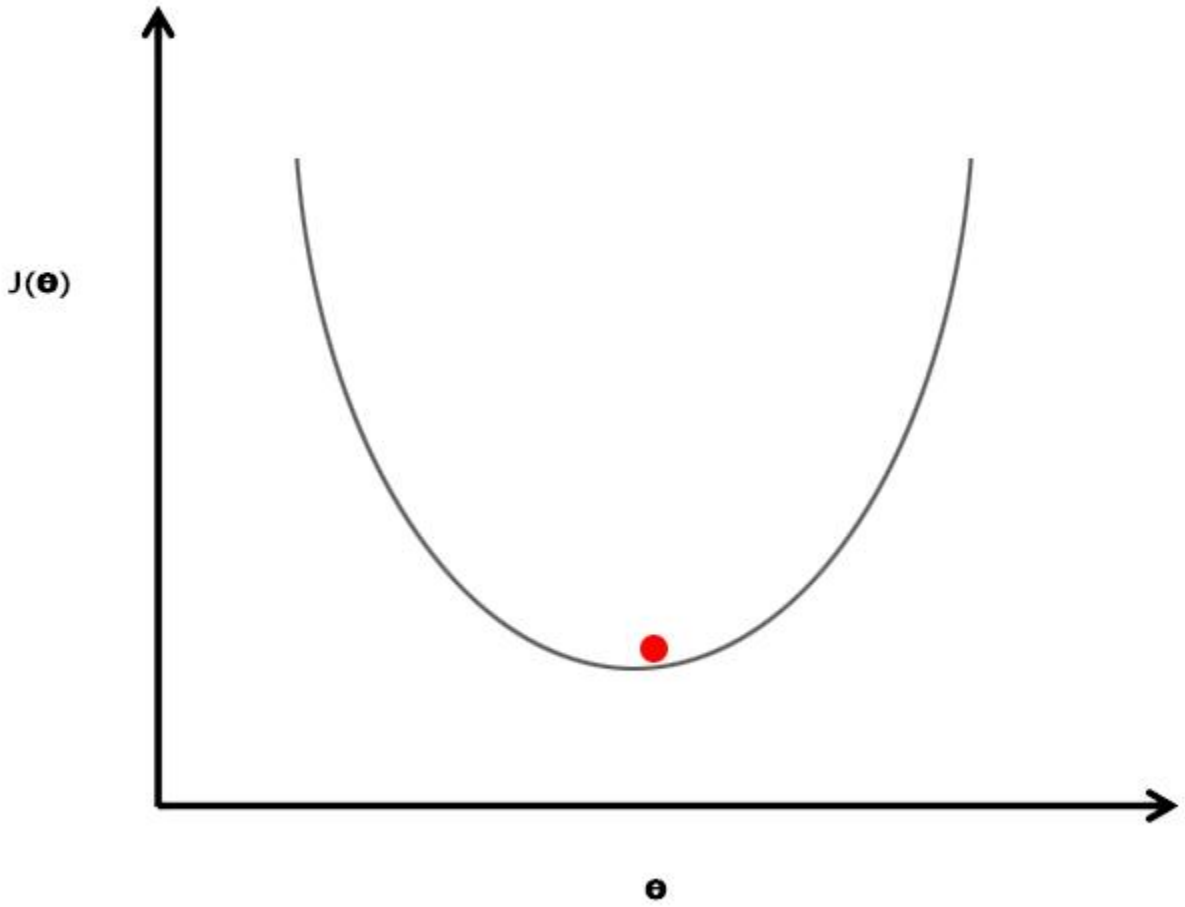

J(θ)
θ


J(θ)
θ


J(θ)
θ


J(θ)
θ


J(θ)
θ


J(θ)
θ

Repeat until converge {

$$\theta \rightarrow \theta - \alpha \frac{d}{d\theta} J(\theta)$$

}

size	#Bedrooms	Years old	price
2104	3	5	460
1416	2	2	232
1534	5	8	315
852	4	1	178

size	#Bedrooms	Years old	price
2104	3	5	460
1416	2	2	232
1534	5	8	315
852	4	1	178

$$\mathbf{X}$$

$$\begin{bmatrix} 2104 & 3 & 5 \\ 1416 & 2 & 2 \\ 1534 & 5 & 8 \\ 852 & 4 & 1 \end{bmatrix}$$

size	#Bedrooms	Years old	price
2104	3	5	460
1416	2	2	232
1534	5	8	315
852	4	1	178

$$X = \begin{bmatrix} 2104 & 3 & 5 \\ 1416 & 2 & 2 \\ 1534 & 5 & 8 \\ 852 & 4 & 1 \end{bmatrix} \qquad Y = \begin{bmatrix} 460 \\ 232 \\ 315 \\ 178 \end{bmatrix}$$

size	#Bedrooms	Years old	price
2104	3	5	460
1416	2	2	232
1534	5	8	315
852	4	1	178

$$\theta = \begin{bmatrix} 2 & 2 & 3 \\ 1 & 2 & 2 \\ 8 & 6 & 5 \\ 4 & 9 & 6 \end{bmatrix} \quad X = \begin{bmatrix} 2104 & 3 & 5 \\ 1416 & 2 & 2 \\ 1534 & 5 & 8 \\ 852 & 4 & 1 \end{bmatrix} \quad Y = \begin{bmatrix} 460 \\ 232 \\ 315 \\ 178 \end{bmatrix}$$

size	#Bedrooms	Years old	price
2104	3	5	460
1416	2	2	232
1534	5	8	315
852	4	1	178

$$\theta \qquad\qquad X \qquad\qquad Y$$

$$\begin{bmatrix} 2 & 2 & 3 \\ 1 & 2 & 2 \\ 8 & 6 & 5 \\ 4 & 9 & 6 \end{bmatrix} x \begin{bmatrix} 2104 & 3 & 5 \\ 1416 & 2 & 2 \\ 1534 & 5 & 8 \\ 852 & 4 & 1 \end{bmatrix} = \begin{bmatrix} 460 \\ 232 \\ 315 \\ 178 \end{bmatrix}$$

