



Deep Learning

Neural Networks





Agenda



- ▶ Understanding Deep Learning
- ▶ Activation Functions
- ▶ How Neural Network works & learns
- ▶ Gradient Descent
- ▶ Stochastic GD
- ▶ ANN, CNN & RNN - Building & evaluation a model
- ▶ Issues in Neural Networks
- ▶ Pre-Trained Models
- ▶ Transfer Learning
- ▶ Hands-on-Project



Understanding Deep Learning

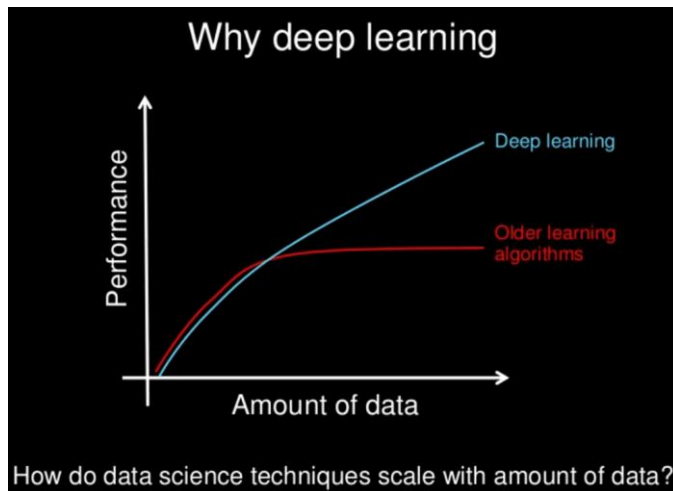


- ▶ Godfrey Hinton → Godfather of Deep Learning
- ▶ Deep Learning: Mimics the human brains

Understanding Deep Learning



Deep Learning is a subfield of machine learning concerned with algorithms inspired by the structure and function of the brain called artificial neural networks.



Activation Function



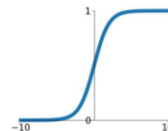
Different types of Activation functions are as follows

- ▶ Step Function
- ▶ Linear Function
- ▶ Sigmoid Function
- ▶ Tanh Function
- ▶ ReLu

Activation Functions

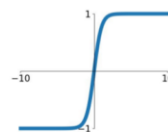
Sigmoid

$$\sigma(x) = \frac{1}{1+e^{-x}}$$



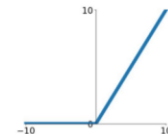
tanh

$$\tanh(x)$$



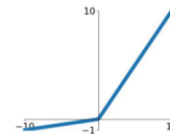
ReLU

$$\max(0, x)$$



Leaky ReLU

$$\max(0.1x, x)$$

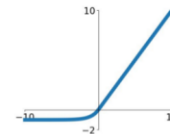


Maxout

$$\max(w_1^T x + b_1, w_2^T x + b_2)$$

ELU

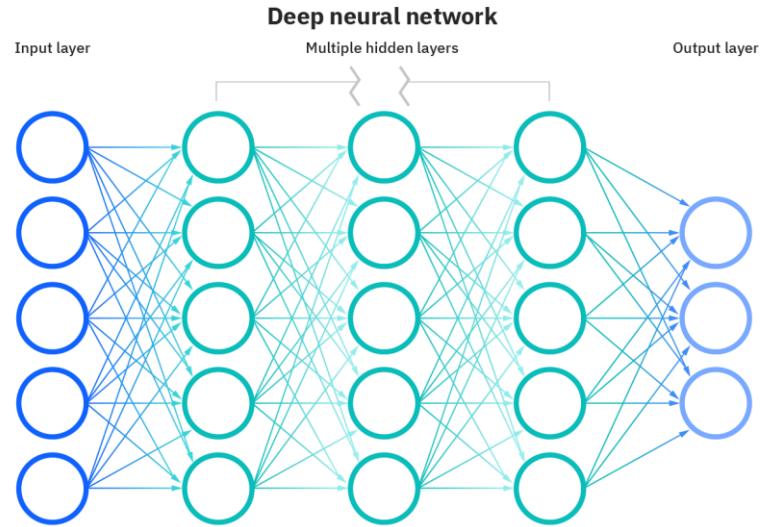
$$\begin{cases} x & x \geq 0 \\ \alpha(e^x - 1) & x < 0 \end{cases}$$



