ASSIGNMENT 1: NEURAL NETWORKS

Vijay Charan Reddy Gottam

KSU ID: 811292996

Introduction:

This study's dataset consists of 50,000 IMDb movie reviews, of which half are classified as "positive" or "good" and the other half as "negative." The objective of the study is to enhance the neural network model's performance through the application of diverse methodologies on the IMDb dataset. The current neural network model will be modified in a number of ways, such as by changing the units, activation function, loss function, number of hidden layers, and regularisation techniques like dropout. The results that follow will be thoroughly examined.

Objective and Approach:

The main objective is to iteratively improve the neural network model. This means modifying important parameters like the number of units, activation function, loss function, and hidden layers in addition to adding regularisation techniques like dropout. An organised methodology is used in the study to evaluate how these changes affect the predictive power of the model.

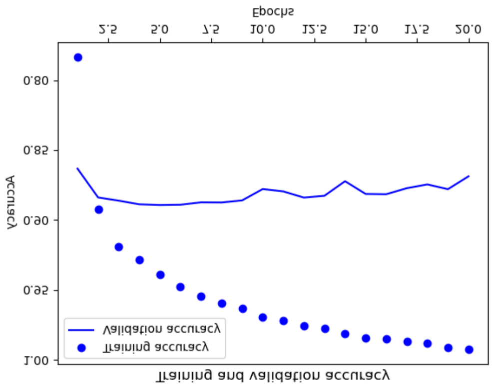
Data Processing Techniques:

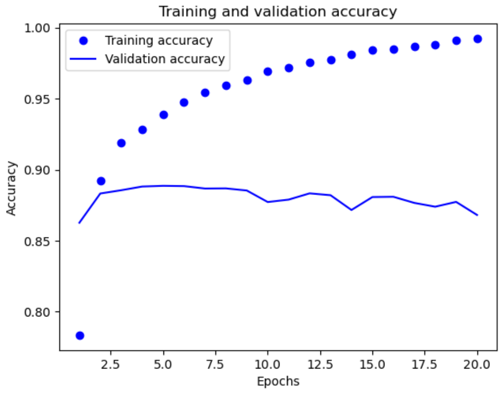
Integral to this study are Robust data processing procedures, which include data handling, manipulation, computing, analysis, and organizing, are essential to this study. In order to guarantee the effectiveness of later model training and assessment, these procedures are essential for obtaining significant patterns and insights from the IMDb dataset.

Tensor representations of the integer representations were required in order to use neural networks. To make all of the reviews the same length, we padded the shorter reviews with zeros and reduced the longer ones. For this reason, each review was represented as a fixed-length vector with each element denoting a dictionary word's index.

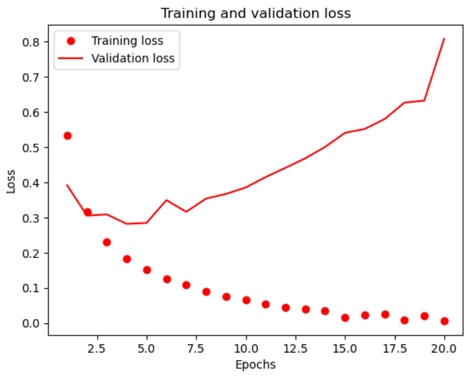
The maximum word count and time for each review were then specified once we imported the data. Next, we constructed a simple neural network model where the hidden layer consists of just 16 units. We employed binary Cross entropy, Mean Squared Error (MSE) as the loss function, return on investment (ROI) of dropout and hyper-tuned hidden layer parameters, and optimization algorithms Adam, Regularization, and Tanh as the activation functions. We then examined the previously indicated approaches in an attempt to improve the model's usefulness. By varying the number of hidden layers, we then produced models with one, two, and three hidden layers. With the test and training datasets, we assessed, compared, and trained the models. We discovered that, in comparison to, adding three hidden layers improved test validity and accuracy as opposed to employing only one hidden layer.