Repeat until converge {

$$\theta \rightarrow \theta - \alpha \frac{d}{d\theta} J(\theta)$$

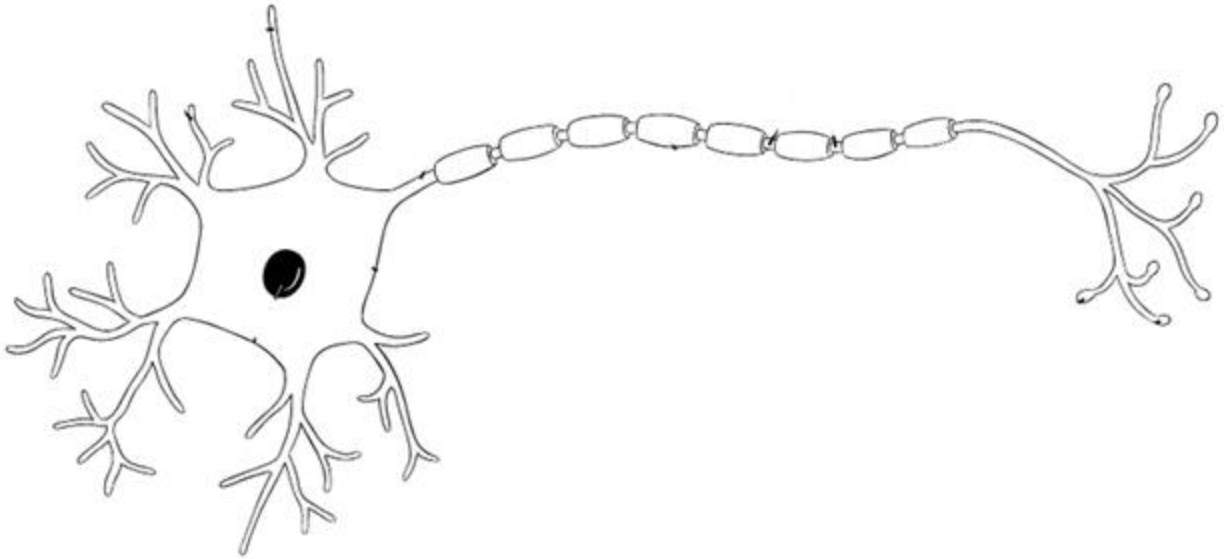
}

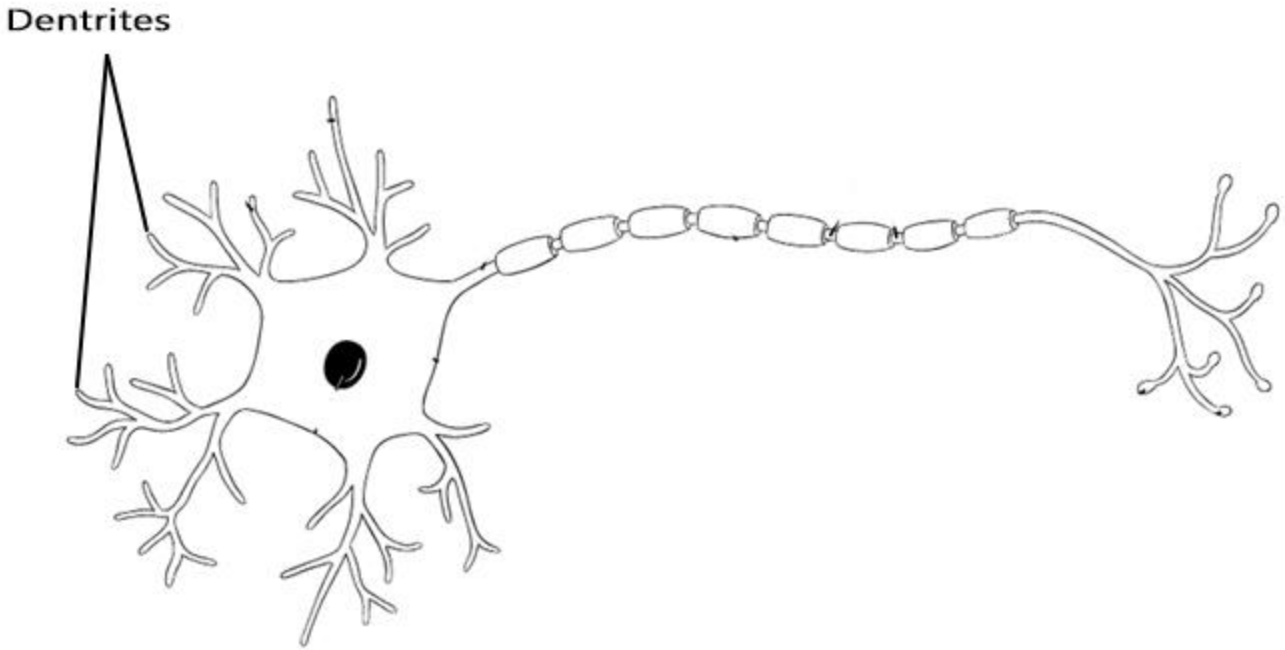
Repeat until converge {

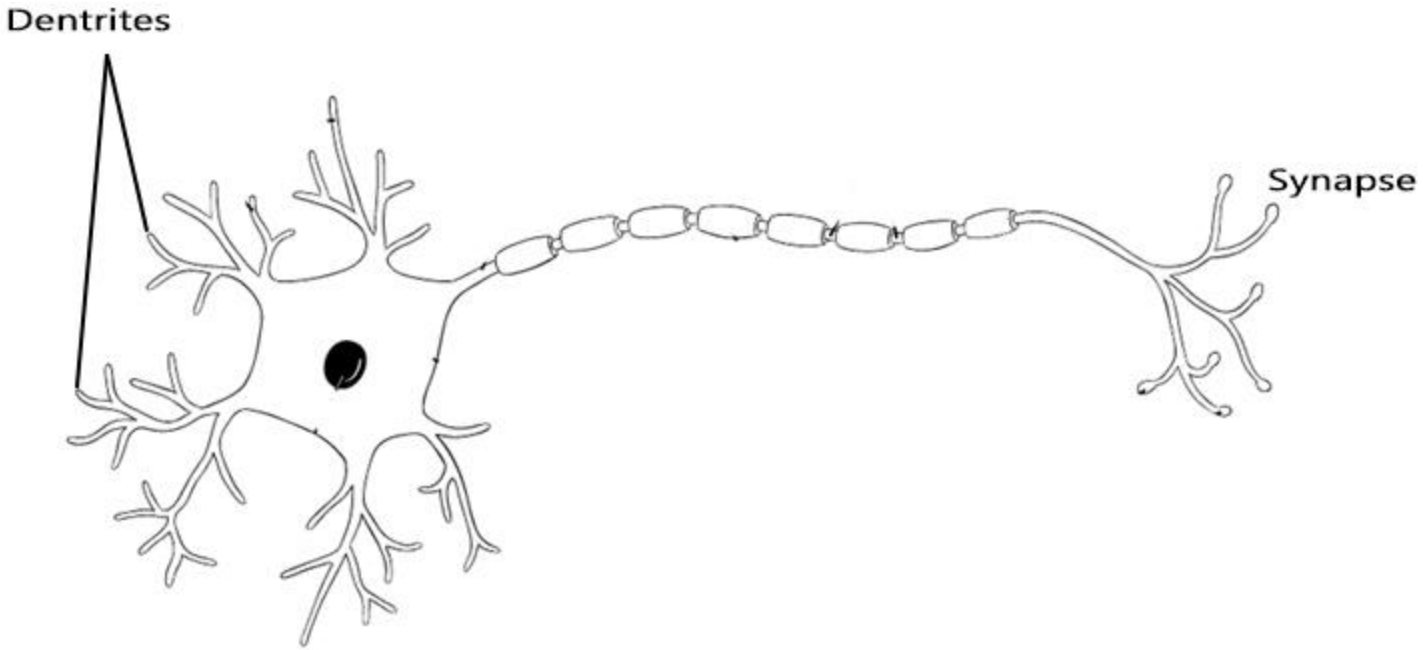
$$\theta_i \rightarrow \theta_i - \alpha \frac{\partial}{\partial \theta} J(\theta)$$

