

# 09-18-2024 NNFL - Neural Network Phases

## Pipeline of Neural Networks

1. Problem Statement Analysis
2. Data Collection Can be done through Web Scraping
3. Data Preparation & Preprocessing
4. Feature Engineering (Correlation Matrix, Chi Square Matrix, etc)
5. Exploratory Data Analysis
6. Data Splitting
7. Model Selection
8. Model Training
9. Model Evaluation
10. Model on Prod


## Various Kinds of Activation Functions

### Sigmoid Function


- Gives values in range 0-1

### SoftMax Function


- Based on the number of classes
- It calculates the probability and assigns weightage to a class accordingly

 Sigmoid vs SoftMax


### Tanh Function

- Used for continuous data.
- Used for scaling purposes in hidden layers of NN
- Ranged from -1 to 1 

### ReLu Function

- Used for continuous data.
- Ranges from 0 to 1 

### Leaky Relu function

- Used for continuous data.
- Ranges from -1 to 1 

## Back Propagation

An algorithm for computing the gradient of the loss function with respect to each weight by applying the chain rule of calculus. This information is used to update the weights. Find weights and biases by finding the local minima using optimizers (Gradient Descent, etc.)

### Gradient Descent:

An optimization algorithm that updates the network's weights to minimize the loss function. Its variants include Stochastic Gradient Descent (SGD), Mini-batch Gradient Descent, and Adam.

### **Example of Training a Neural Network for handwritten Digit Recognition.**

1. Dataset
2. Initialization: Randomly initialize weights and biases
3. Forward Propagation : Pass each image through the network to obtain a predicted digit.
4. loss Calculation: Compute the Cross-Entropy loss between the predicted digit and actual digit.
5. Backpropagation: Calculate the gradient of the loss wrt each weight and biases
6. Weight Update: Use gradient descent to adjust the weights and biases, reducing the loss
7. Iteration