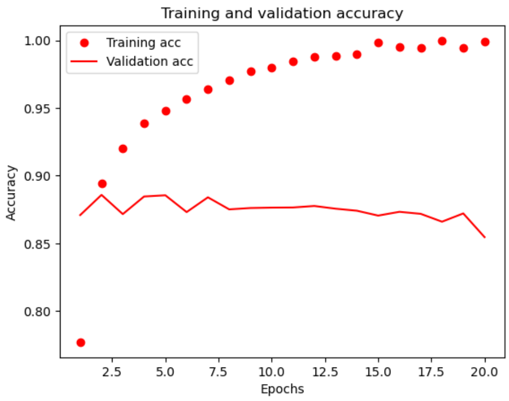
The different approaches that we used for validation and test accuracy:Neural network with – 1-hidden layer,16-units , loss= binary crossentropy, activation=relu



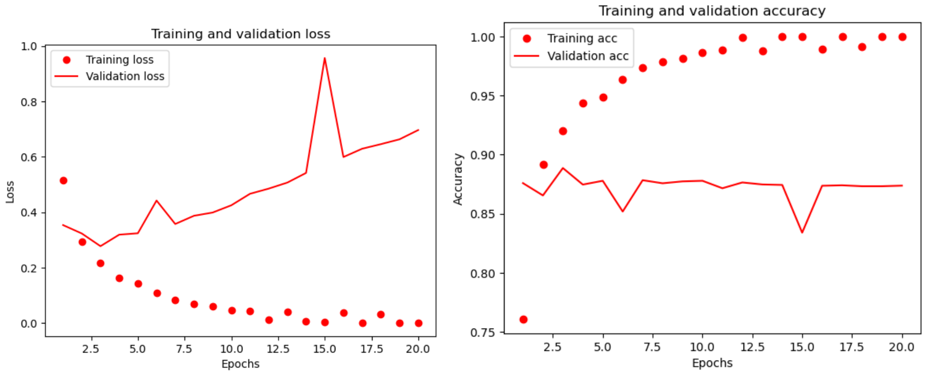


Neural network with – 3-hidden layer,16-units , loss= binary crossentropy,activation=relu

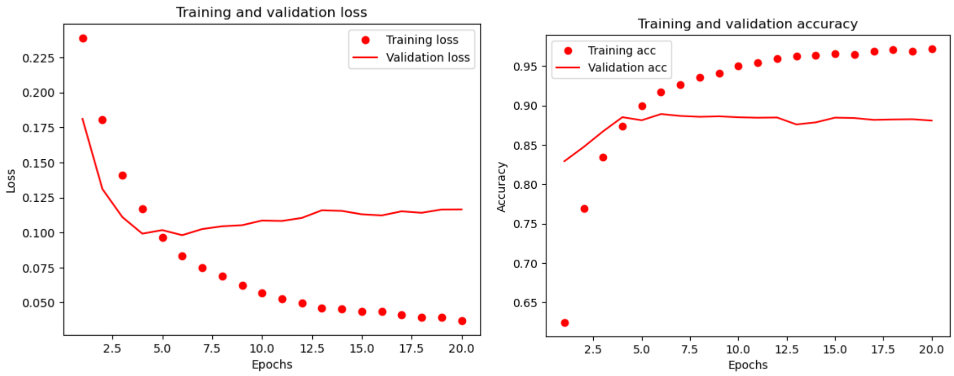




Neural Network with 32 Hidden units & 3 layers.

