



TensorFlow

INTRO TO  
DEEP  
LEARNING

# STRUCTURE OF TENSORFLOW MODEL

- Data Flow graph Structure
  - Nodes are Mathematical Operations
  - Edges are multi-dimensional arrays (tensors)
- Support For GPU and Distributed Computing

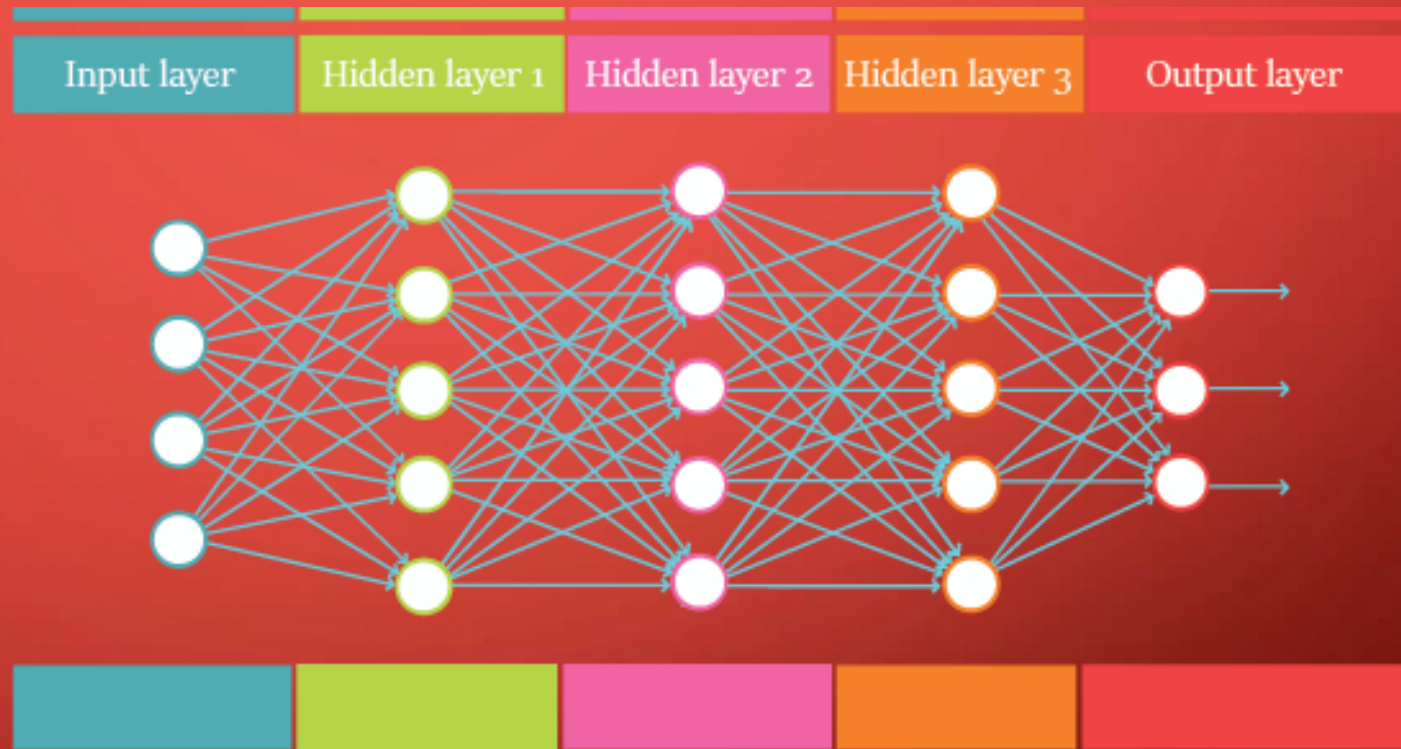


# DEEP LEARNING

- Terminology:
- Features
- Labels
- Training Set
- Test Set
- Validation Set
- Model, Graph

# WHAT IS

Algorithms that attempt to model high-level abstractions in data by using multiple processing layers, with complex structures or otherwise, composed of multiple non-linear transformations.