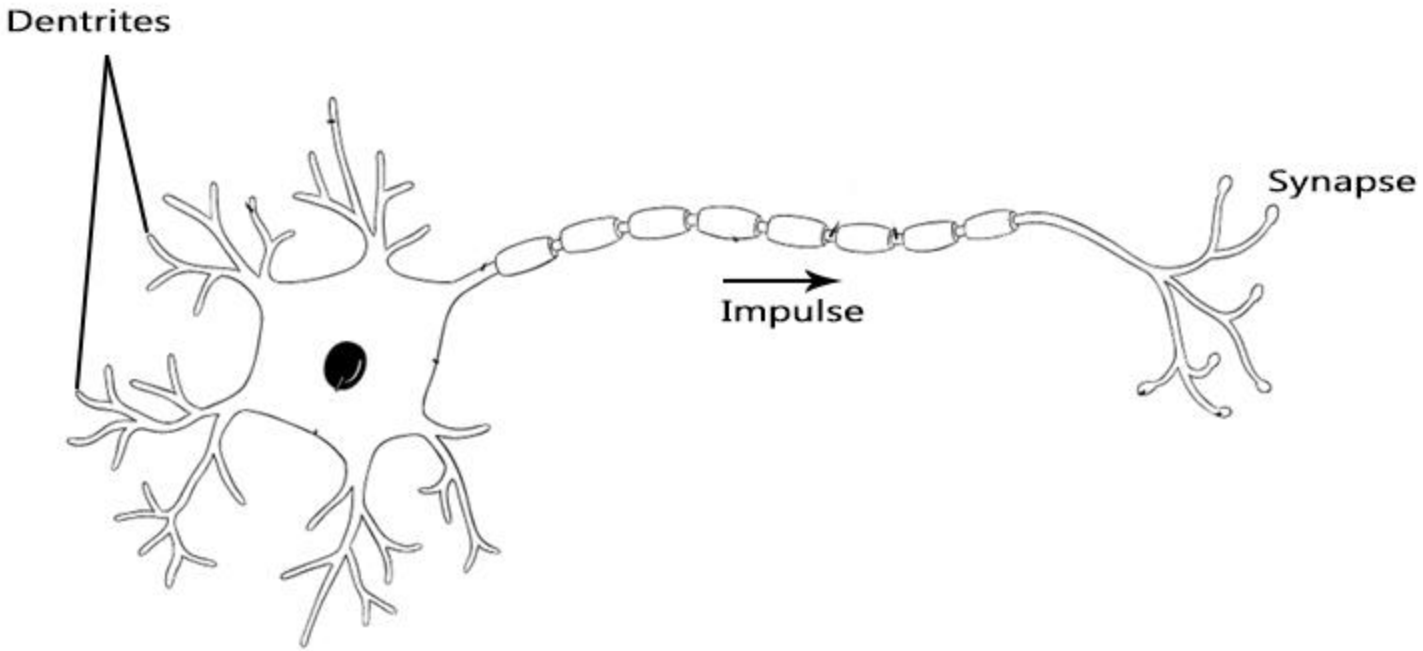
}

NEURONS

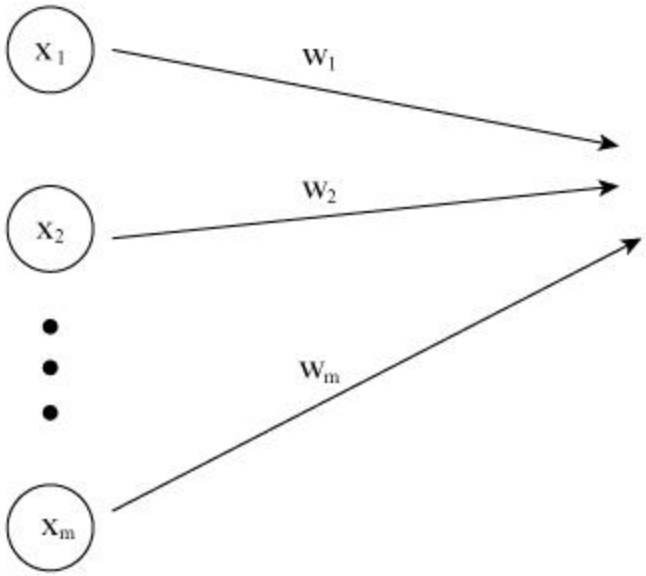


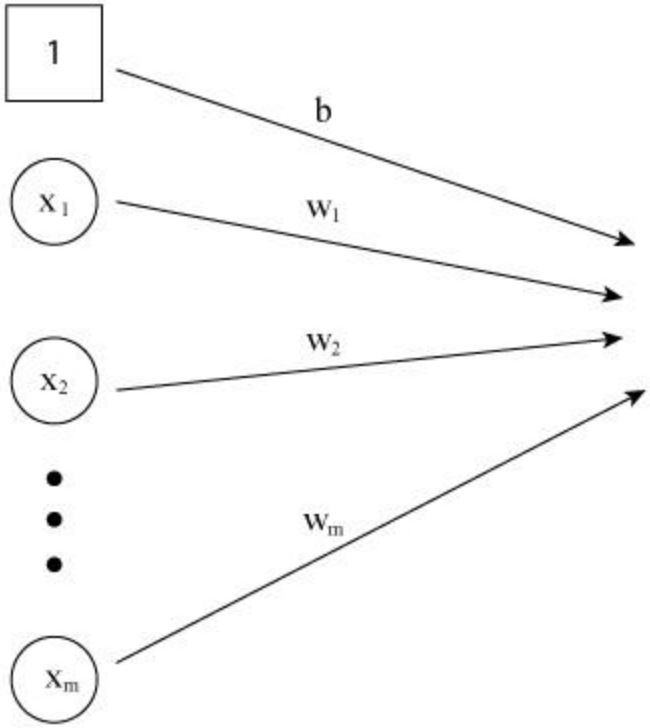

Dentrites

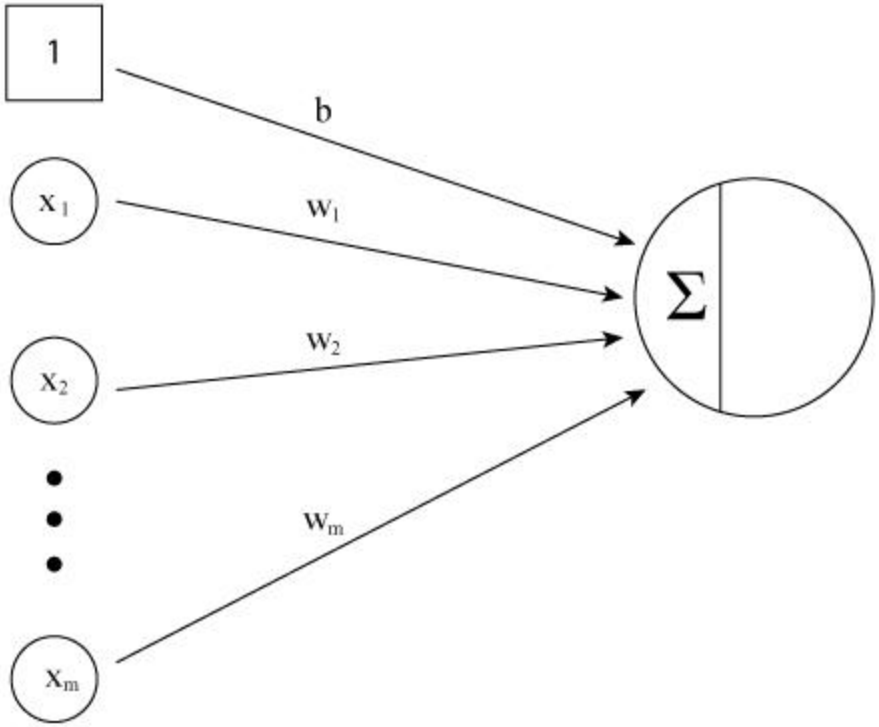

Dentrites
Synapse

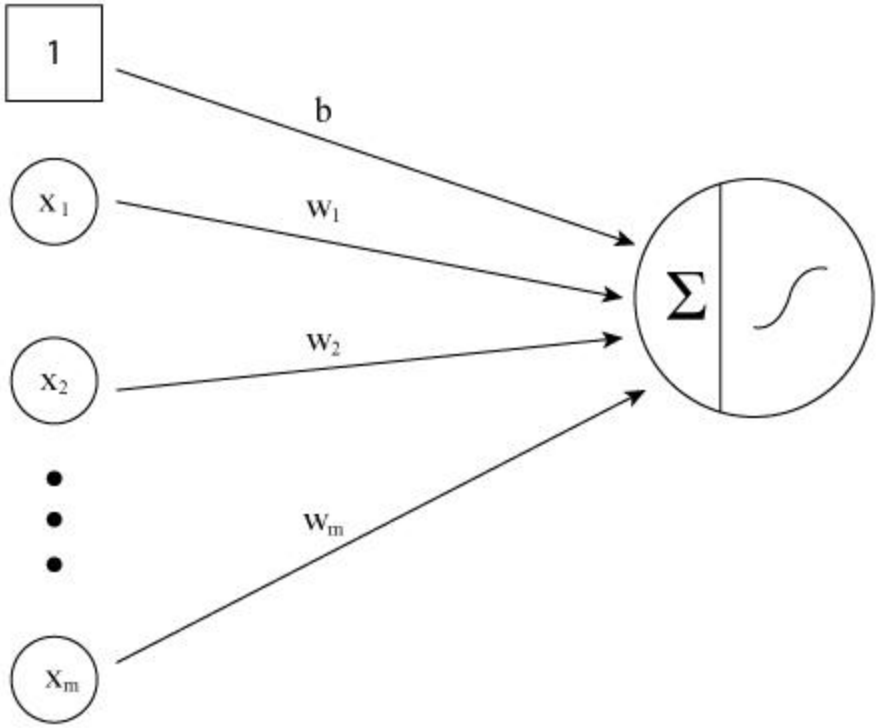

Dentrites
Synapse
Impulse

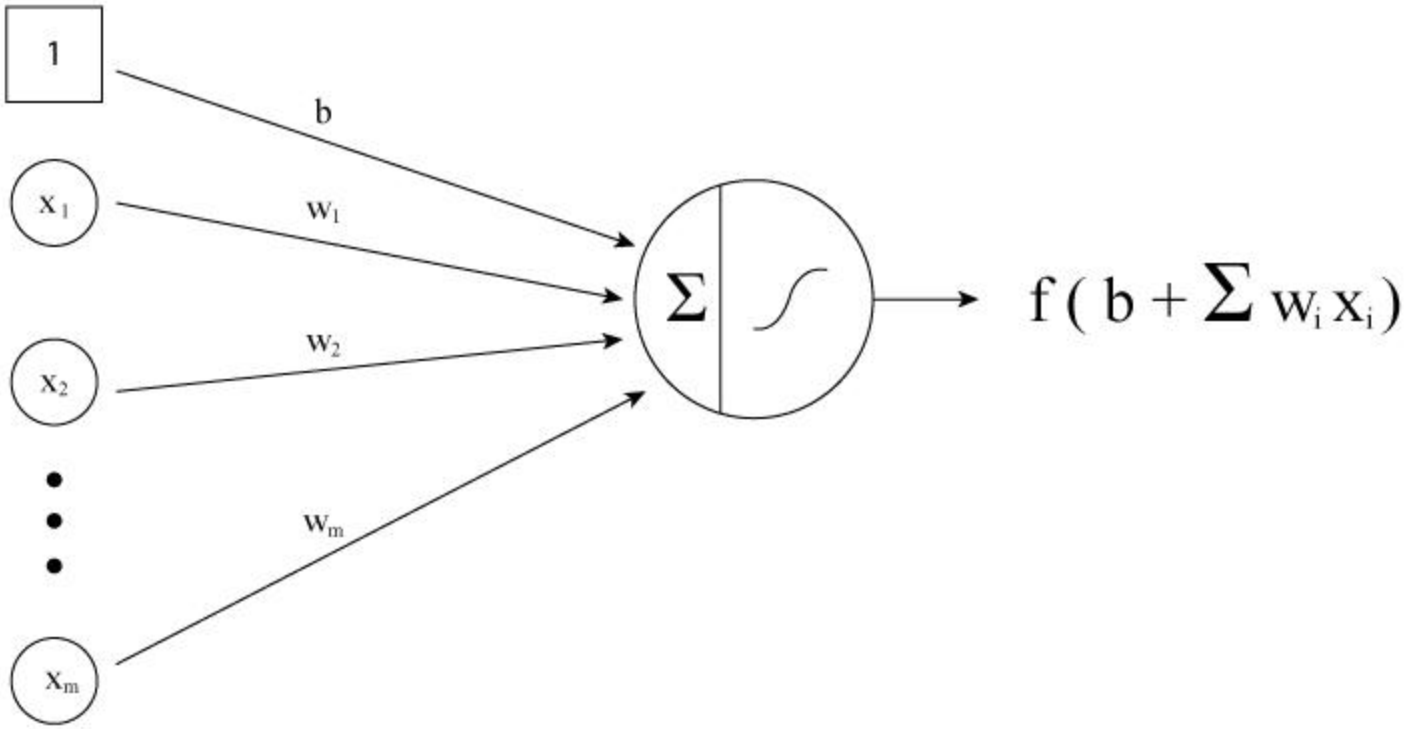

x_1
x_2
x_m


X1
W1
X2
W2
Wm
Xm

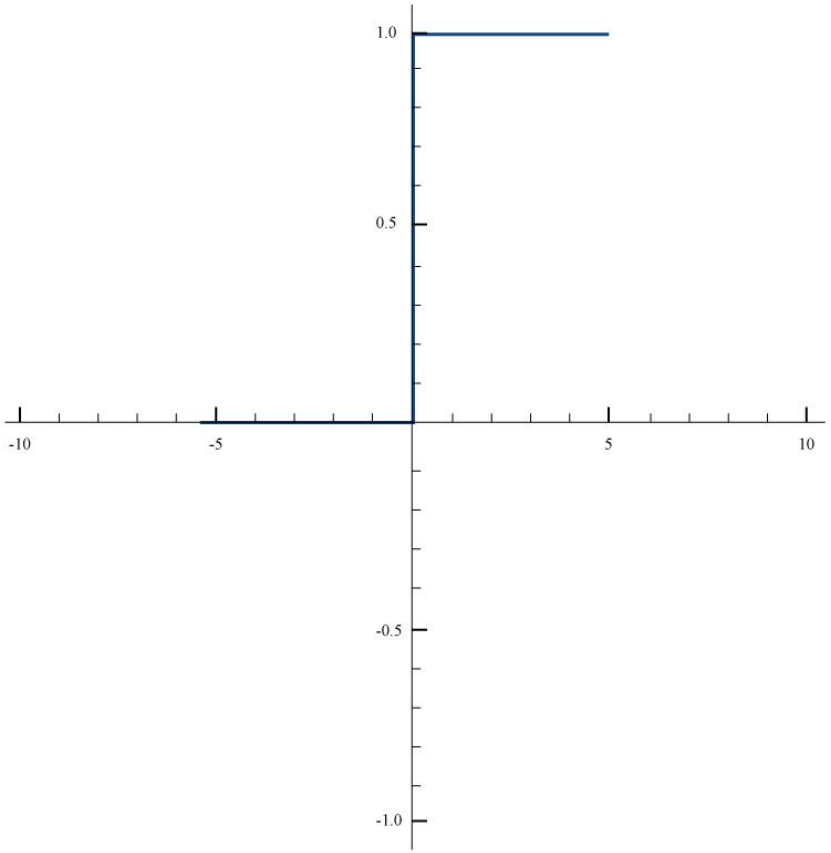

1
b
X1
W1
W2
X2
Wm
Xm


1
b
x1
w1
Σ
w2
x2
wm
xm


1
b
X1
W1
X2
W2
Wm
Xm
Σ


1
b
x1
w1
x2
w2
wm
xm
Σ
f (b + Σ wi xi)

