Python For Machine Learning

UE19EC353

Department of ECE

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Diving Deep with Deep Learning

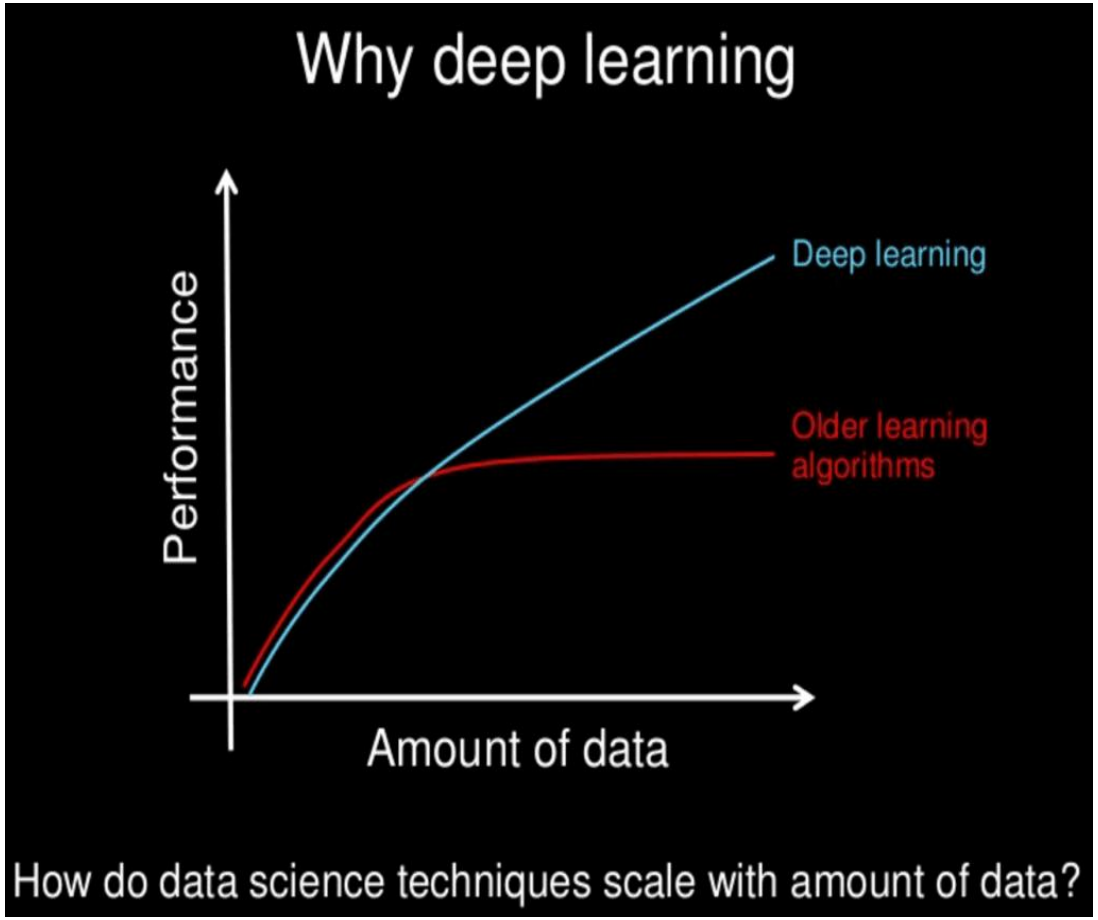
How Brain Neurons Inspired Deep Neural Networks?

Deep Learning Book, Ian Goodfellow

What is Deep Learning : A page from Andrew Ng's 2013 talk

- Subfield of machine learning concerned with algorithms inspired by the structure and function of the brain called **artificial neural networks.**

- we now have fast enough computers and enough data to actually train large neural networks.



