Computer Vision

- The field of computer science that focuses on replicating parts of the complexity of human vision system and enabling computers to identify and process objects in images and videos in the same way that humans do.
- Each pixel's brightness is represented by a single 8-bit number, whose range is from 0 (black) to 255 (white).
- Pixel values are almost universally stored, at hardware level, in a one dimensional array.
- It usually read 3 values - red, green and blue (RGB) - on that same (0 - 255) scale.

How the pixels look:

H	E	L	L	O
O	P	E	N	F
R	A	M	E	W
O	R	K	S	!

How pixels are numbered

0	1	2	3	4
5	6	7	8	9
10	11	12	13	14
15	16	17	18	19

- ~~Tensor~~ Accessing image pixels

```
* pixel = image[100,100]
  print(pixel)
* img.shape, img.size
```

To access shape To access size

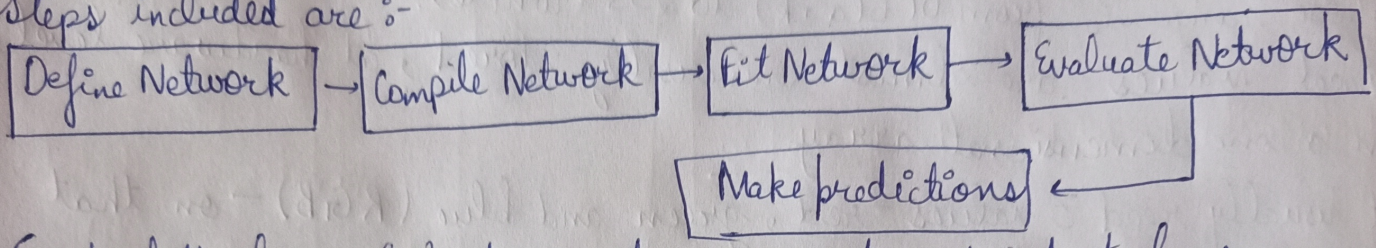
- Tensorflow and Theano are libraries for defining abstracts, general-purpose computation graphs
- Keras is a deep learning framework that provides a well-designed API to facilitate building deep neural networks with each
- It works as an engine in your car. You can replace parts in your engine, optimize others, or replace engine entirely. Utilizing Keras gives you probability across engines and ability to choose best engine for project.

Benefits

1) Powerful underlying computation engine
2) An API that makes it easier for you to build your deep learning networks.

* Keras is an interface for Tensorflow, CNTK etc.
- Keras is quite fast

Steps included are :-



- Each of the layers is just a matrix consisting of input layer, hidden layer and output layer.
- They have multiple layers e.g. convolutional layers, recorrnent layers.
- We define the model using Sequential() class.
- We can use instances of the model class and each new line acts as a new layer.
- Then we compile the network.
- Network is trained using Backpropagation algorithm and optimized according to Optimization algorithm.
- Keras is easiest ways to get started.

Difference b/w Keras and Tensorflow

* Keras
- open source, high-level neural network library, easy to debug
- allows fast prototyping, user friendly modular, easy to extend

* Tensorflow
- Open source, symbolic math library
- Used for ML applications like neural networks
- Flexible and comprehension ecosystem of tools

Keras	Tensorflow
1) Easy and simple architecture	Gives Keras as framework
2) Complex models can be quickly build by writing code in Keras	Tough to code from scratch by beginner
3) Easier to code	Written in both python and C++
4) Less no. of errors	More no. of errors, difficult debugging
5) Takes longer to train models	Training faster
6) Used for small datasets	Big datasets
7) High level API	Low level API
8) Performance is slower	Suitable for high performance