Neural Networks

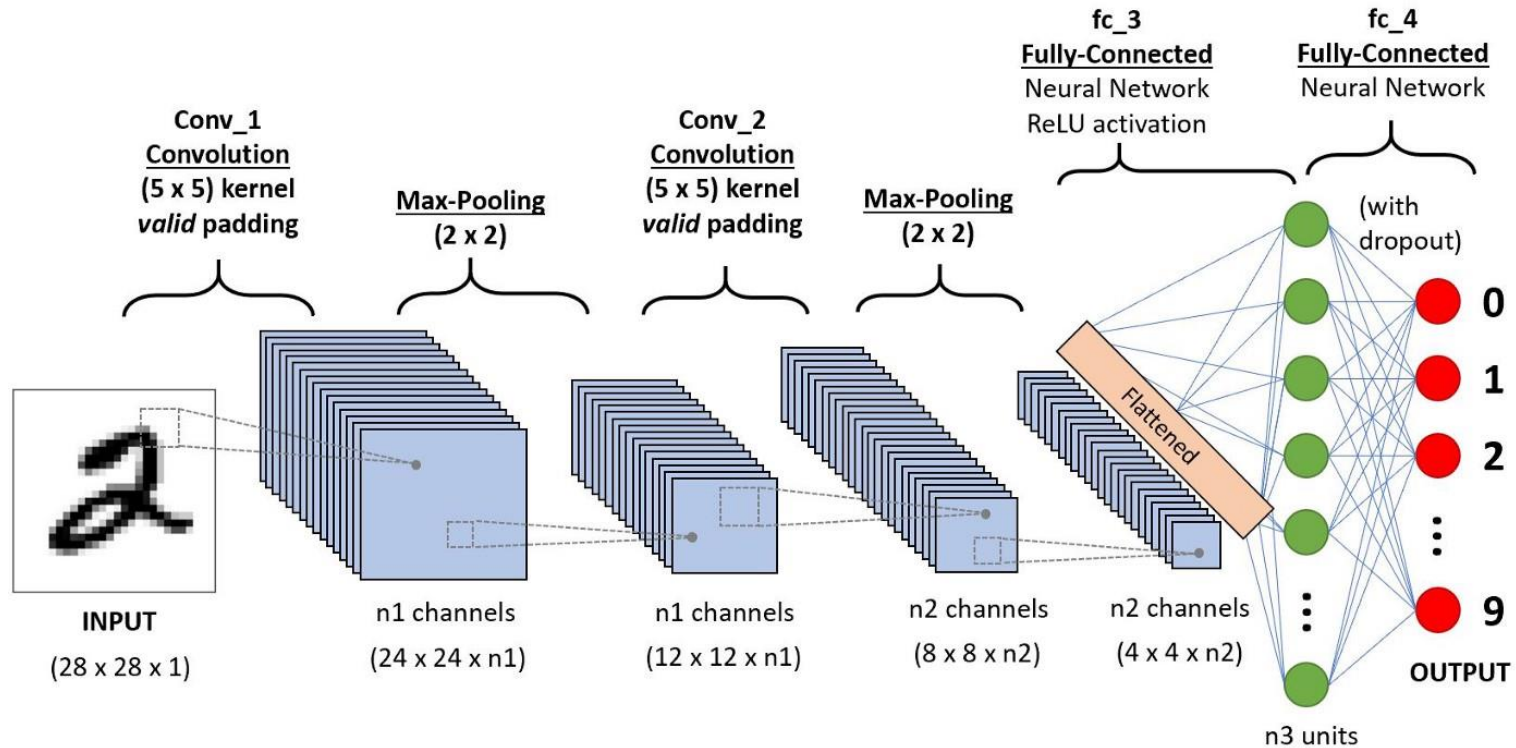


- ▶ The Neuron
- ▶ Activation Functions
- ▶ How NN works & learns
- ▶ Gradient Descent & Stochastic GD
- ▶ Back Propagation