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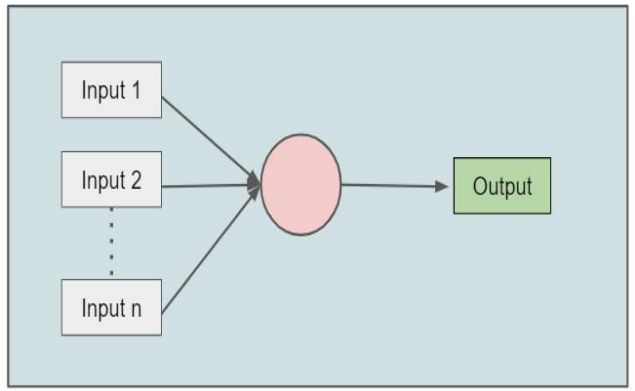
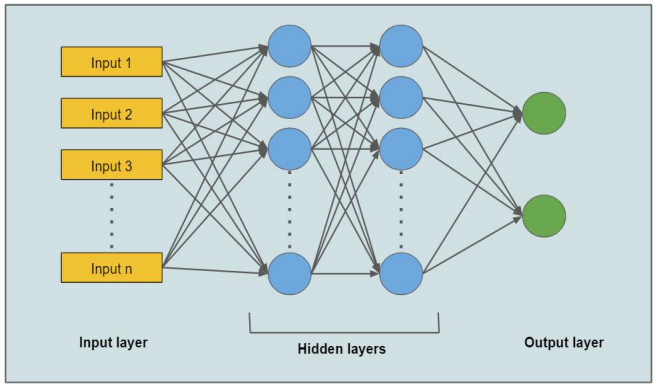
- scalability of neural networks indicating that results get better with more data and larger models
- *"seek to exploit the unknown structure in the input distribution in order to discover good representations, often at multiple levels, with higher-level learned features defined in terms of lower-level features"* - Yoshua Bengio
- Best example : MLP (Multilayer Perceptron)
- Deep learning allows computational models that are composed of multiple processing layers to learn representations of data with multiple levels of abstraction.
- Deep Learning is scalable across all domains : Images, Audio, etc.

Neural Network Types

- Perceptron (or MLP)
  - simplest neural network structure
  - Input and Output layer
  - takes input and calculates the weighted input for each input node
  - activation function to generate the output
  - AND,XOR,OR gates





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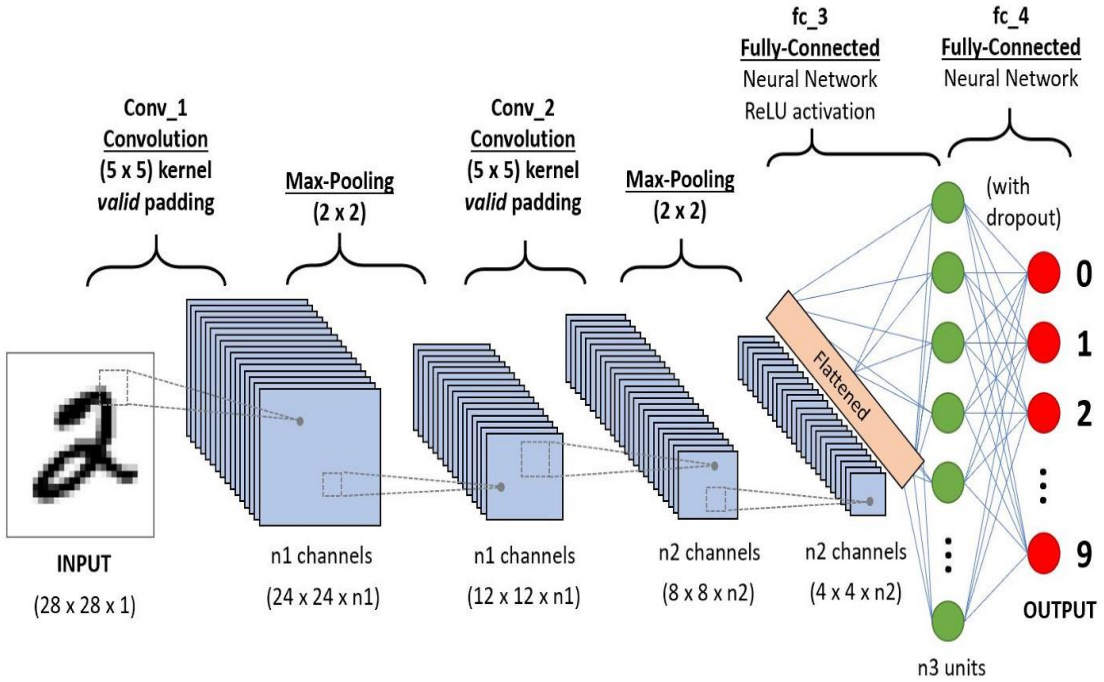
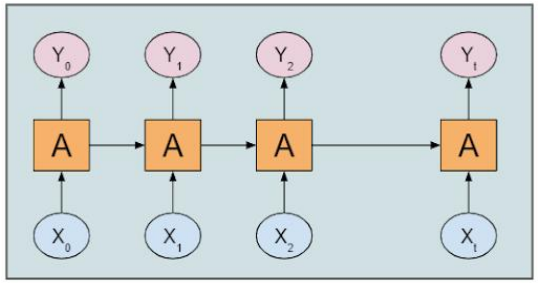
Neural Network Types

