NOVEMBER 3, 2019

2:00PM - 5:00PM

ROOM HC10

COME TO OUR WORKSHOP AND LEARN HOW TO TEACH A COMPUTER TO RECOGNIZE HAND WRITTEN NUMBERS

UNB DEV SOCIETY

Welcome!

- Our first event of 2019-2020
- Follow us on social media and Slack
  - www.facebook.com/UNBDEVSOC
  - UNBDevSociety.slack.com
  - UNBDevSoc@gmail.com

OUR GOAL

- Generate interest for software development at UNB.
- Fill the gaps school might have missed.
- Career building
- Have fun!

WHAT'S NEXT?

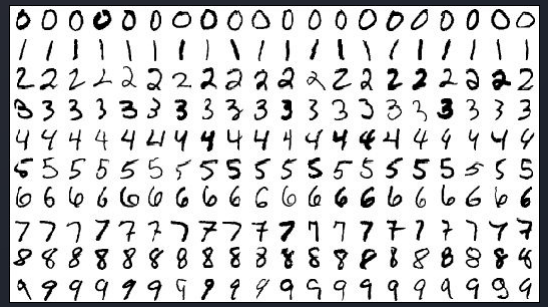
- **More Workshops**
  - React workshop (November 17th)
- **Career Prep**
  - Technical Interviews (Weekly *Check Slack*)
- **Hack-a-thon**
  - Every Winter Semester
- **And more...**

HAVE IDEAS?

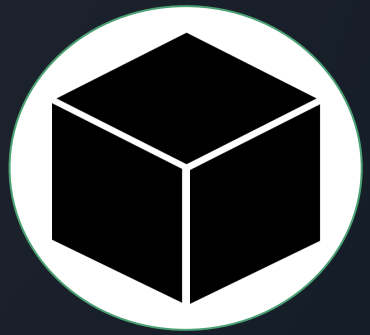
- We can help you put on events.

WHAT IS ML?