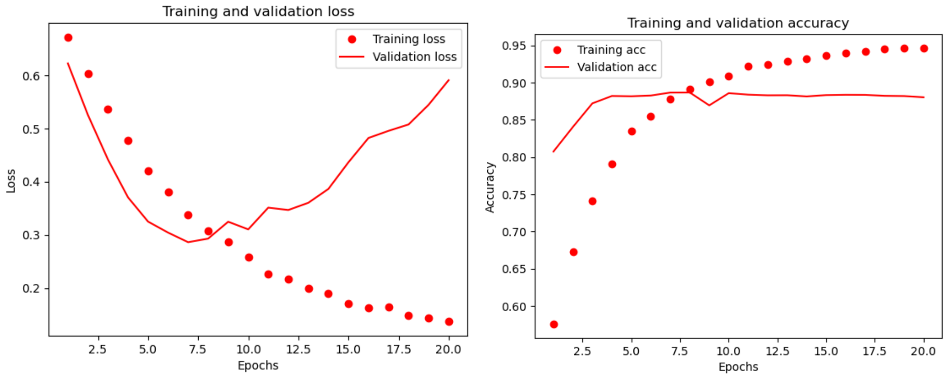


Neural network with – 3-hidden layer,32-units, loss=binary Cross entropy, activation=relu, optimizer=rmsprop(regularization), droupout=0.5, Hyper tuned parameters (kernel_regularizer=regularizers. l2(0.0001))



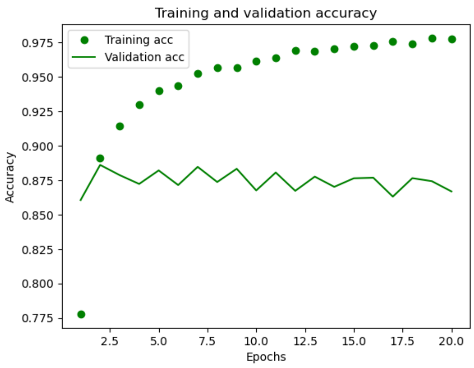
Accuracy: 87.1%

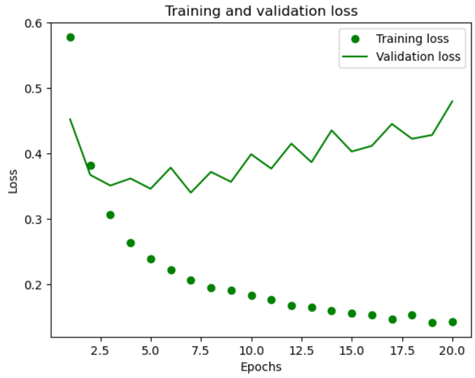
Neural network with – 3-hidden layer,16-units ,loss=binary Cross entropy , activation=relu, optimizer=rmsprop(regularization),dropout=0.5



Accuracy: 87.5%

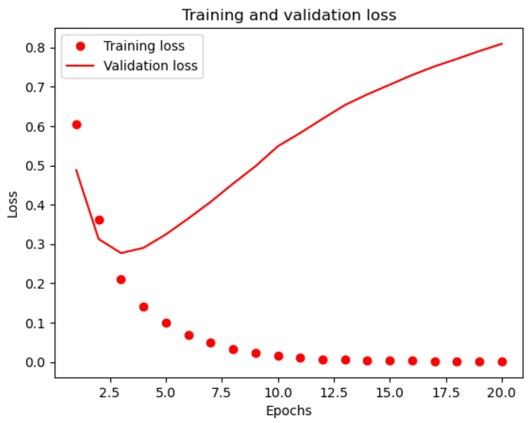
Neural network with – 2-hidden layer,16-units ,loss=binary Cross entropy , activation=relu, optimizer=rmsprop(regularization)