- CNN
  - inspired by the visual cortex of the eyes
  - convolution layer
  - the filters are randomized initially, the filters are adjusted and over multiple iterations, the network gets better at achieving its task
- RNN
  - designed to interpret temporal or sequential information.
  - taking in input and reusing the activations of previous nodes or later nodes in the sequence to influence the output.
  - LSTM, GRU





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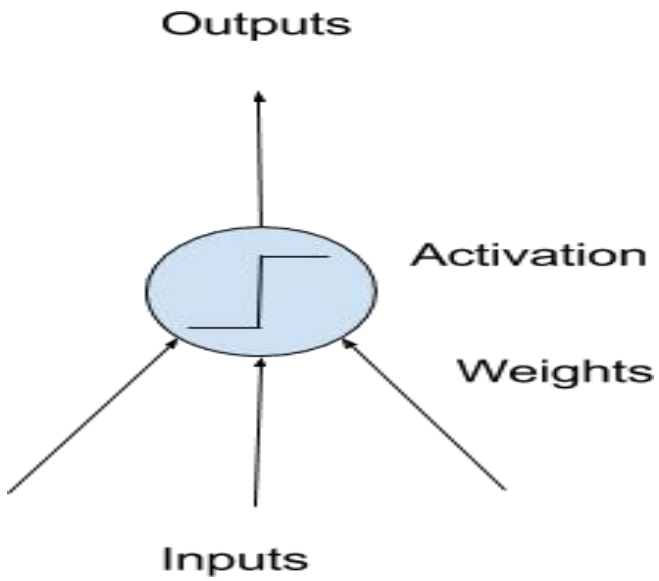
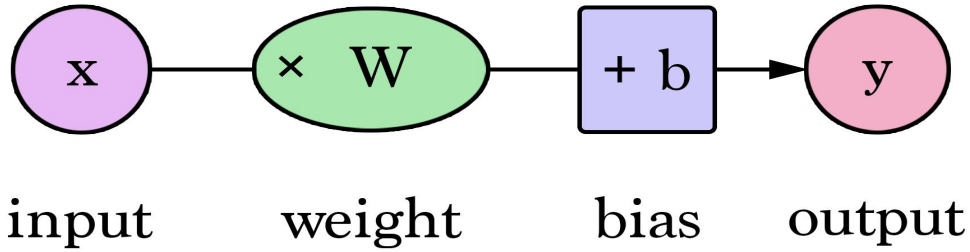
Simple Working of Neural Networks

- Neurons
  - Building Block of ANN
  - weighted input signals and produce output using an activation function
- Weight
  - parameter within a neural network that transforms input data within the network's hidden layers
  - example, a single node may take the input data and multiply it by an assigned weight value, then add a bias before passing the data to the next layer