AF: Calculates a weighted sum of its input, adds bias & then decides whether to fire or not

CNN



Steps in CNN



Steps in CNN are as follows:

- ▶ Convolution
- ▶ ReLu (Activation Layer)
- ▶ Pooling
- ▶ Flattening
- ▶ Fully Connected Layer

Building a CNN

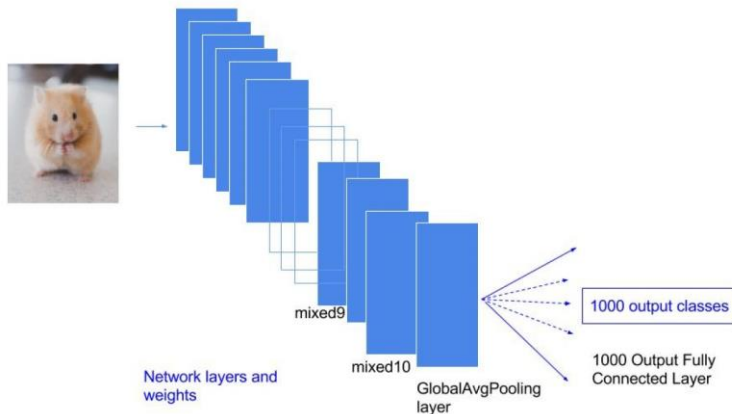


- ▶ Initialise the CNN
- ▶ Convolution
- ▶ ReLu
- ▶ Pooling
- ▶ Flattening
- ▶ Fully Connected Layer