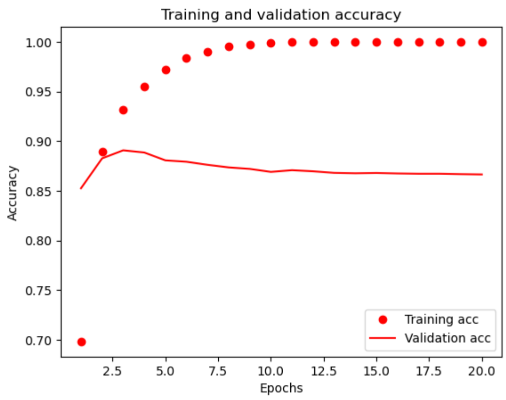




Accuracy: 86.95%

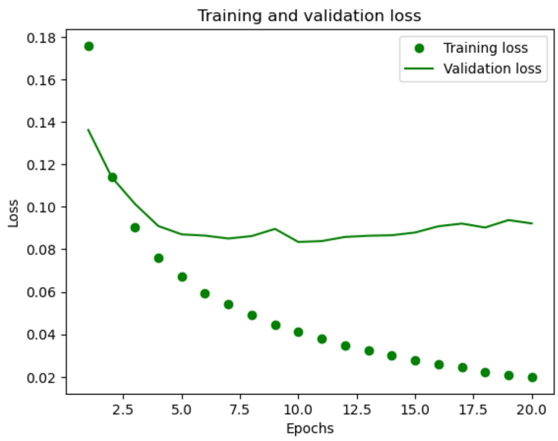
Neural network with – 3-hidden layer,16-units ,loss=binary crossentropy , activation=relu,optimizer=adam

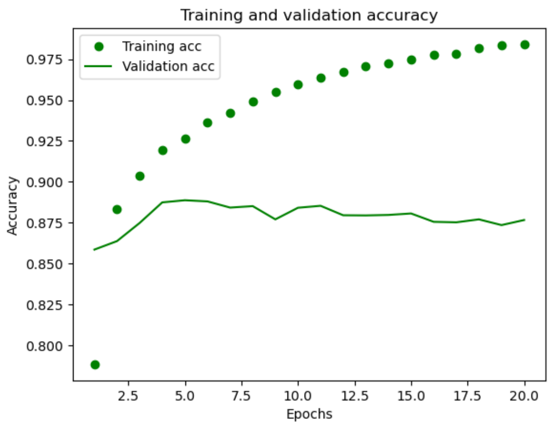




Accuracy: 85.83%

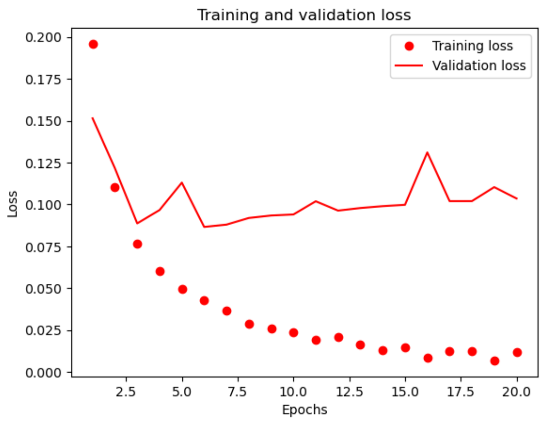
Neural network with – 1-hidden layer,16-units ,loss=MSE , activation=tanh

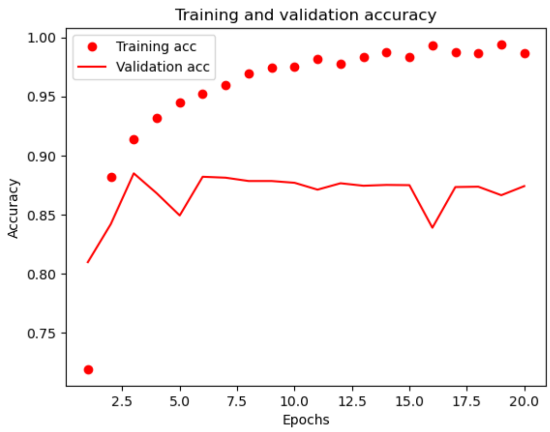




Accuracy: 86.55%

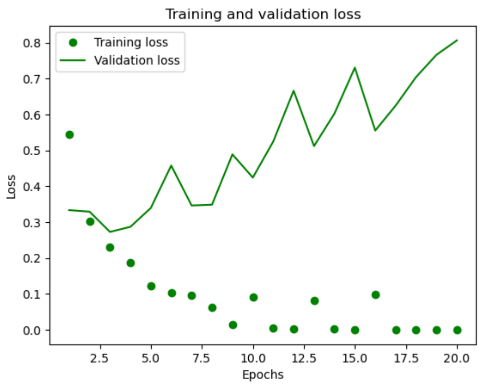
Neural network with – 3-hidden layer,16-units ,loss=MSE , activation=relu