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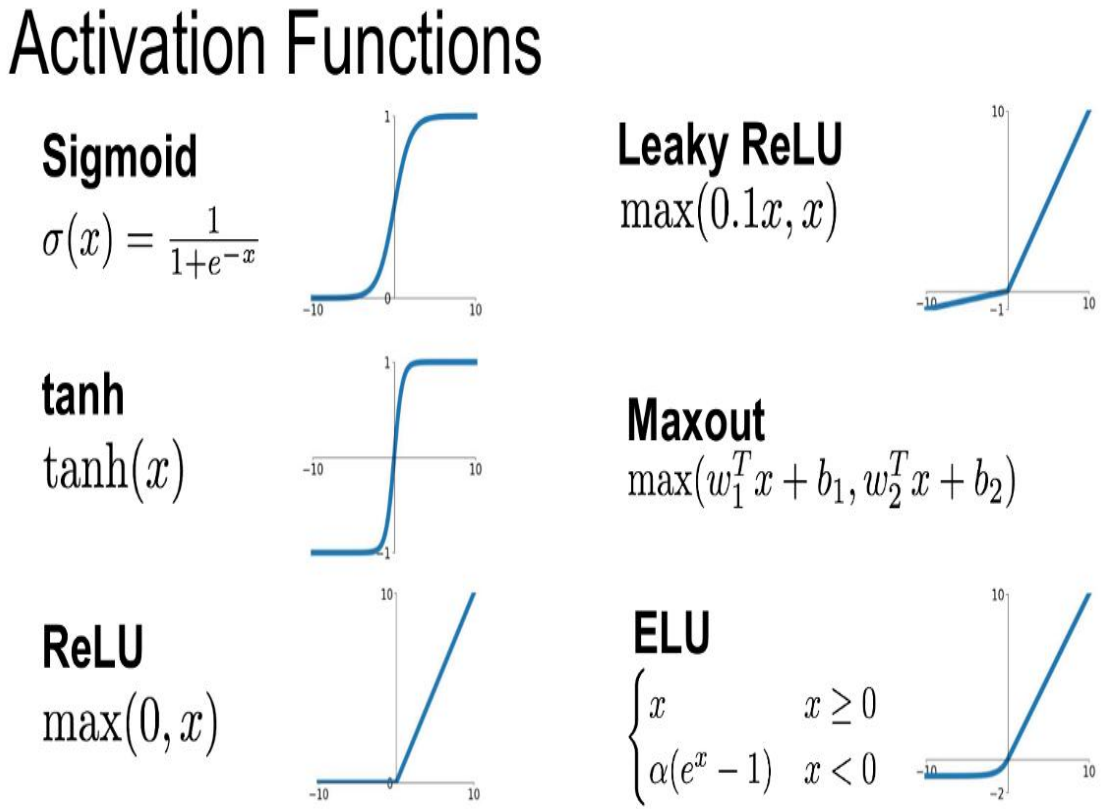
Simple Working of Neural Networks

- Activation
  - The weighted inputs are summed and passed through an activation function
  - a simple mapping of summed weighted input to the output of the neuron
  - It governs the threshold at which the neuron is activated and strength of the output signal.
  - ReLu, Sigmoid, softmax, tanh



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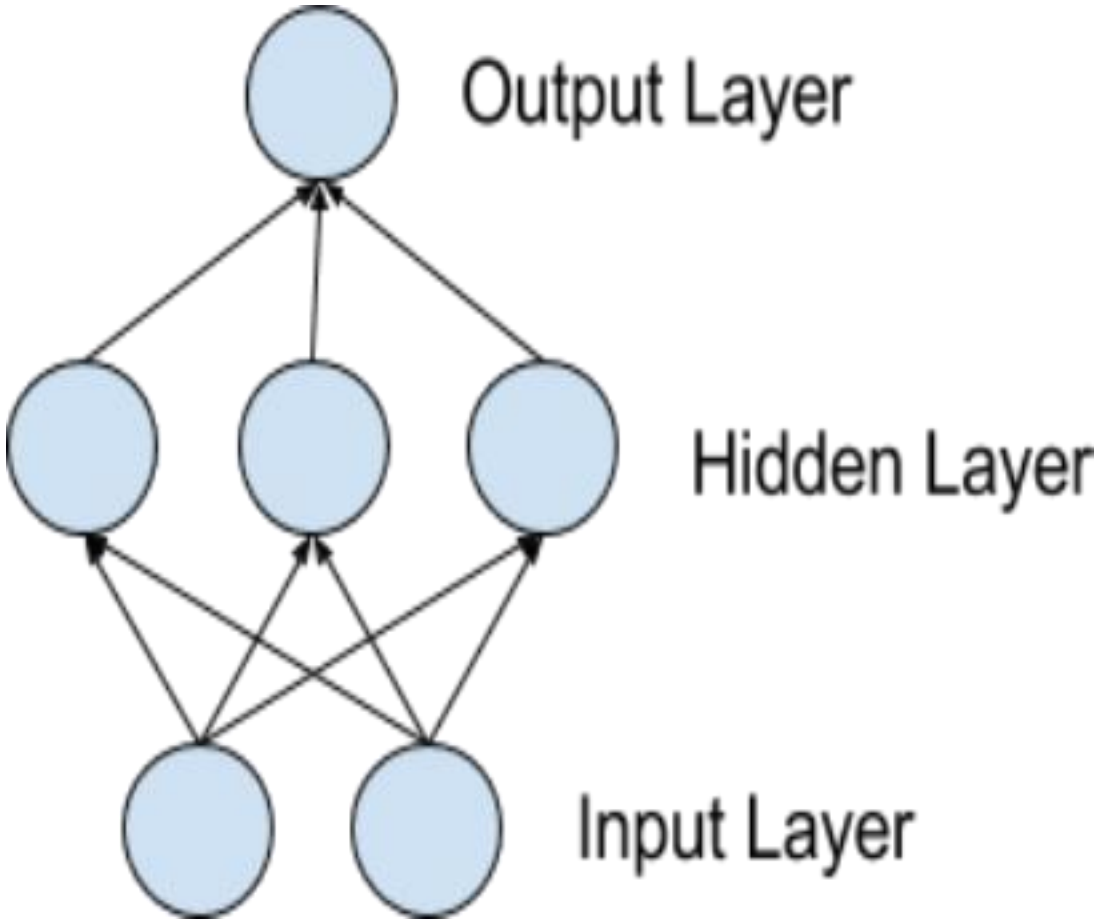
Simple Working of Neural Networks