Data



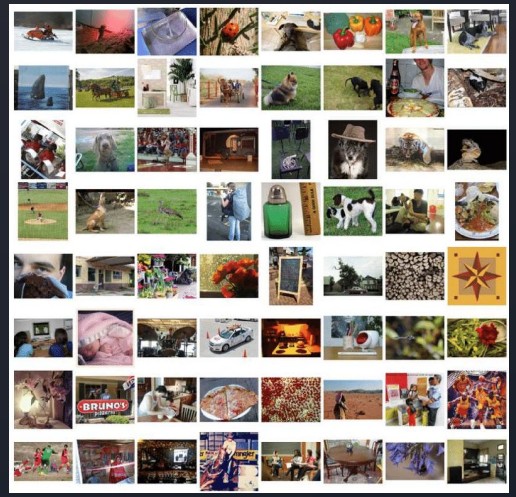
Model



Predictions

DATA

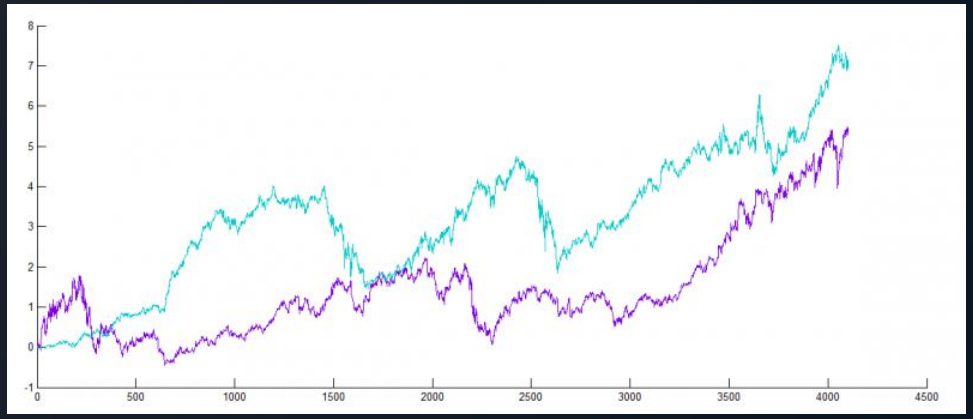
Image



Tabular

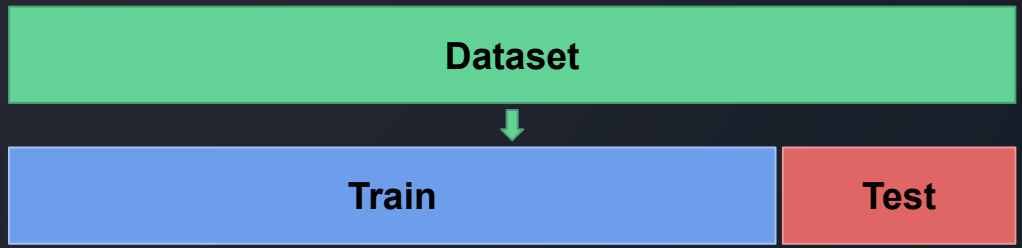
car_ID	symboling	CarName	fueltype	aspiration	doornumber	carbody	drivewheel	enginelocati	wheelbase	carlength	carwidth	carheight	curbweight
1	3	alfa-romero	gas	std	two	convertible	rwd	front	88.6	168.8	64.1	48.8	2548
2	3	alfa-romero	gas	std	two	convertible	rwd	front	88.6	168.8	64.1	48.8	2548
3	1	alfa-romero	gas	std	two	hatchback	rwd	front	94.5	171.2	65.5	52.4	2823
4	2	audi 100 ls	gas	std	four	sedan	fwd	front	99.8	176.6	66.2	54.3	2337
5	2	audi 100ls	gas	std	four	sedan	4wd	front	99.4	176.6	66.4	54.3	2824
6	2	audi fox	gas	std	two	sedan	fwd	front	99.8	177.3	66.3	53.1	2507
7	1	audi 100ls	gas	std	four	sedan	fwd	front	105.8	192.7	71.4	55.7	2844
8	1	audi 5000	gas	std	four	wagon	fwd	front	105.8	192.7	71.4	55.7	2954
9	1	audi 4000	gas	turbo	four	sedan	fwd	front	105.8	192.7	71.4	55.9	3086
10	0	audi 5000s (	gas	turbo	two	hatchback	4wd	front	99.5	178.2	67.9	52	3053
11	2	bmw 320i	gas	std	two	sedan	rwd	front	101.2	176.8	64.8	54.3	2395
12	0	bmw 320i	gas	std	four	sedan	rwd	front	101.2	176.8	64.8	54.3	2395
13	0	bmw x1	gas	std	two	sedan	rwd	front	101.2	176.8	64.8	54.3	2710
14	0	bmw x3	gas	std	four	sedan	rwd	front	101.2	176.8	64.8	54.3	2765
15	1	bmw z4	gas	std	four	sedan	rwd	front	103.5	189	66.9	55.7	3055
16	0	bmw x4	gas	std	four	sedan	rwd	front	103.5	189	66.9	55.7	3230
17	0	bmw x5	gas	std	two	sedan	rwd	front	103.5	193.8	67.9	53.7	3380
18	0	bmw x3	gas	std	four	sedan	rwd	front	110	197	70.9	56.3	3505