# COMPONENTS OF A SIMPLE DEEP LEARNING MODEL

- Linear Operation:

$$y' = b + \sum w_i x_i$$

- Optimizer
  - Used to minimize the loss
- Input function

Loss Function:

$$MSE = \frac{1}{N} \sum [y - y']^2$$

Activation Function

$$F(x) = \max(0, x)$$

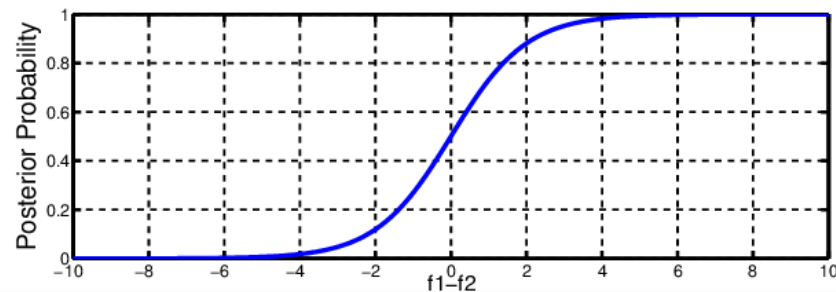
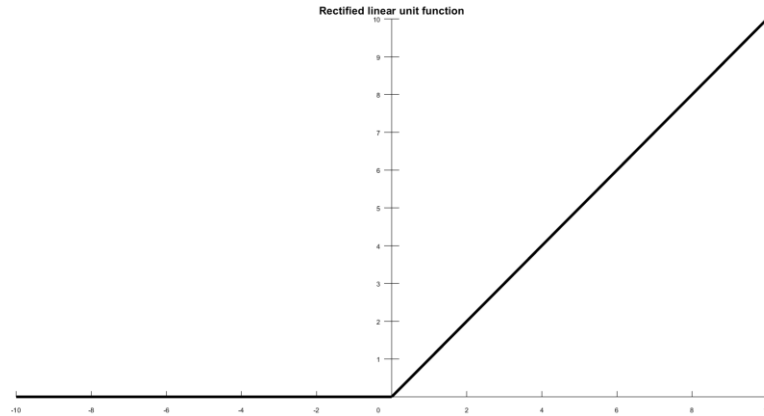
# ACTIVATION FUNCTIONS

- Rectified Linear Unit

$$F(x) = \max(0, x)$$

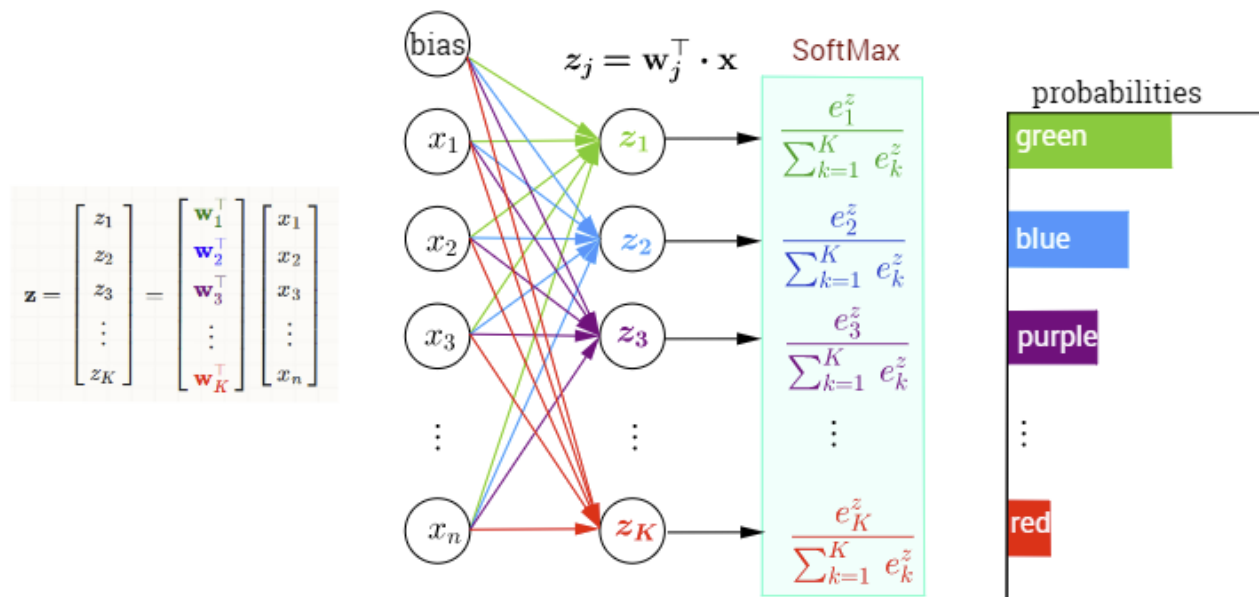
- Softmax (Sigmoid Function)

