University of Central Punjab

Faculty of Information Technology

IDL Assignment# 2 (Section – H6)

Instructor: Mr. Usman Asghar   **Issue Date: 07/04/2024**

Course Title: Introduction to Deep Learning

Code: CSAL4333

Total Marks: 10   **Deadline: 15/04/2024**

Student Name: University ID:

Hyperparameters definition:

Hyperparameters are settings that are chosen before training a Deep/Machine learning model and are not learned from the data. They control the learning process and the overall behavior of the model. Examples of hyperparameters include:

- Learning Rate: Controls the step size taken during optimization.
- Batch Size: Number of samples used in each iteration of training.
- Number of Epochs: Number of times the entire dataset is passed forward and backward through the neural network during training.
- Optimizer: Algorithm used to update the weights of the neural network during training.
- Activation Functions: Functions applied to the output of each neuron.
- Number of Layers: The depth of the neural network.
- Number of Neurons per Layer: The width of the neural network.
- Dropout Rate: Fraction of neurons randomly set to zero during training to prevent overfitting.
- Weight Initialization Scheme: Method used to initialize the weights of the neural network.
- Regularization: Techniques used to reduce overfitting.

Question# 1

1. Dataset Selection: Choose any dataset from online. Explain your choosed dataset in one paragraph or stats of dataset in tabular form.

2. Neural Network Creation: Create a neural network using TensorFlow or Keras with suitable architecture.

3. Hyperparameter Testing: Test the same model with different values of Hyperparameter's and Examine the effect on the model. Make 4 to 5 Test Cases with your choice of Hyperparameters.
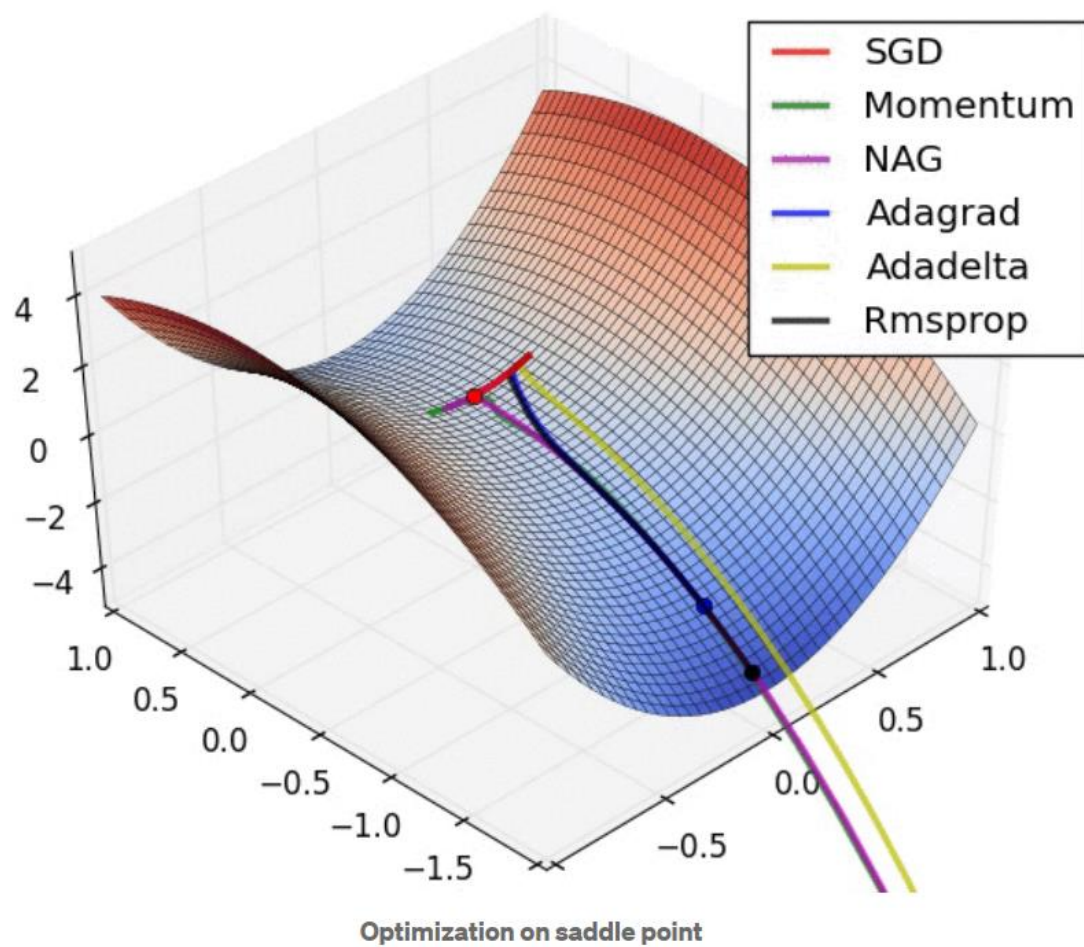
For Example:

**Learning Rate:** Test different rates (e.g., 0.001, 0.01, 0.1).
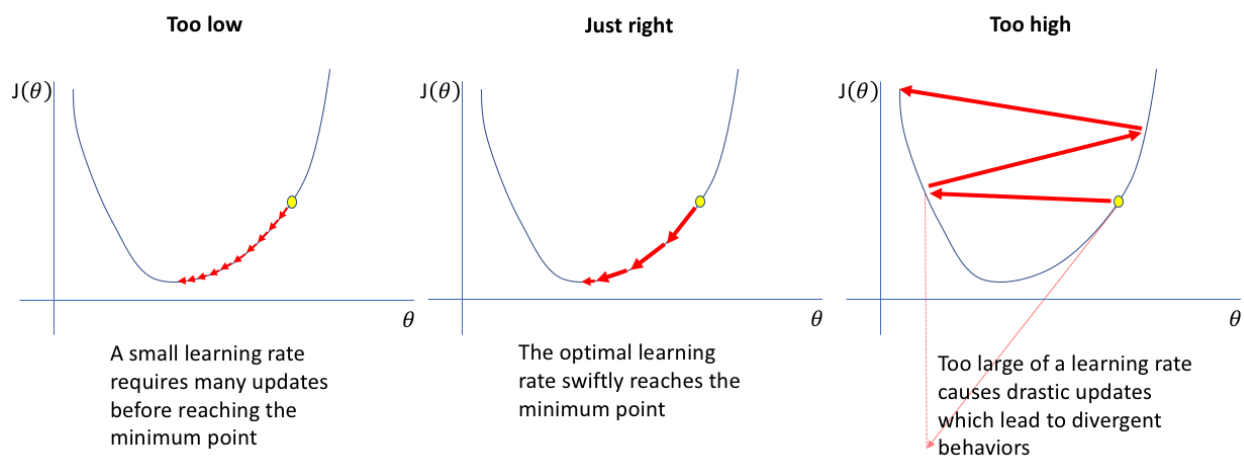
Change learning rate and determiner its effect on model!

Optimization Function: Test different Optimization functions (e.g., SGD, Adam, RMSprop).
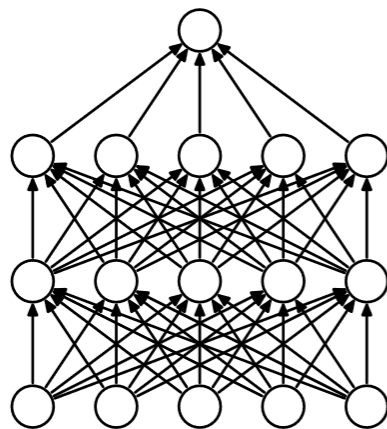
Optimization on saddle point

Change optimization function. Examine the output of your model.