Time Series



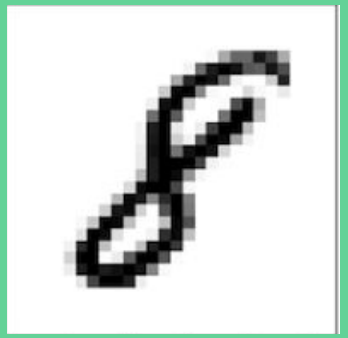
DATASETS

Splitting Datasets



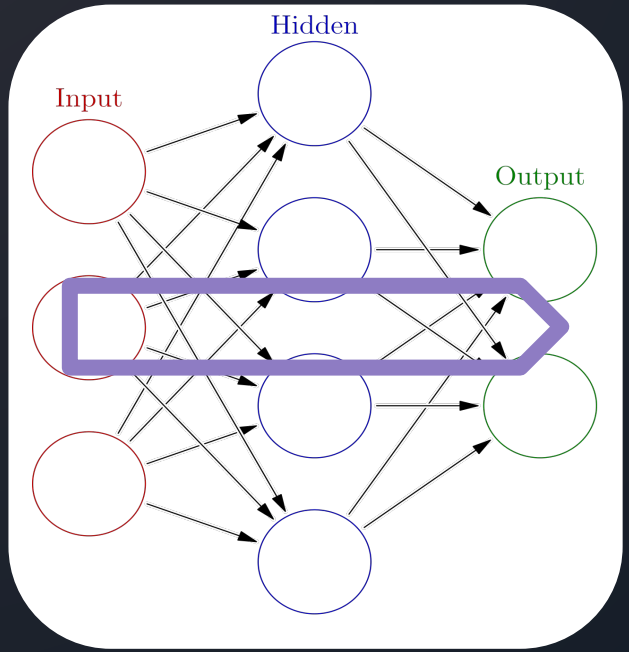
Dataset Row

Example:

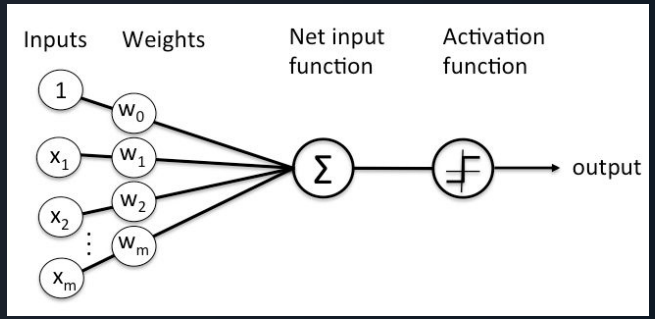


Label: **8**

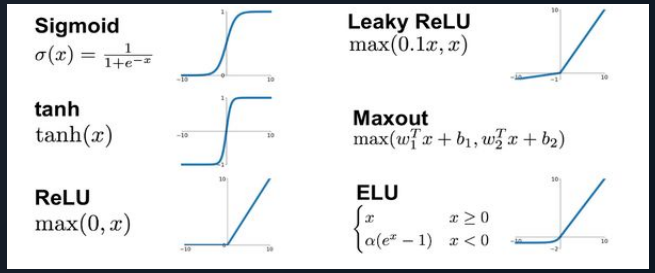
NEURAL NETWORK



Feedforward

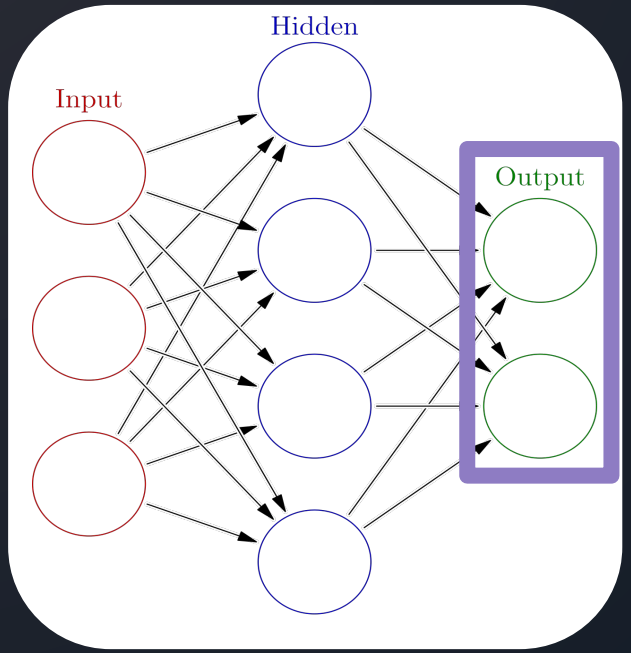


Activation Functions



UNB DEV SOCIETY

NEURAL NETWORK



Loss Functions

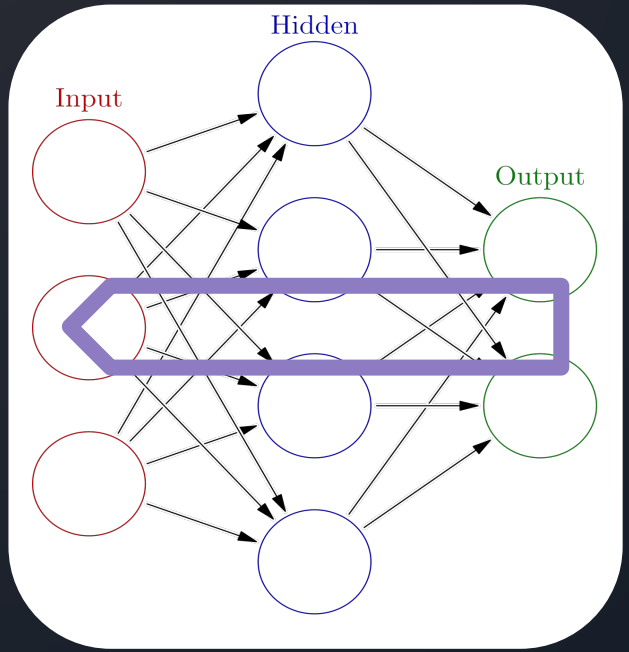
Mean Squared Error

$$\text{MSE} = \frac{1}{n}\sum_{i=1}^{n}(y_i - \tilde{y}_i)^2$$

Cross-Entropy

$$L_{\text{cross-entropy}}(\hat{\mathbf{y}}, \mathbf{y}) = -\sum_{i} y_i \log(\hat{y}_i)$$

NEURAL NETWORK



Backpropagation

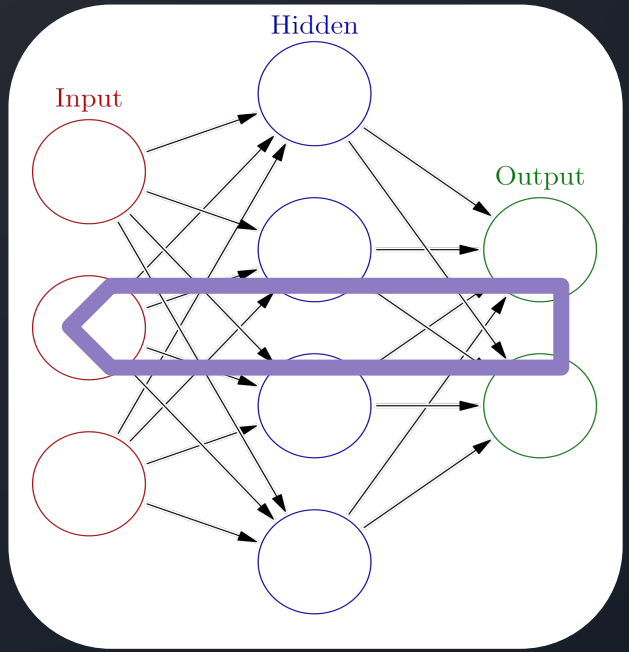
$$\frac{\partial J_{\text{net}}}{\partial \mathbf{W}^{[l]}} = \frac{1}{m}\boldsymbol{\Delta}^{[l]}\left(\boldsymbol{A}^{[l-1]}\right)^{\mathbf{T}} + \frac{\lambda}{m}\mathbf{W}^{[l]}$$

$$\frac{\partial J}{\partial \boldsymbol{b}^{[l]}} = \frac{1}{m}\sum_{i=1}^{m}\Delta_{ji}^{[l]}$$

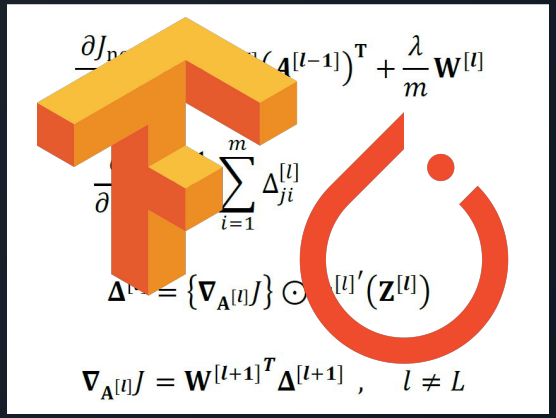
$$\boldsymbol{\Delta}^{[l]} = \left\{\nabla_{\mathbf{A}^{[l]}}J\right\} \odot g^{[l]\prime}\left(\mathbf{Z}^{[l]}\right)$$

$$\nabla_{\mathbf{A}^{[l]}}J = \mathbf{W}^{[l+1]^{T}}\boldsymbol{\Delta}^{[l+1]}\ , \quad l \neq L$$