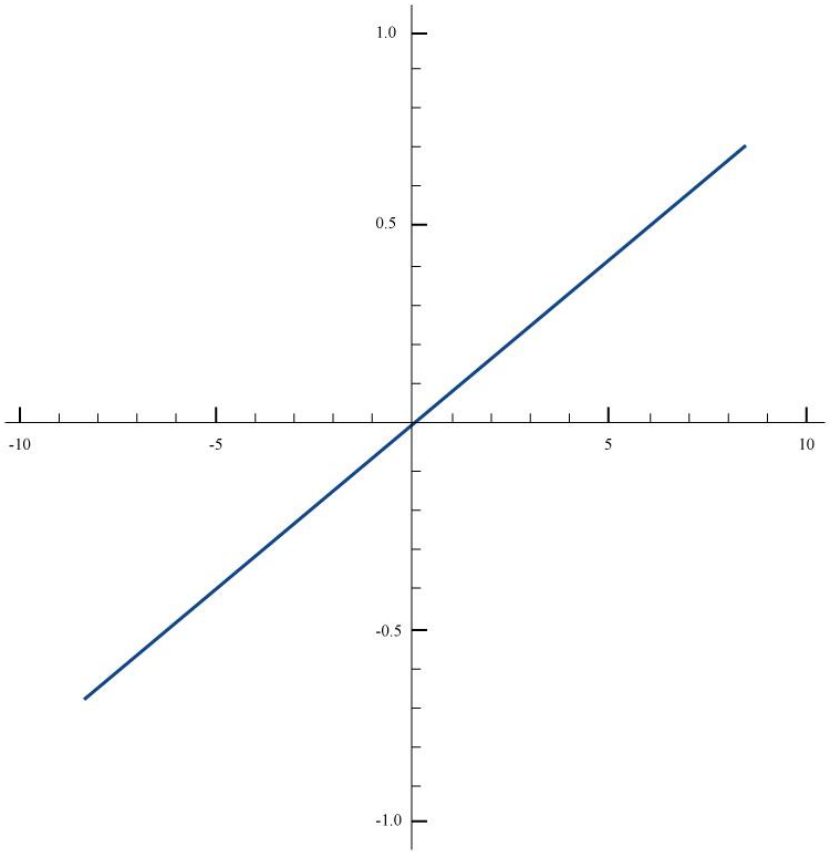
ACTIVATION FUNCTIONS



Step Function

It can only turn on or off neurons, can't give an intensity

Non differential

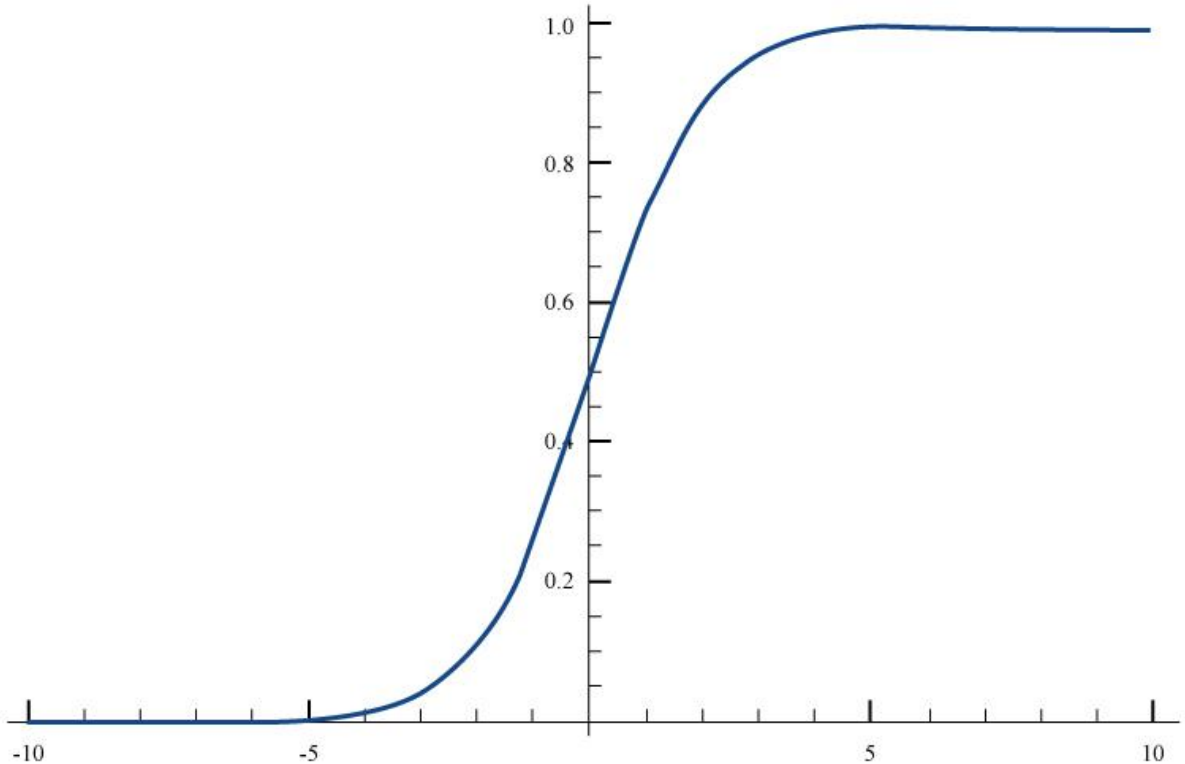


Linear Function

Differentiable and can forward intensity

Range is from negative infinity to positive infinity

Cannot differentiate non linear data

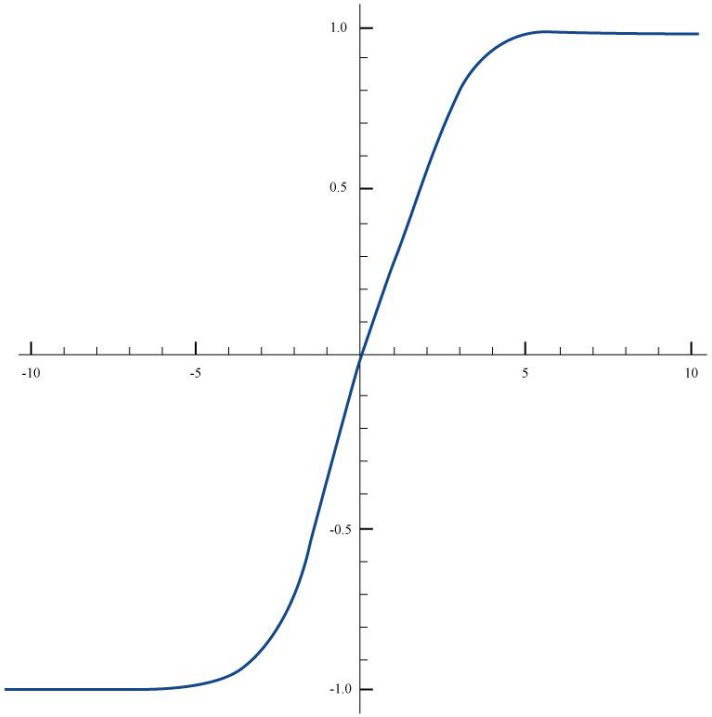


Sigmoid Functon

Differentiable and can forward intensity, Range between 1 , 0

Small active range for gradients

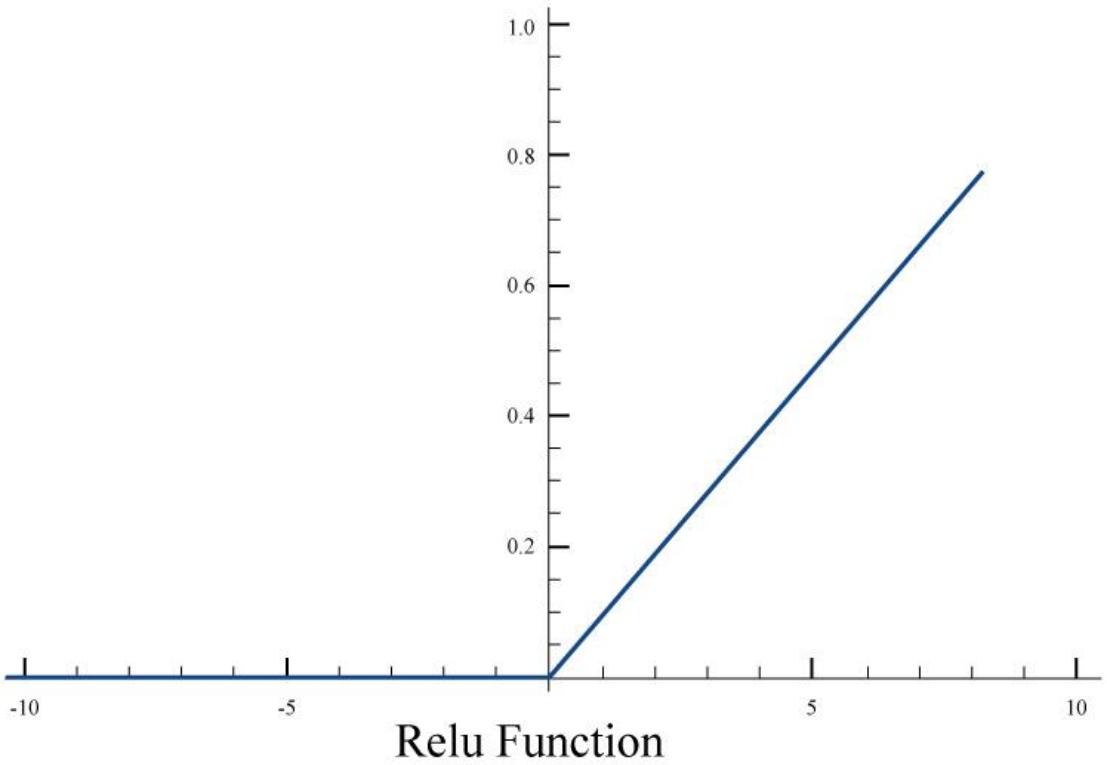
Non zero centric



tan h Functon