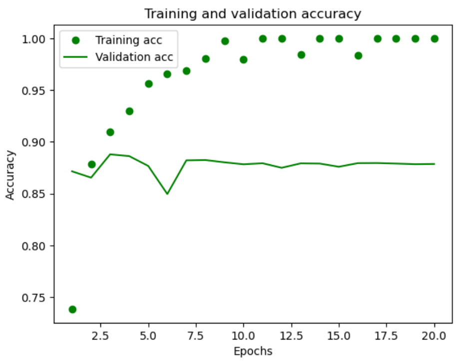




Accuracy : 86.5%

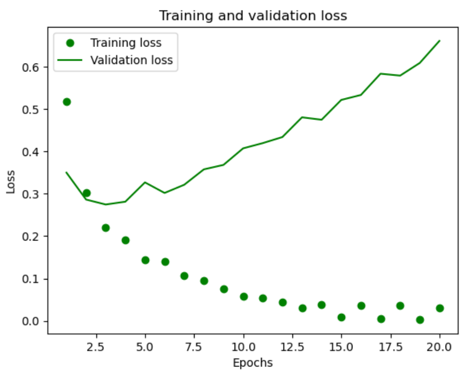
Neural network with – 3-hidden layer,128-units ,loss=binarcrossentropy,activation=relu

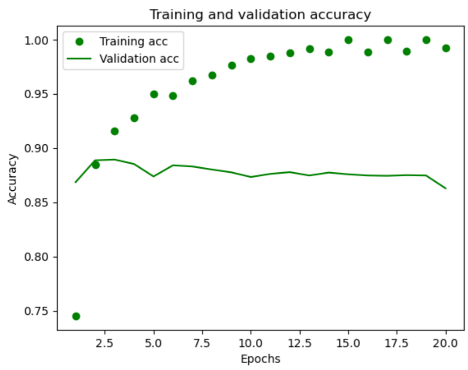




Accuracy: 87.37%

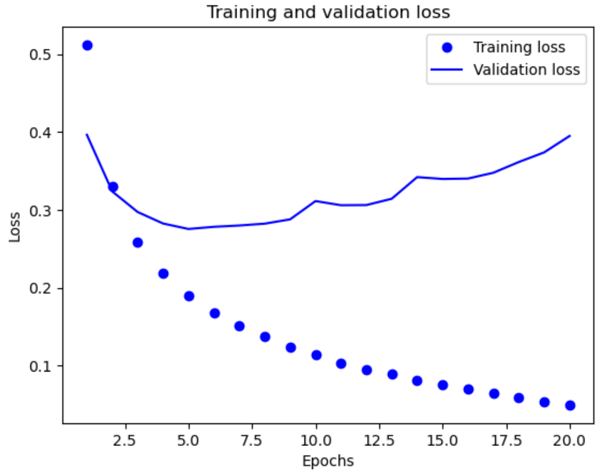
Neural network with – 2-hidden layer,64-units , loss= binarcrossentropy,activation=relu