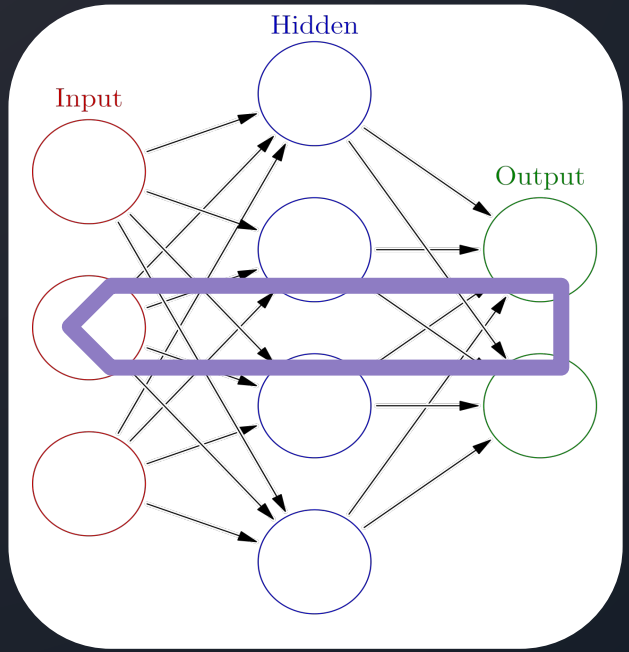
NEURAL NETWORK



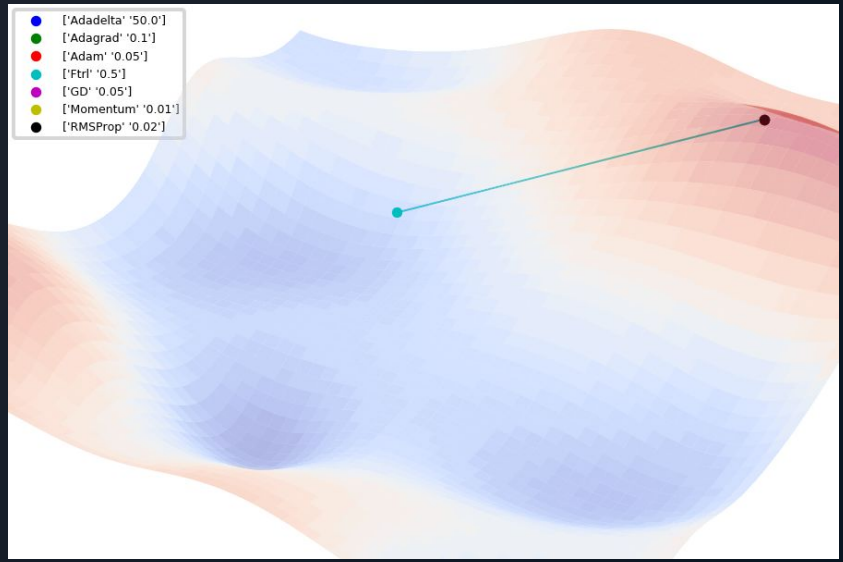
Backpropagation



NEURAL NETWORK

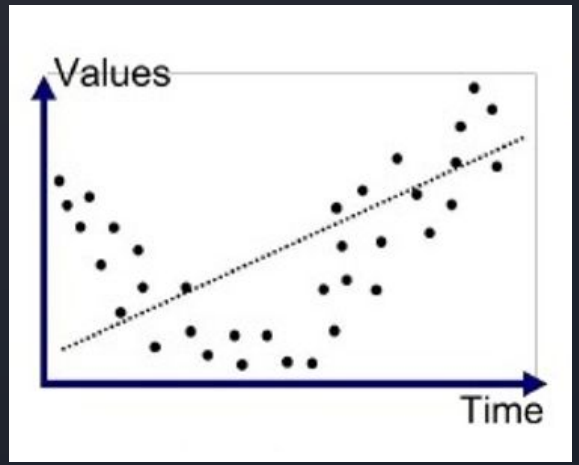


Optimizers