Differentiable and can forward intensity, Range between 1 , -1, Zero centric

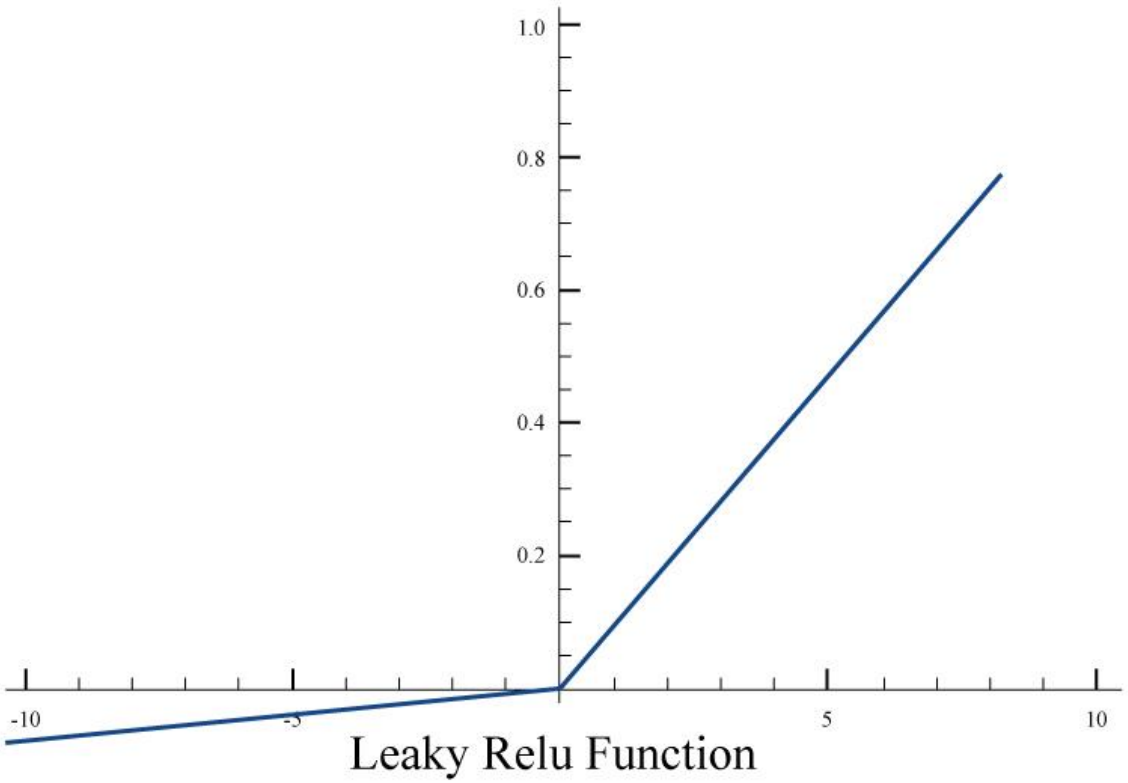
Small active range for gradients



Differentiable and can forward intensity, more active region for gradients

Dead zone for gradients below 0

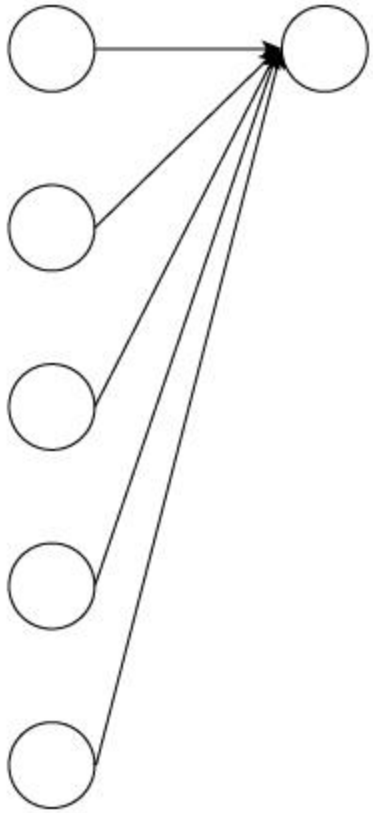
Range between 0 , infinity

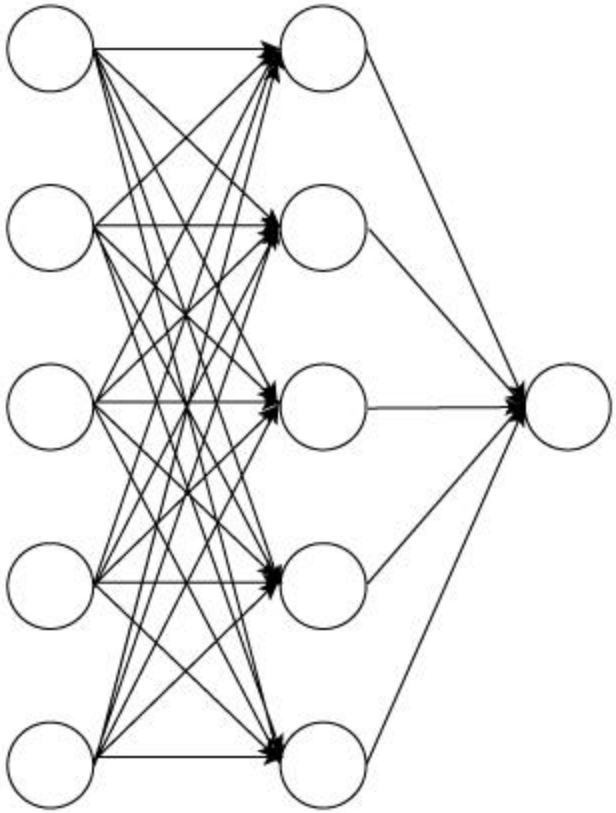


Differentiable and can forward intensity, more active region for gradients

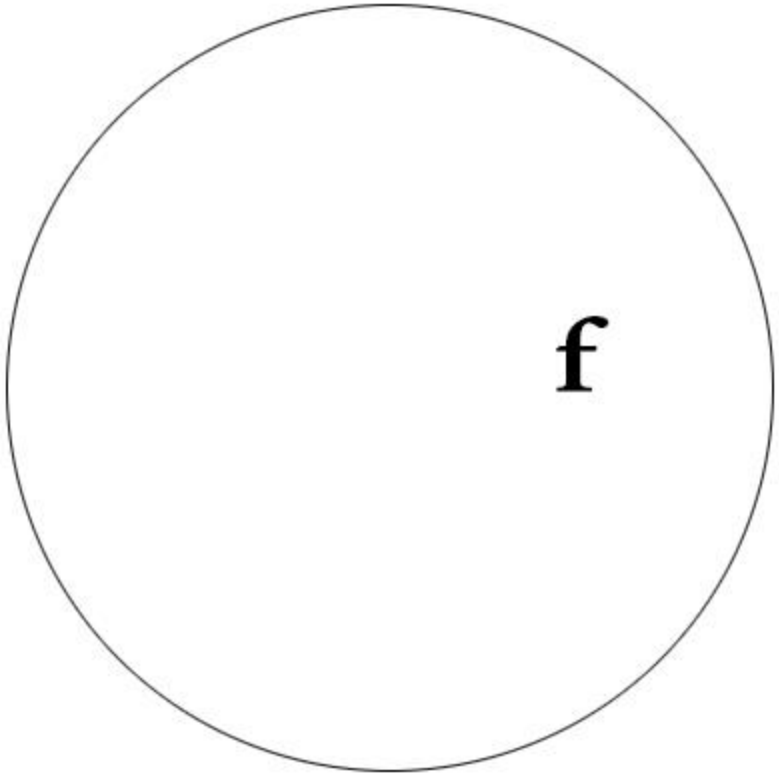
Range between 0, infinity

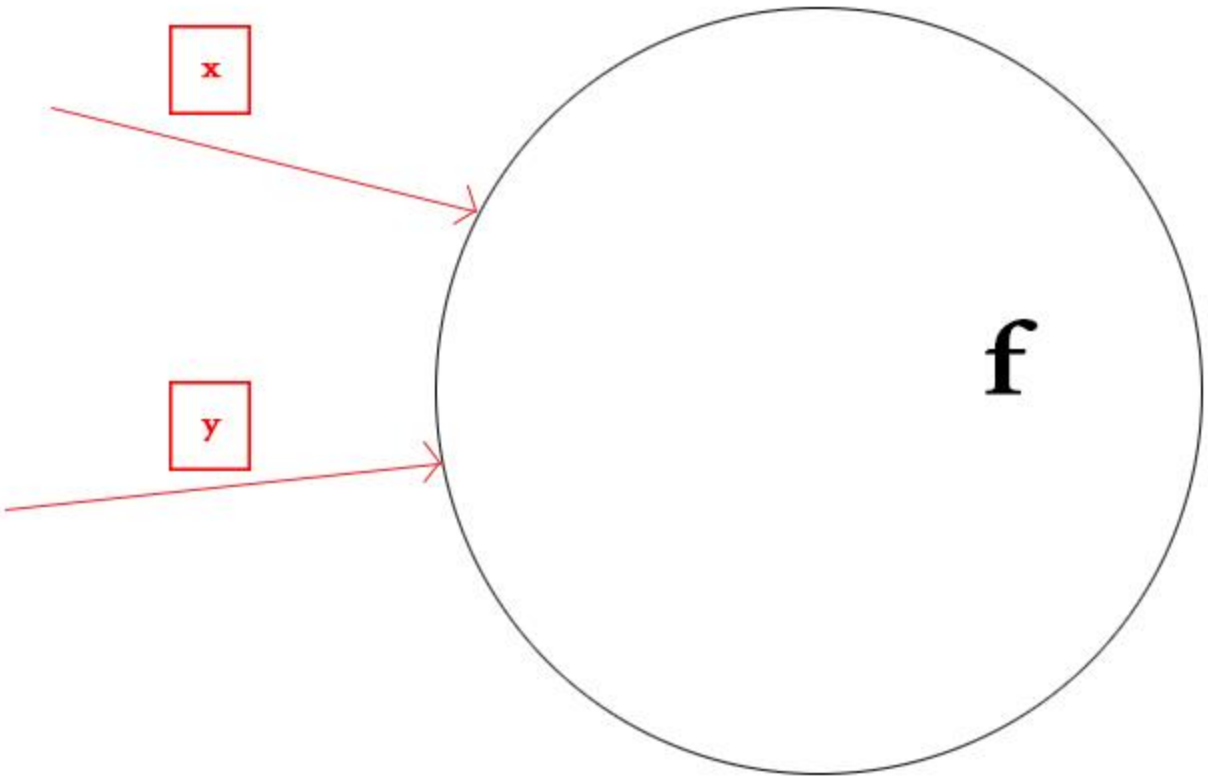
DEEP NEURAL NETWORK

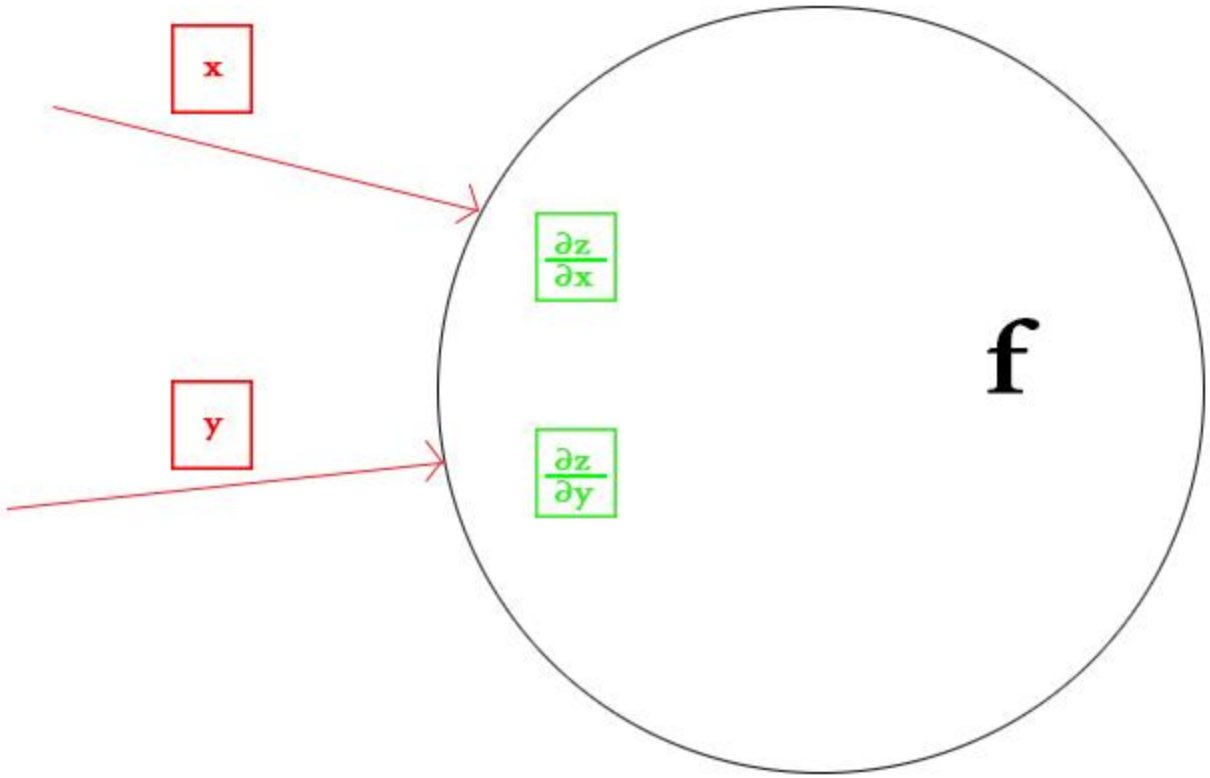