$$\sigma(\mathbf{z})_j = \frac{e^{z_j}}{\sum_{k=1}^K e^{z_k}} \quad \text{for } j = 1, \dots, K.$$



# SOFTMAX MODEL

## Multi-Class Classification with NN and SoftMax Function



# DIGIT CLASSIFICATION ON MNIST DATASET

- 55,000 data points
- `mnist.train.images` for inputs
- `mnist.train.labels` for outputs

Training

- 5,000 data points
- `mnist.validation.images` for inputs
- `mnist.validation.labels` for outputs

Validation

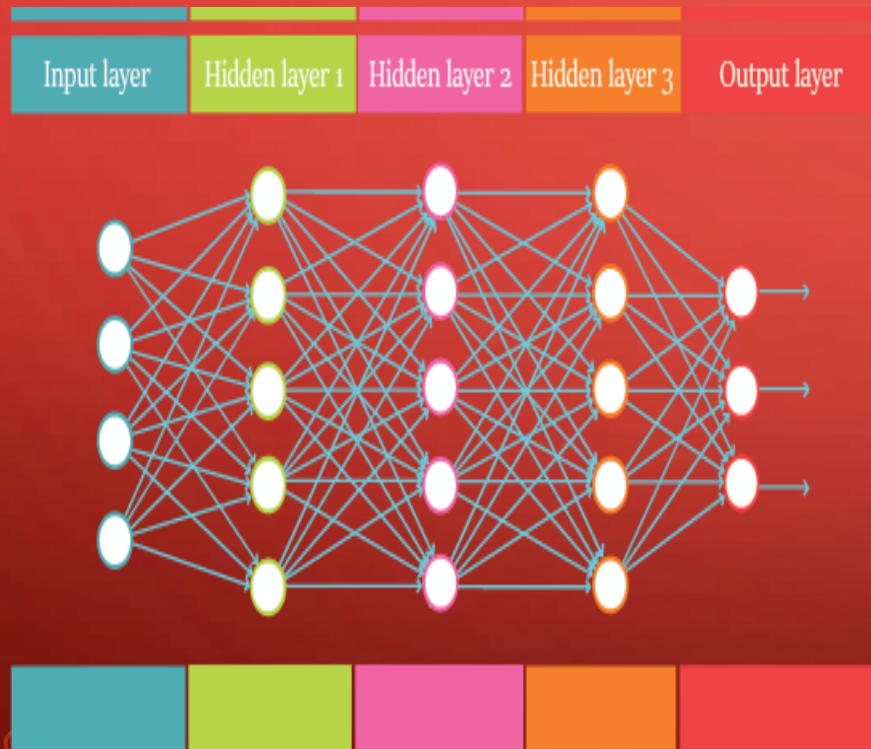
- 10,000 data points
- `mnist.test.images` for inputs
- `mnist.test.labels` for outputs