Number of Layers: It is also a Hyperparameter, Test different numbers of layers (e.g., 1, 2, 3).
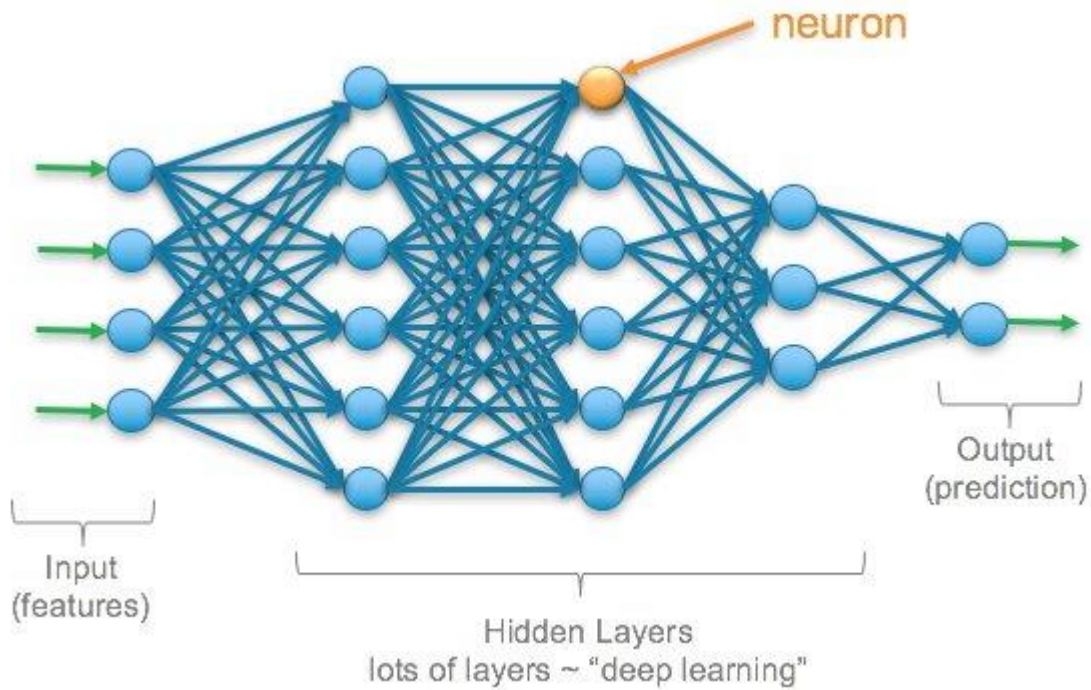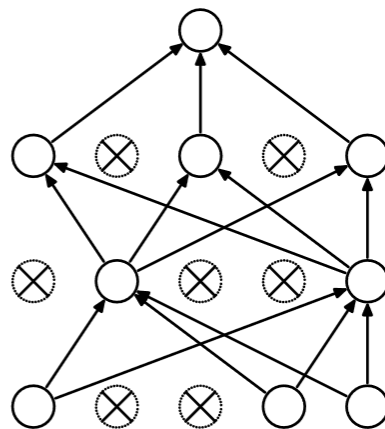
Change the number of hidden layers and test it outcome.

Dropout Rate: Test different rates (e.g., 0.1, 0.3, 0.5).

(a) Standard Neural Net   (b) After applying dropout.

Activation Function: Test different Activation functions.(e.g tanh, RELU, sigmoid).
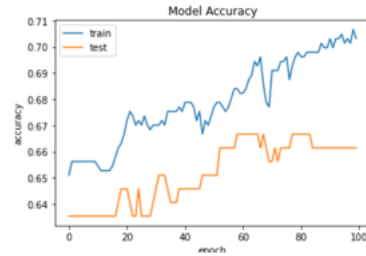
Fig. RELU activation function for Hidden Layer & Sigmoid for Output Layer
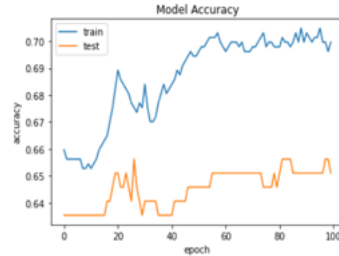

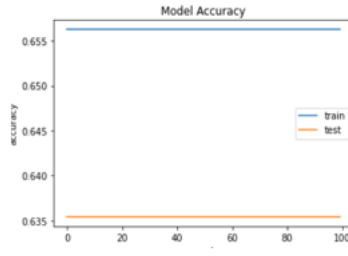Fig. Leaky RELU activation function for Hidden Layer & Sigmoid for Output Layer

Fig. Sigmoid activation function for Hidden Layer & Sigmoid for Output Layer
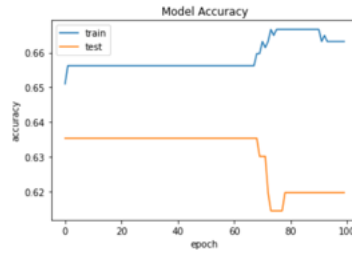

Fig. Tanh activation function for Hidden Layer & Sigmoid for Output Layer

4. Testing Procedure: Train the model with different set of hyperparameters and evaluate performance.

5. Analysis: Write a 1 to 2-page report in your own words on the effects of each hyperparameter on model performance.

6. Submission: Submit report and code implementation.