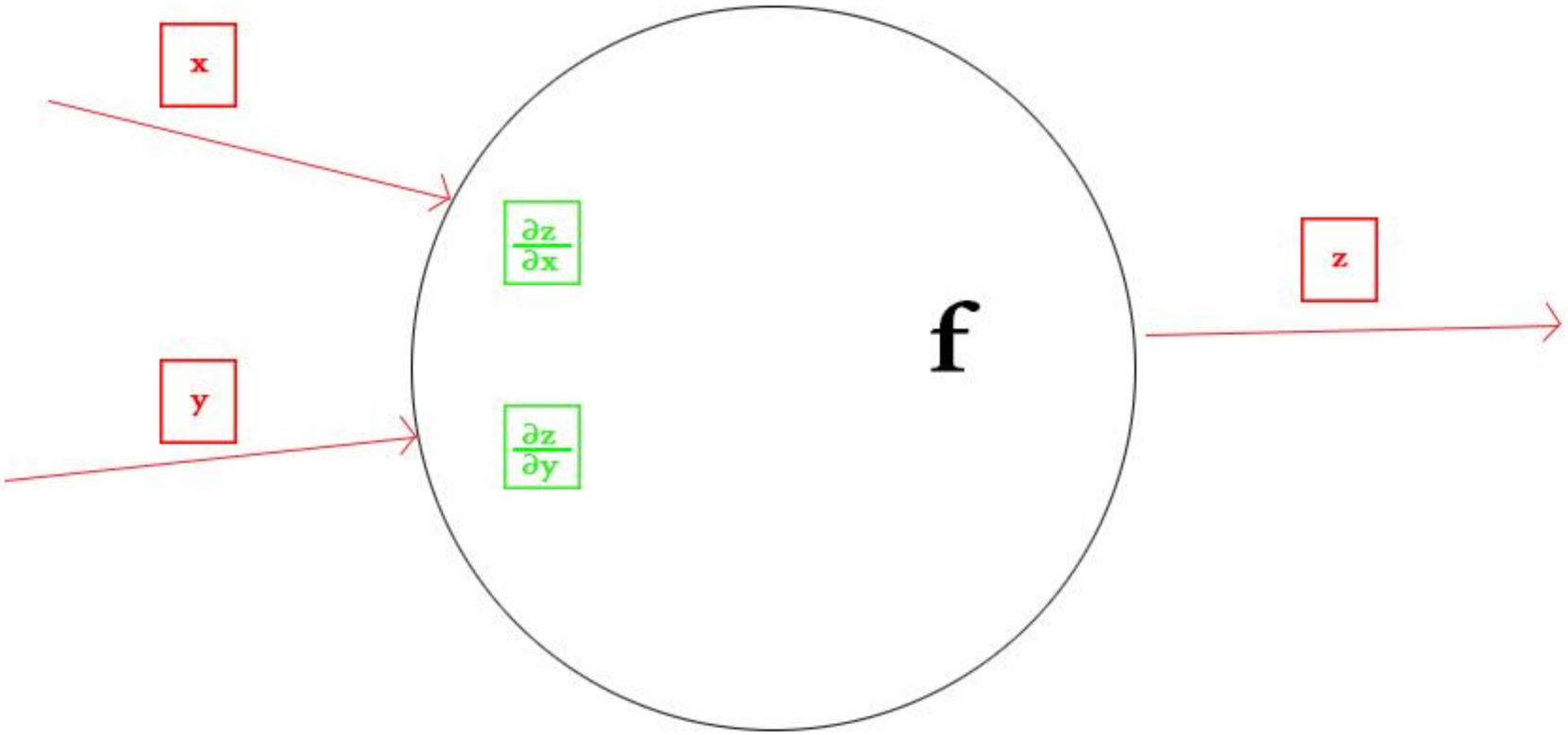


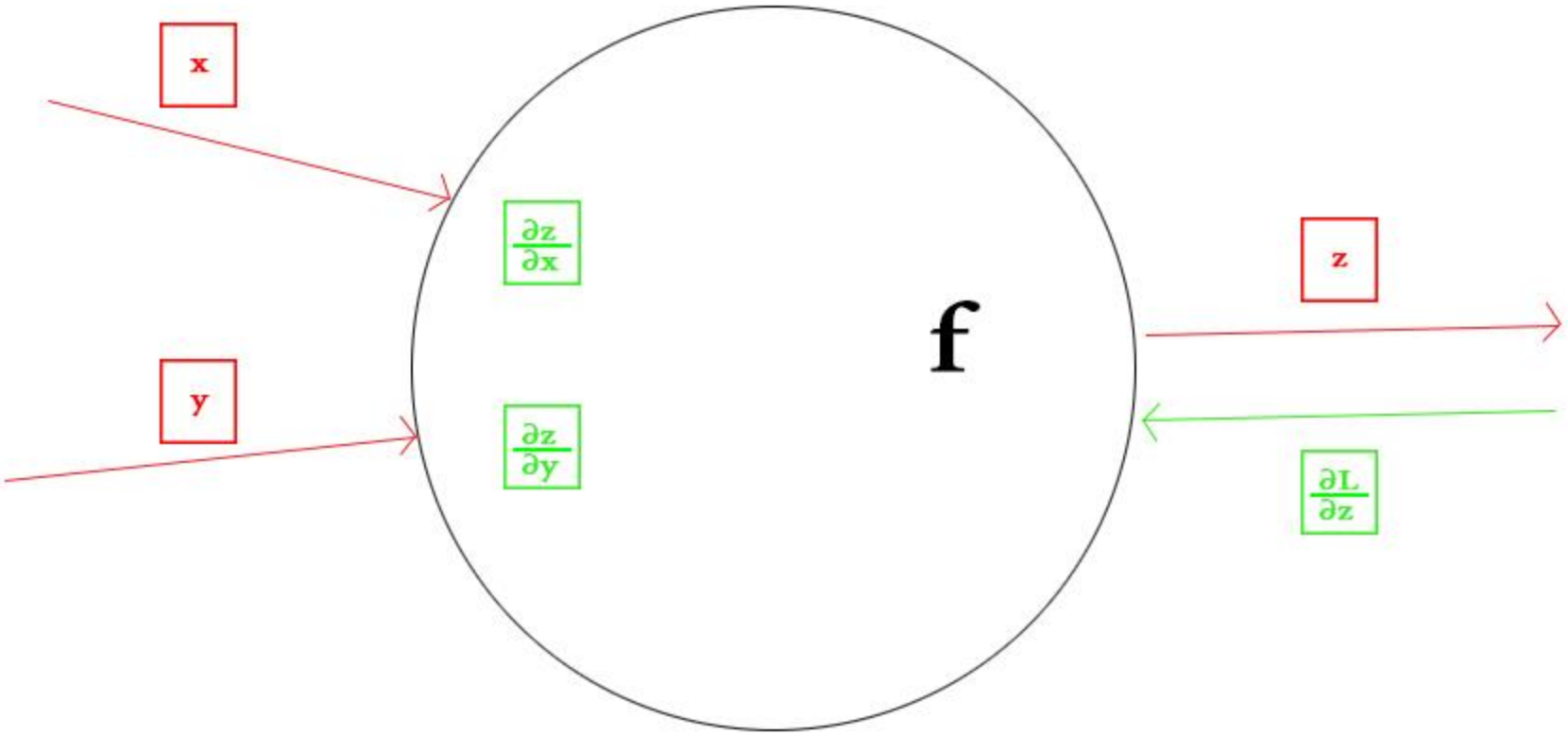
BACK PROPAGATION

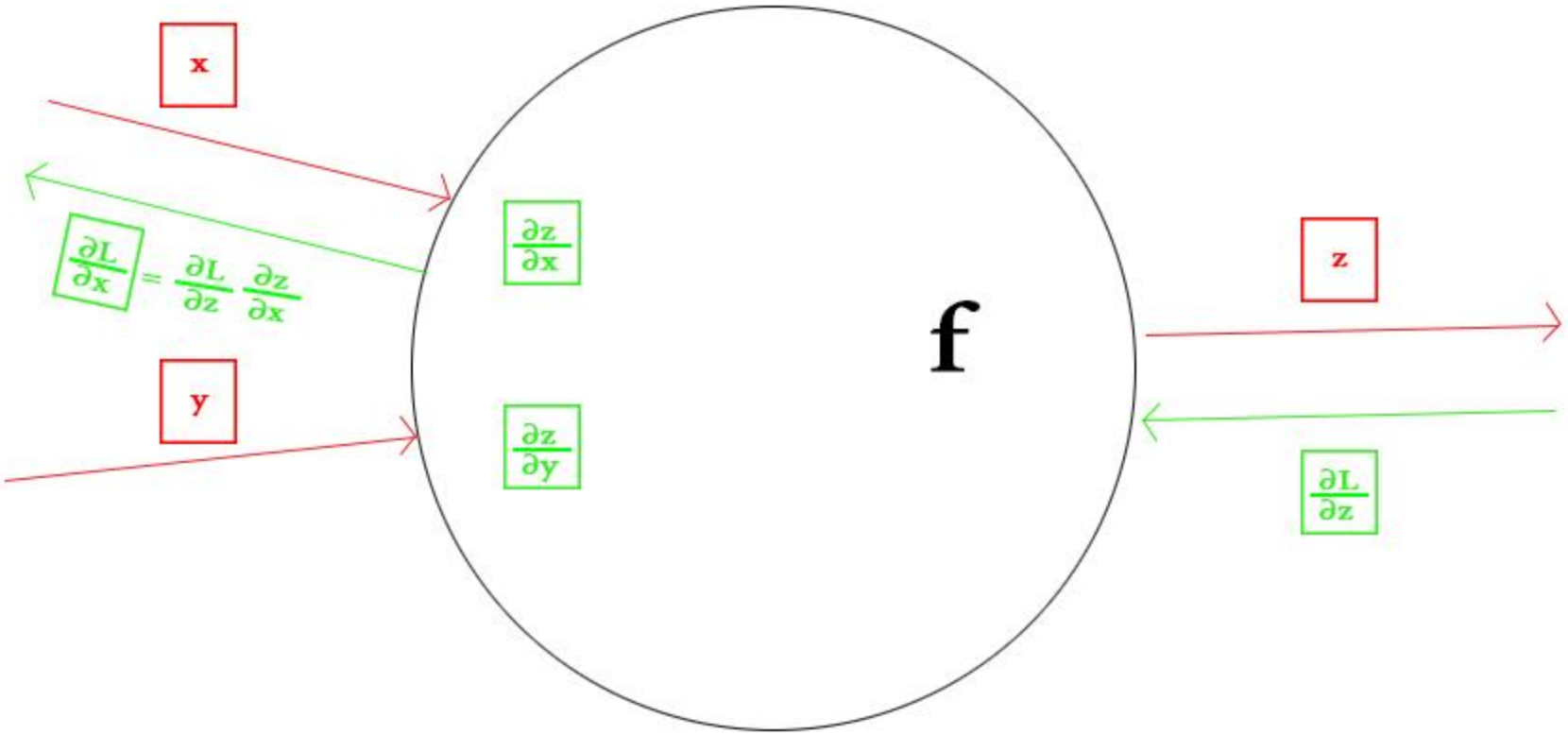

f

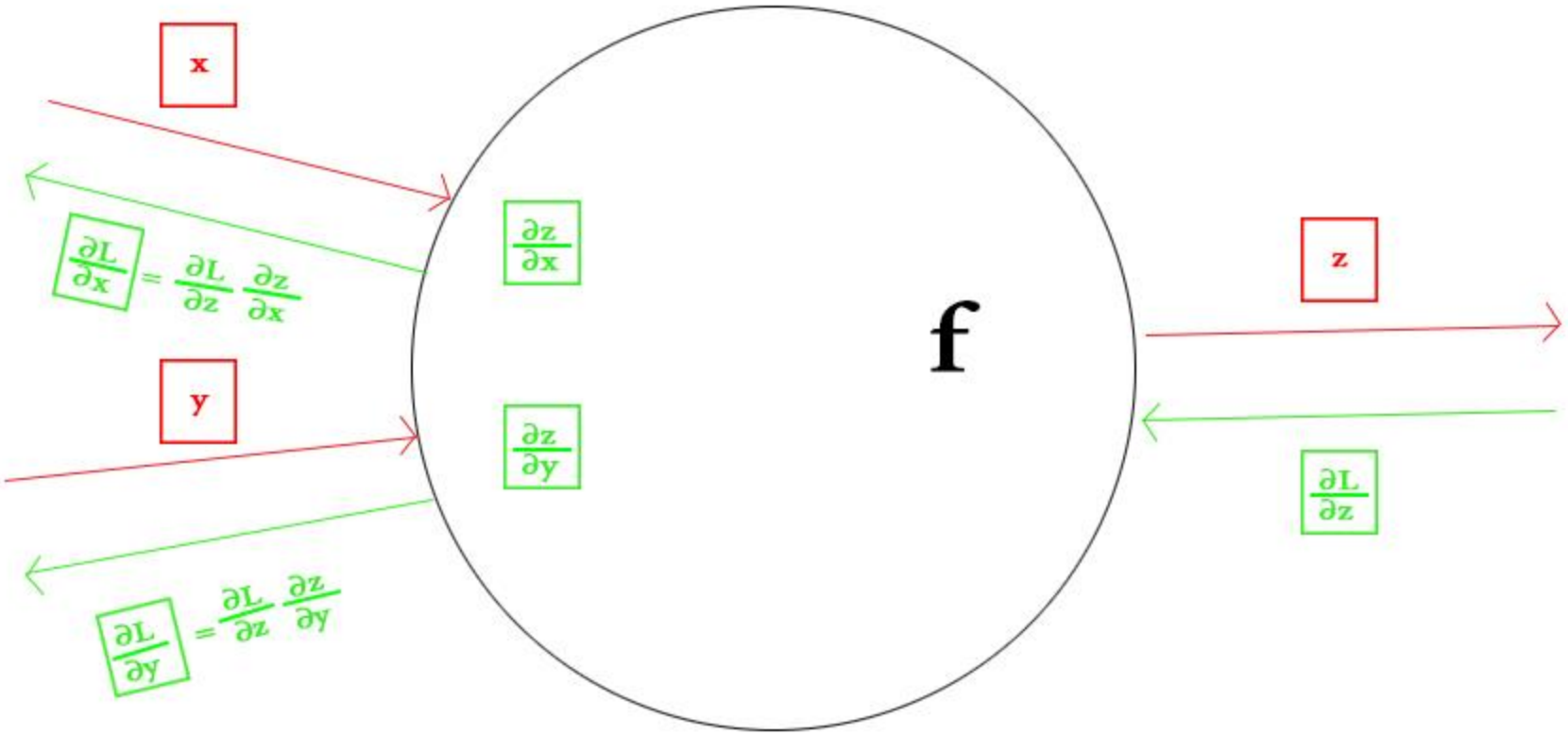

x
y
f


x
y
$\frac{\partial z}{\partial x}$
$\frac{\partial z}{\partial y}$
f


x
y
$\frac{\partial z}{\partial x}$
$\frac{\partial z}{\partial y}$
f
z


x
y
$\frac{\partial z}{\partial x}$
$\frac{\partial z}{\partial y}$
f
z
$\frac{\partial L}{\partial z}$


x
y
f
z
$\frac{\partial z}{\partial x}$
$\frac{\partial z}{\partial y}$
$\frac{\partial L}{\partial z}$
$\frac{\partial L}{\partial x} = \frac{\partial L}{\partial z}\frac{\partial z}{\partial x}$