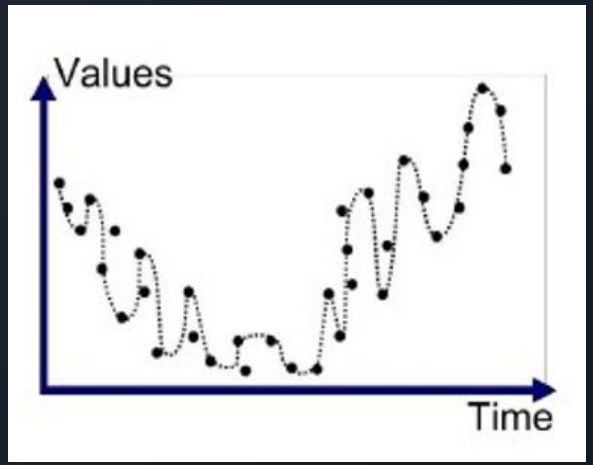


TRAINING RESULTS

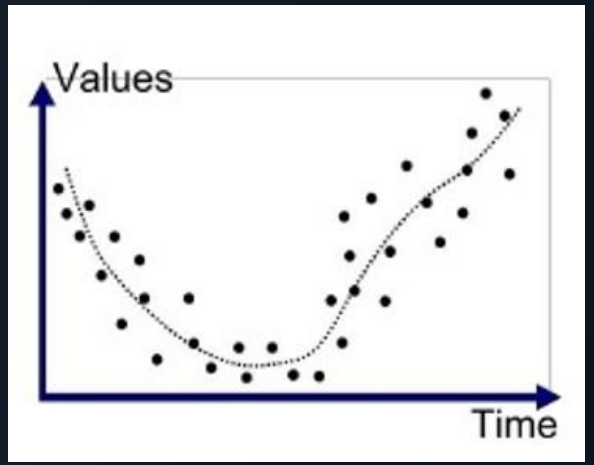
Underfitting



Overfitting



Robust Fit

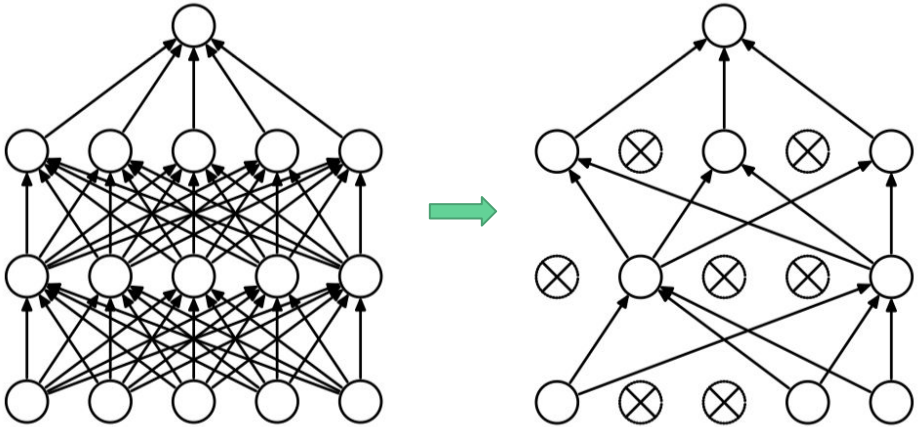


Bad