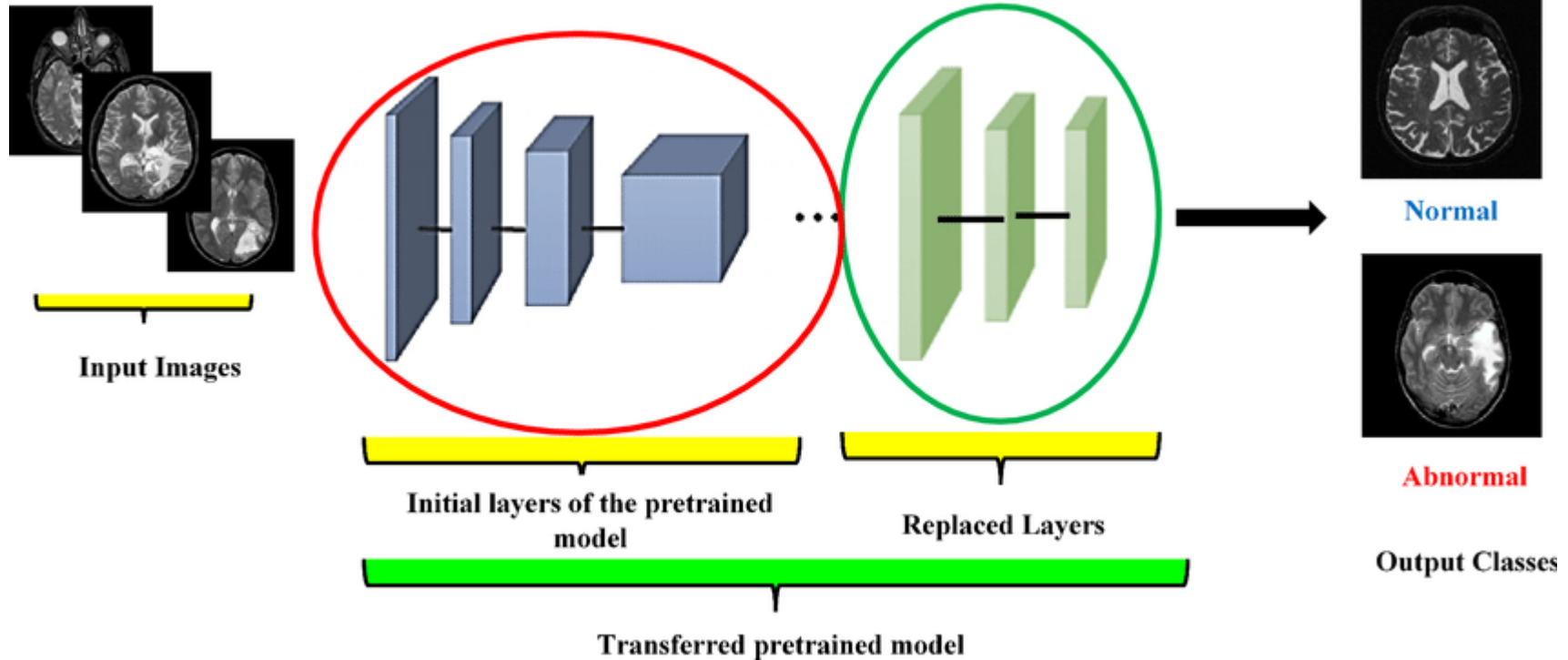
Fine Tuning a CNN

Suggestions:

- ▶ Changing the hyper parameters
- ▶ Increase CNN hidden layers
- ▶ Increase to 2-blocks & 3-blocks (VGG1, VGG2, VGG3, etc models)
- ▶ Dropout Regularization
- ▶ Image Augmentation
- ▶ Rescaling
- ▶ Flipping
- ▶ Rotation
- ▶ Noise
- ▶ Zoom etc.



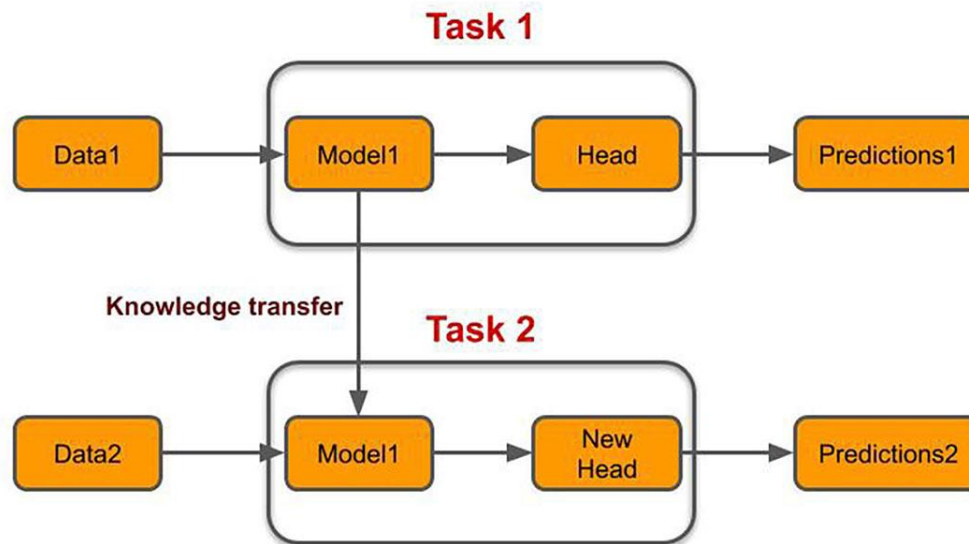
Pre-Trained Models



Transfer Learning



Transfer Learning



LIVE PROJECT AND DEPLOYMENT