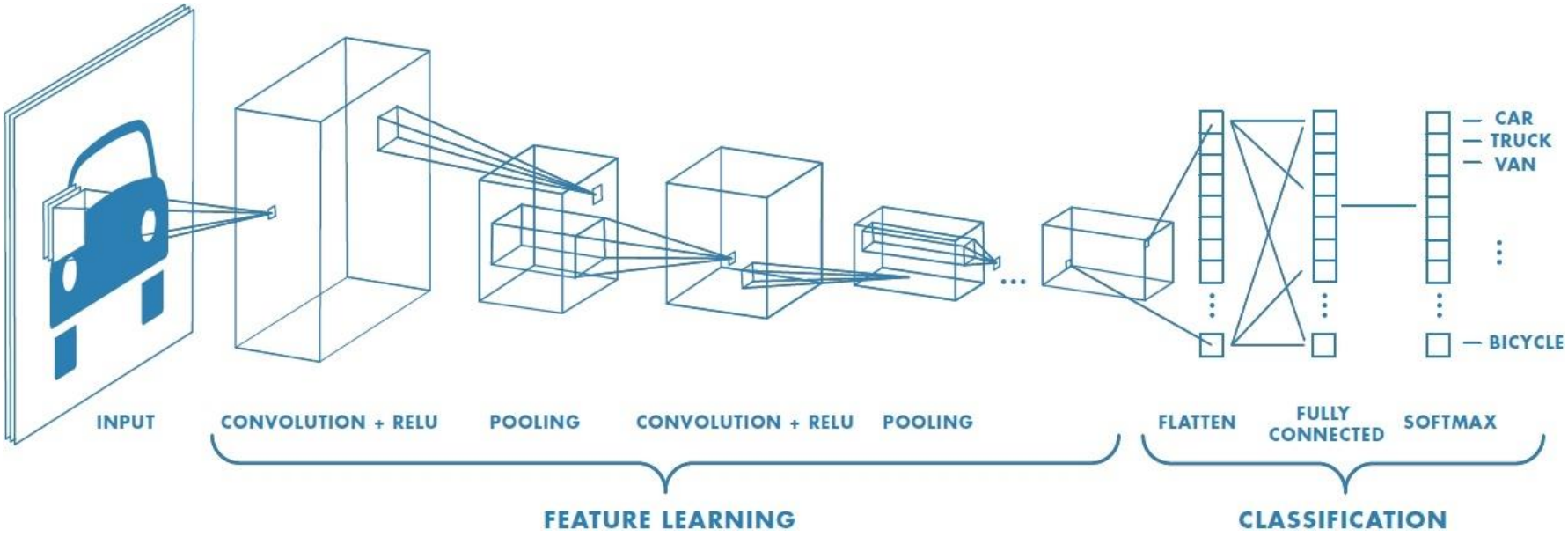

x
y
f
z
$\frac{\partial z}{\partial x}$
$\frac{\partial z}{\partial y}$
$\frac{\partial L}{\partial z}$
$\frac{\partial L}{\partial x} = \frac{\partial L}{\partial z}\frac{\partial z}{\partial x}$
$\frac{\partial L}{\partial y} = \frac{\partial L}{\partial z}\frac{\partial z}{\partial y}$

WHAT'S MORE

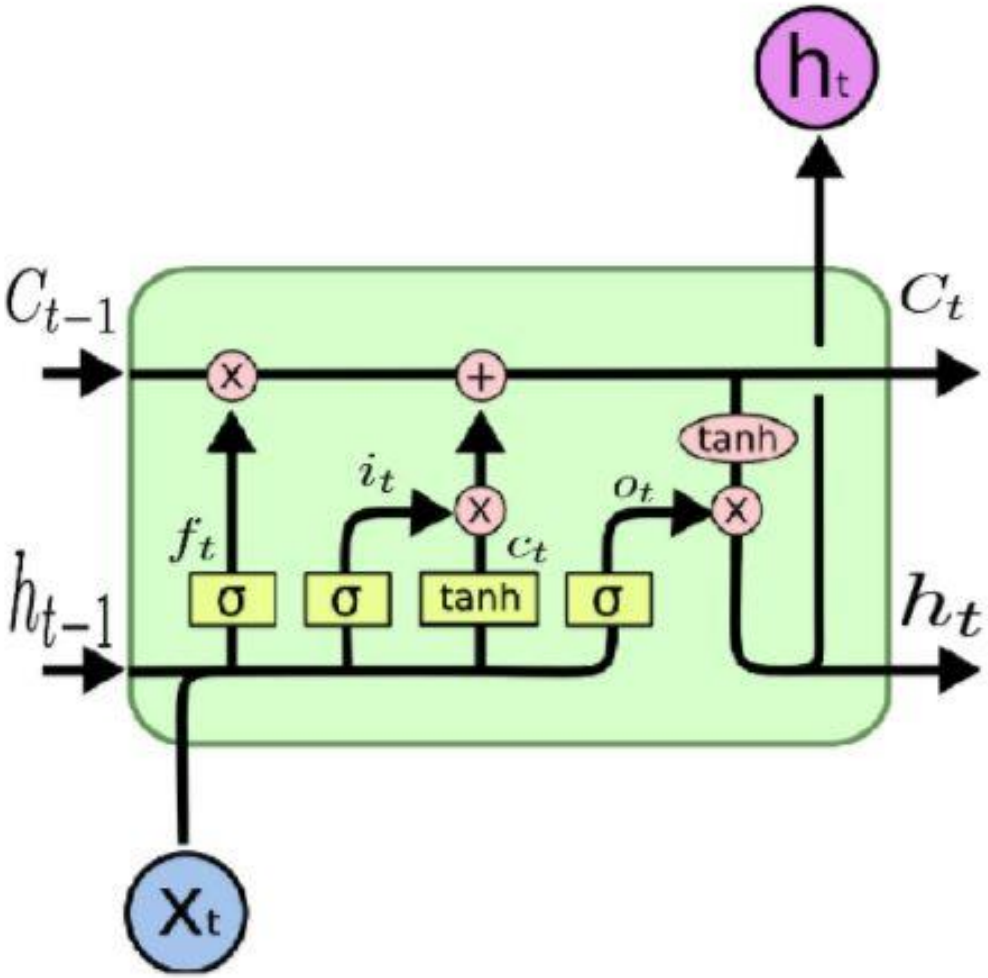
Regularization

- >> Data Preprocessing
- >> Weight Initialization
- >> Big Data
- >> Batch Normalization
- >> Regularization
- >> Drop out
- >> Validation aka babysitting
- >> Early stopping