Good

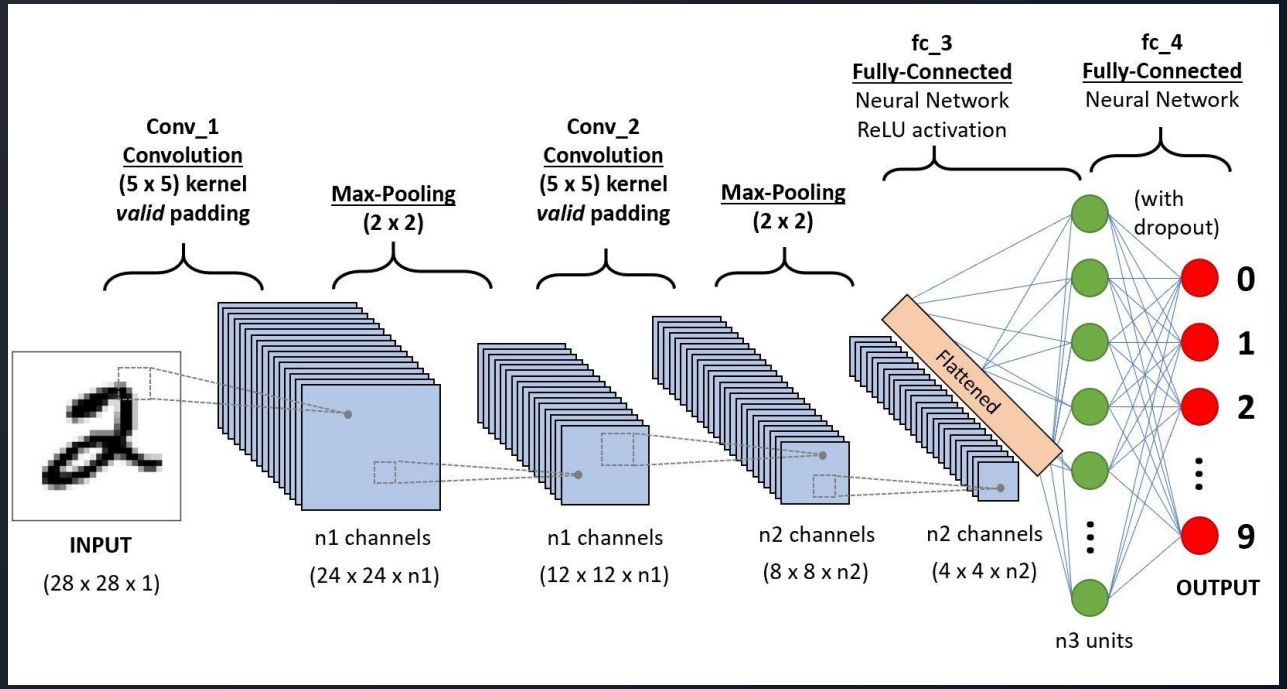
FIXING BAD TRAINING

Dropout

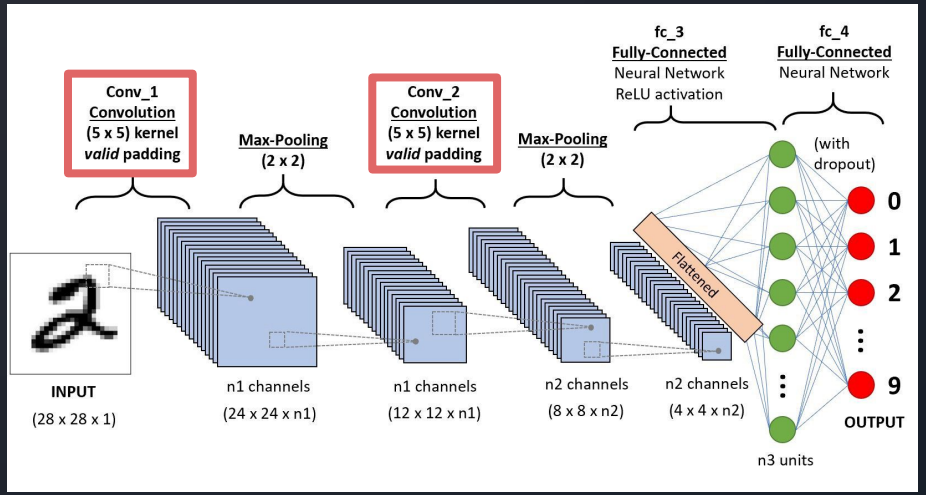


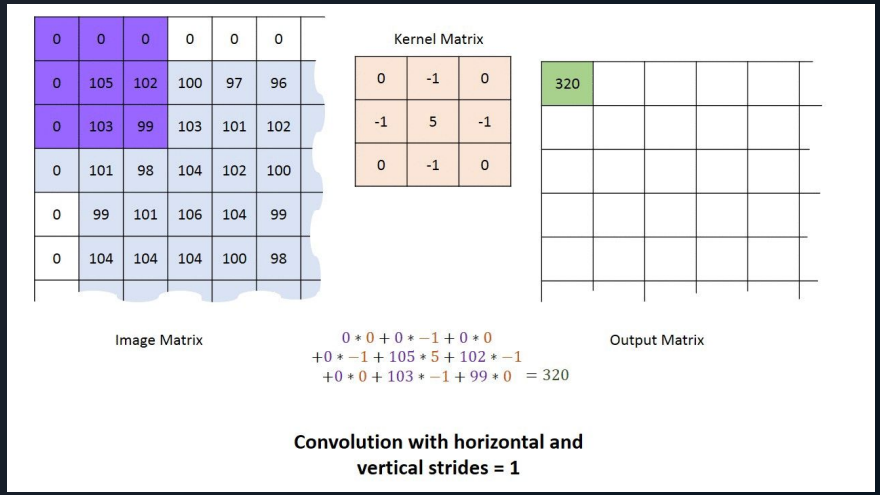
CNN

Convolutional Neural Network