- Layers
  - Input Layer:
    - one neuron per input value or column in your dataset
    - simply pass the value to next layer
  - Hidden Layers
    - not directly exposed to the input.
    - may have activation functions.
    - Multiple of these
  - Output Layer
    - Final hidden layer
    - responsible for outputting a value or vector of values that correspond to the format required for the problem.
    - Activation functions for different tasks



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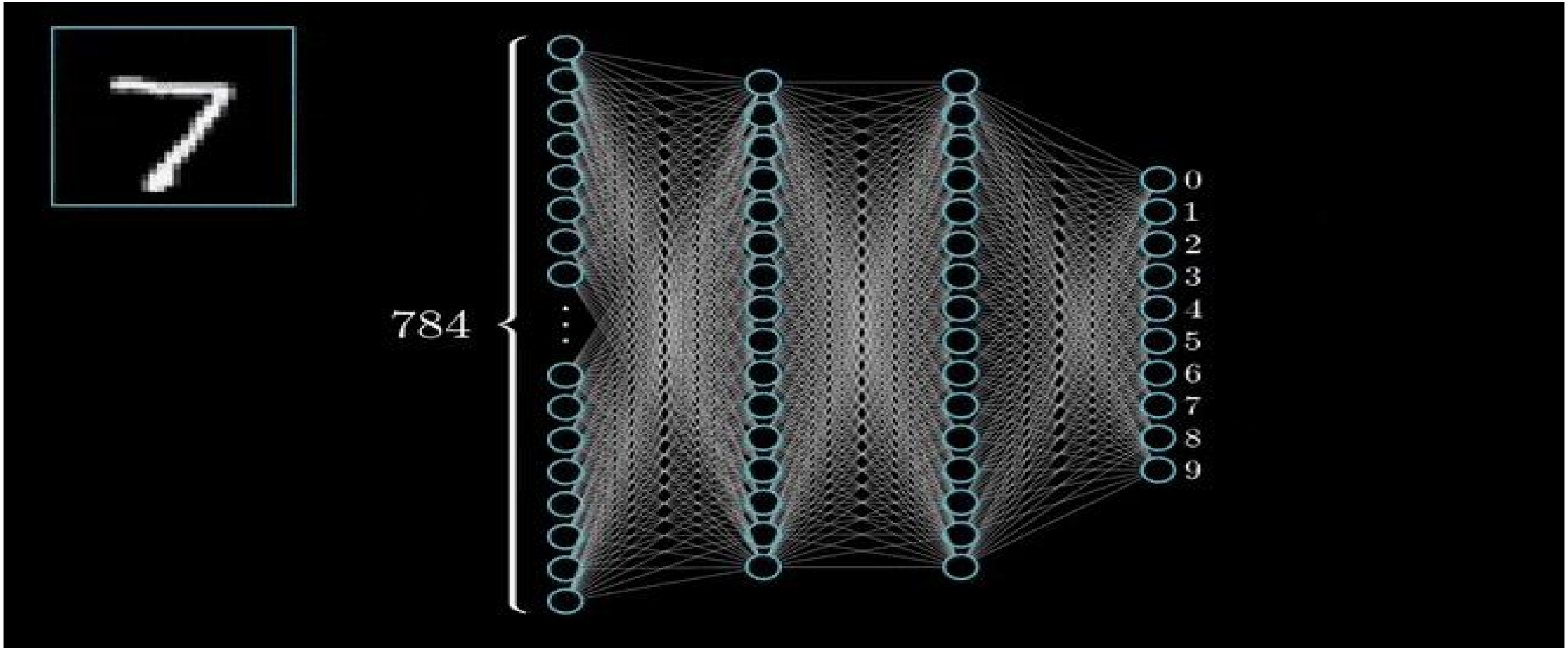
Simple Working of Neural Networks