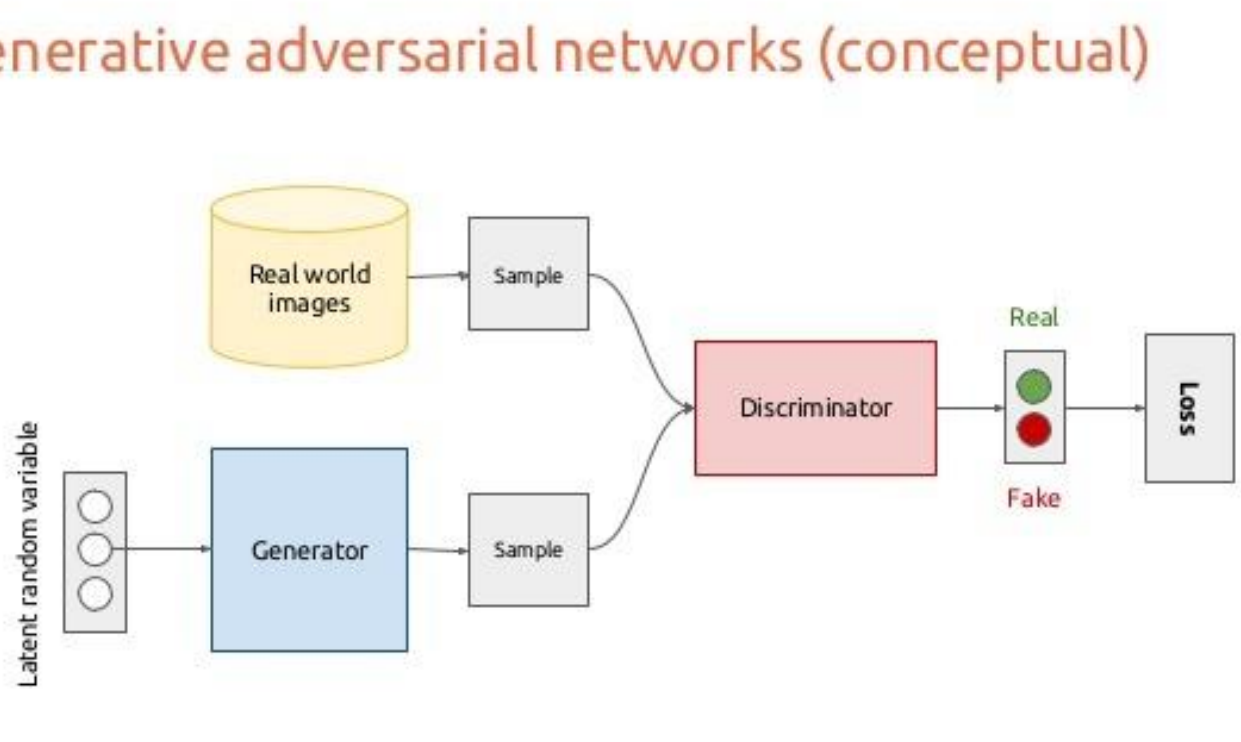
CONVOLUTIONAL NEURAL NETWORKS



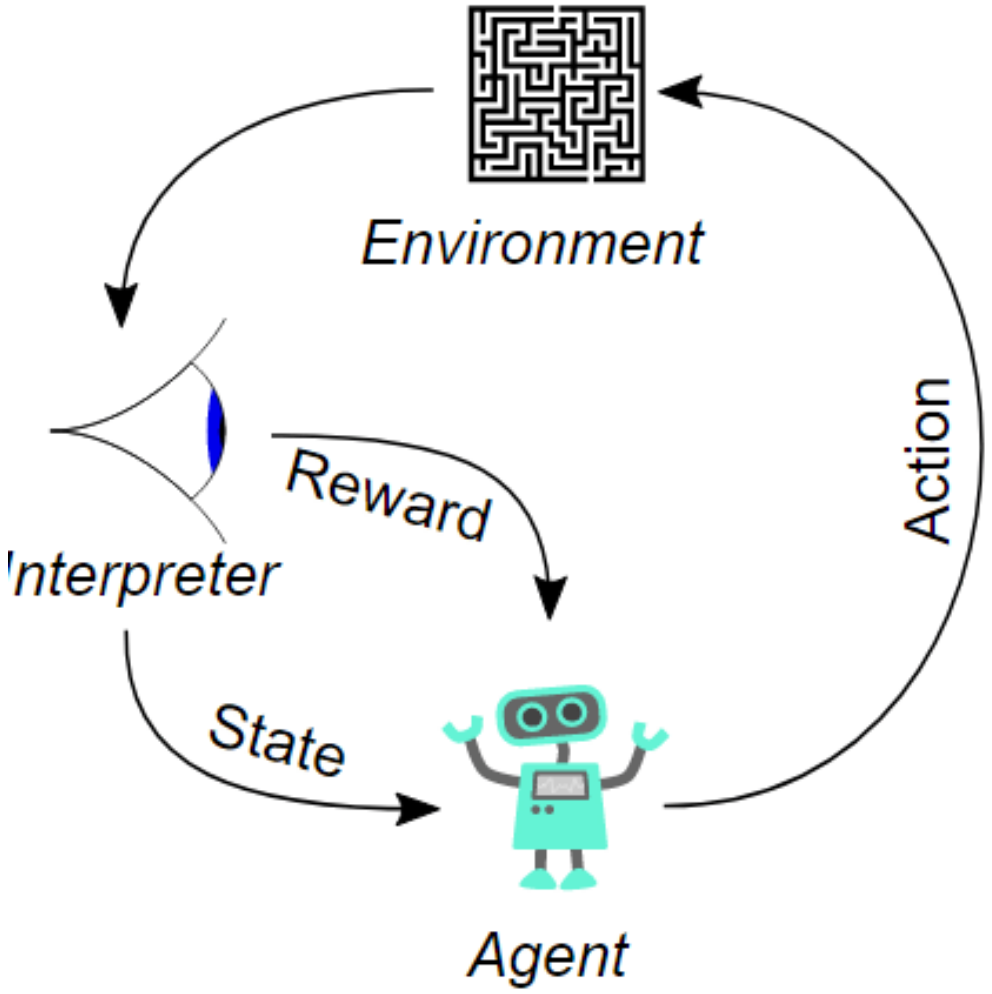
RECURRENT NEURAL NETWORKS



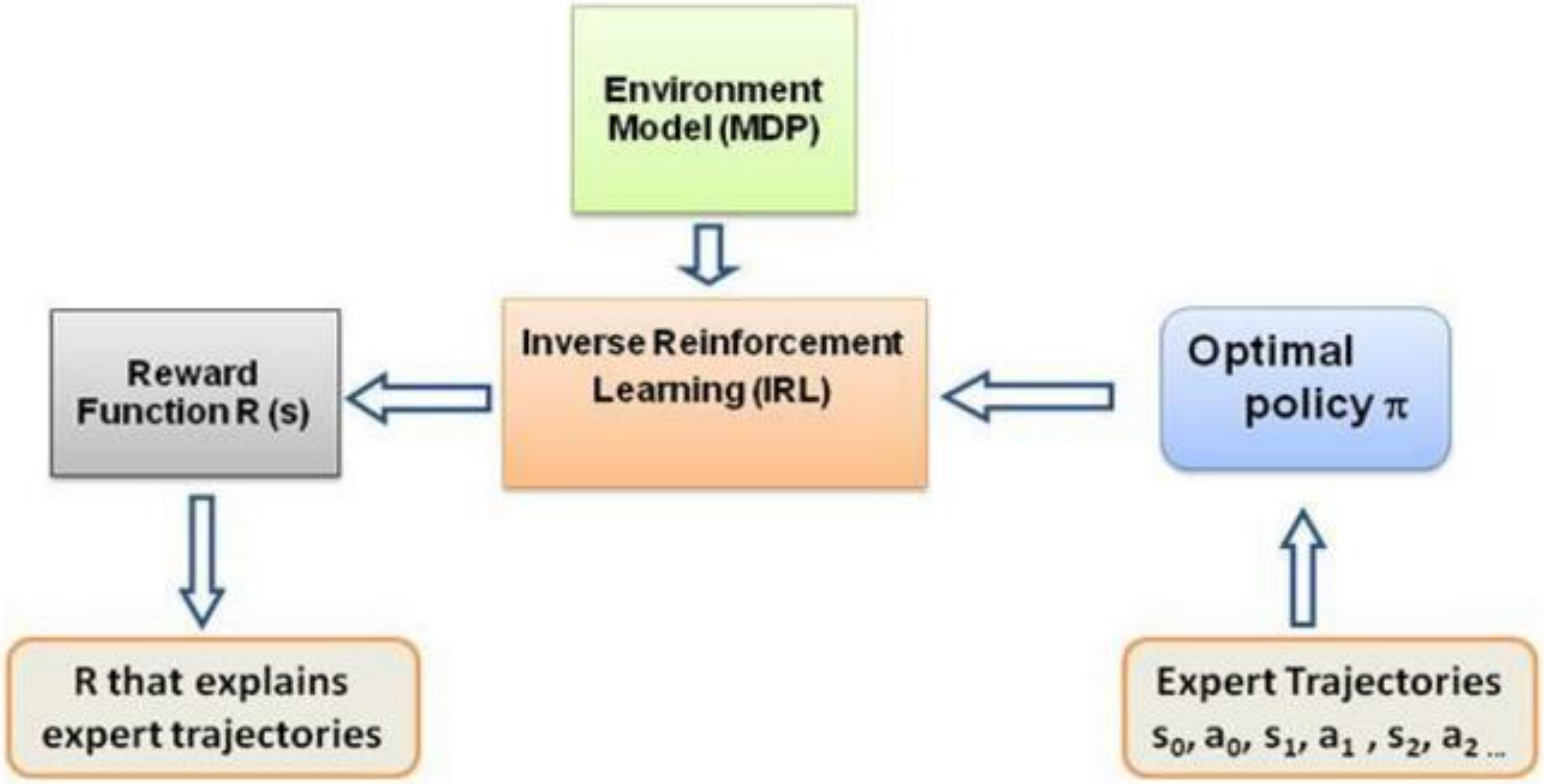
GENERATIVE MODELS



REINFORCEMENT LEARNING



INVERSE REINFORCEMENT LEARNING



INCREDIBLE STUFFS

AUTOMATIC IMAGE COLORIZATION

Combining Deep Convolutional Neural Networks with Markov Random Fields for Image Colorization

Colorization Results: Charlie Chaplin Goes to the Beach

VISUALLY INDICATED SOUND

PROGRESSIVE GROWING OF GAN

LEVEL 2 SELF DRIVING VEHICLES