Test

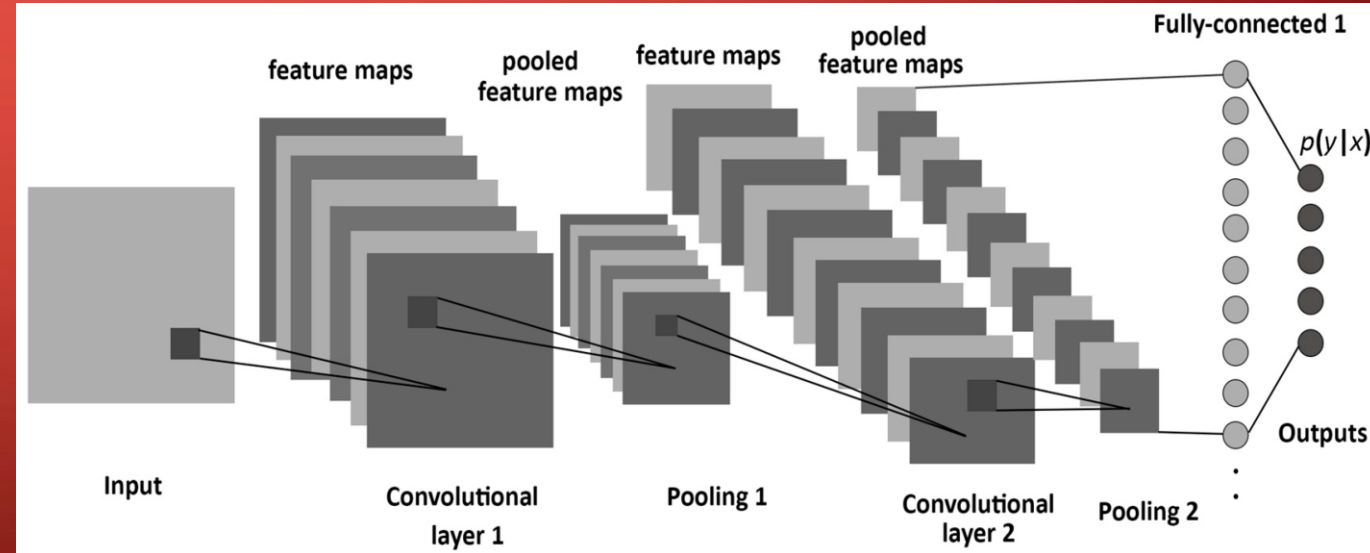


# TYPES OF NEURAL NETWORKS

- Neural Network

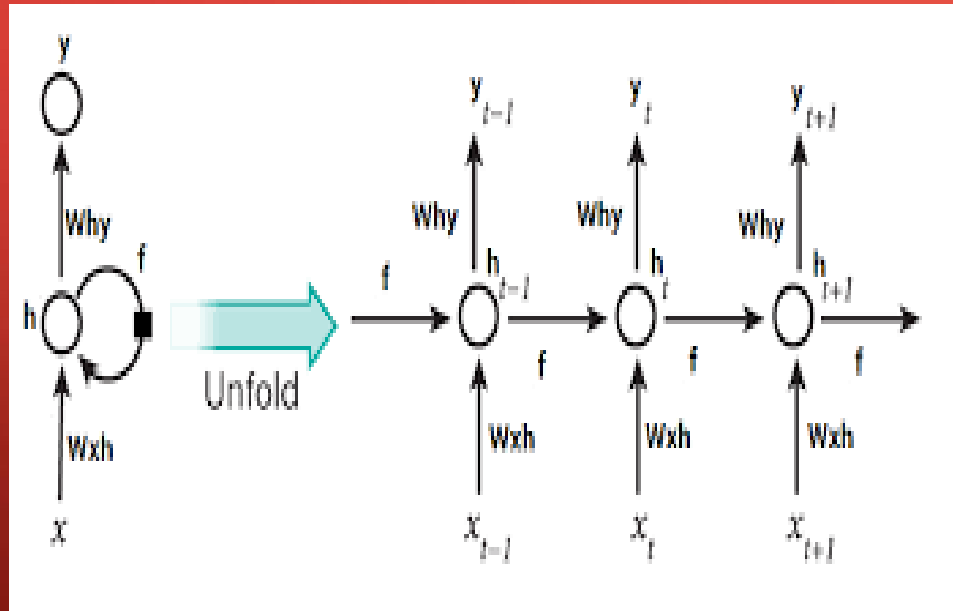


## Convolutional Neural Network



# TYPES OF NEURAL NETWORKS

- Recurrent neural Network



## Autoencoders