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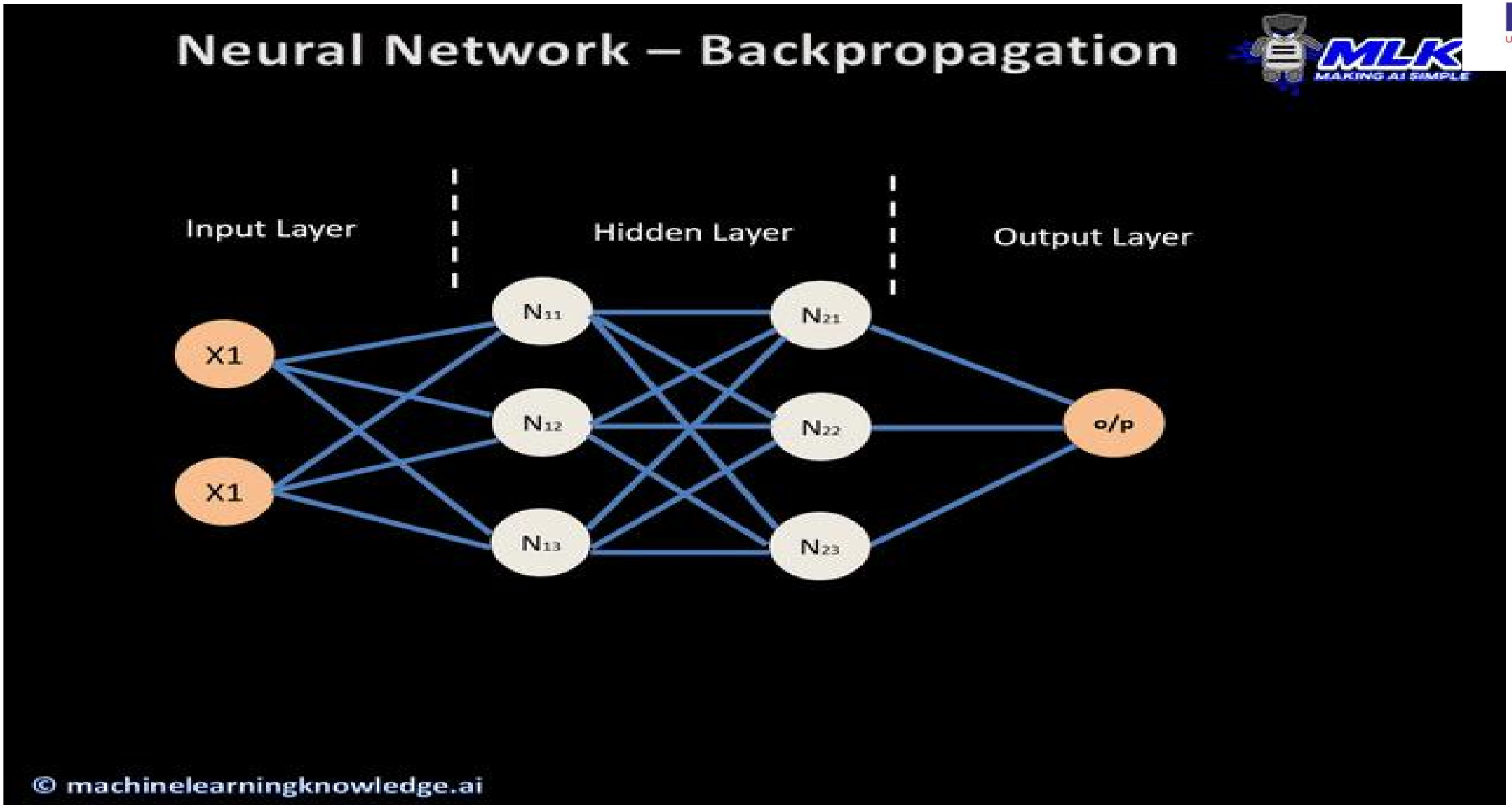
Neural Network – Backpropagation
MLK
MAKING AI SIMPLE
Input Layer
Hidden Layer
Output Layer
X1
X1
N11
N12
N13
N21
N22
N23
o/p
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Acknowledgments

- *Deep Learning Book* , Ian Goodfellow et al
- Machine Learning Mastery
- *Neural Networks and Deep Learning* , Charu C Aggarwal