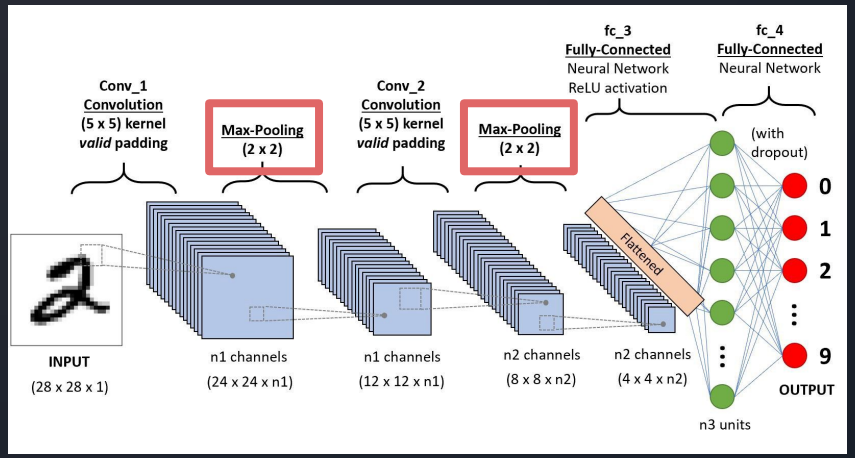


2D CONVOLUTIONS

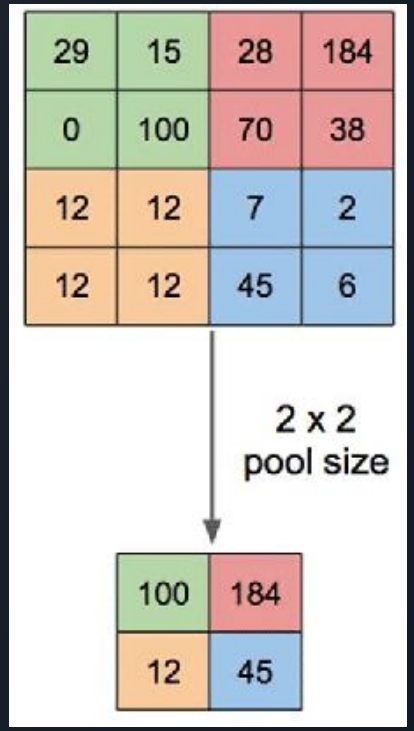
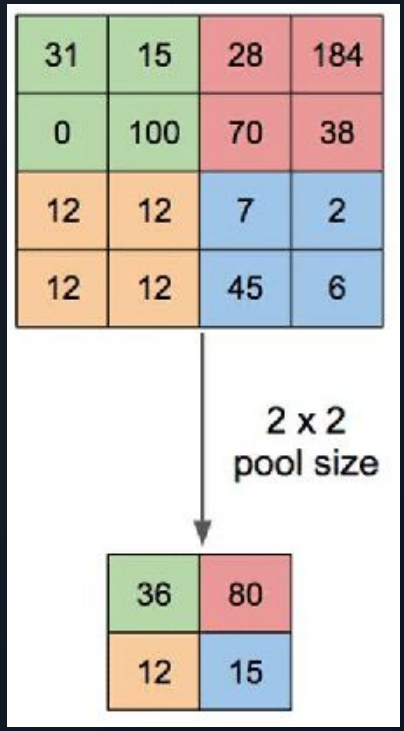




POOLING



Max Pooling



Average Pooling