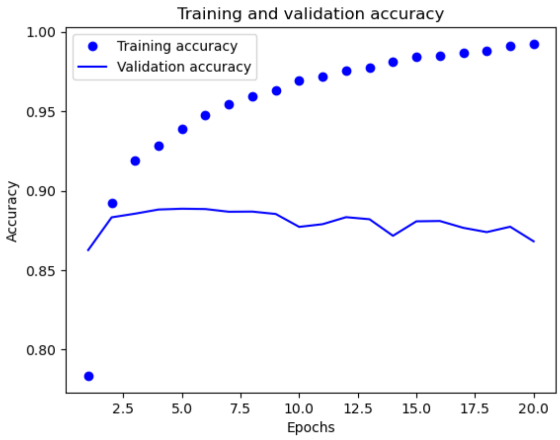




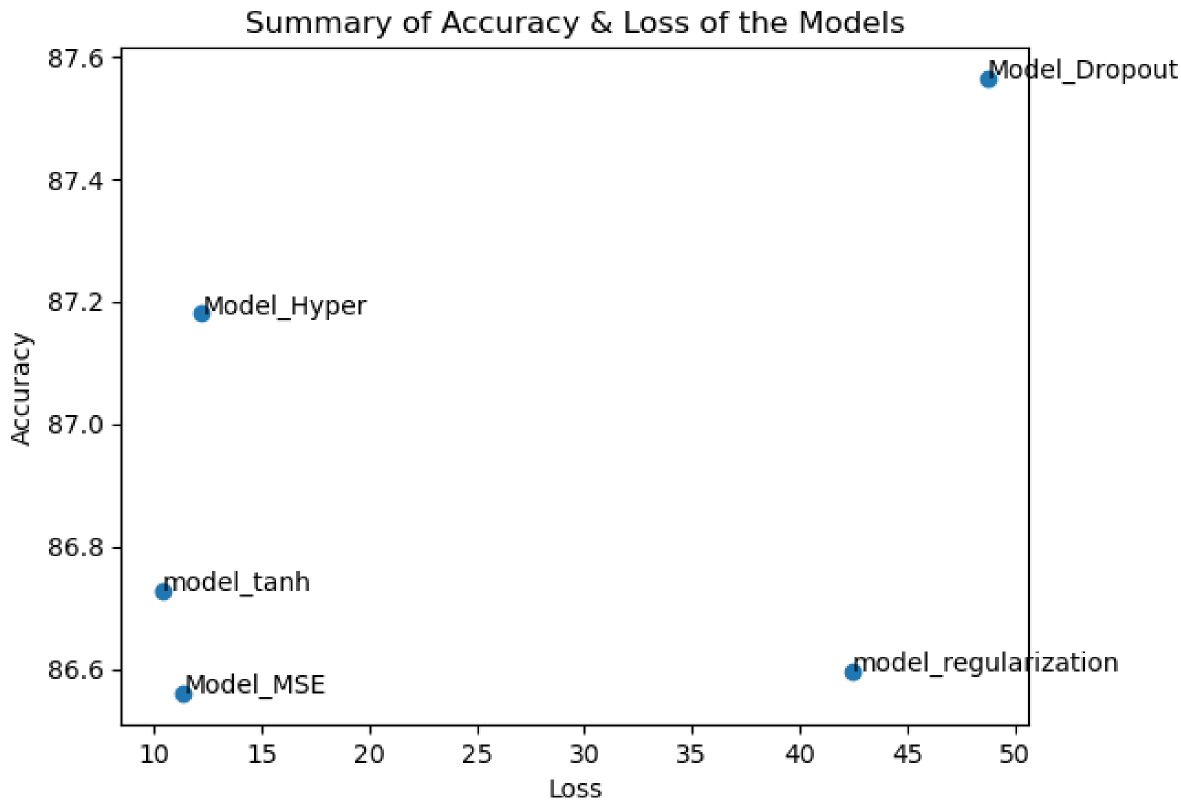
Accuracy: 86.95%

Neural network with – 1-hidden layer,16-units , loss= binary crossentropy,activation=relu





The picture below illustrates the many models that are employed together with their accuracy and validation loss performance, making it easier for us to understand each model.



Conclusion:

Finally, we tried dropout regularisation to prevent overfitting. We developed a new model with training and test datasets using dropout layers. We found that applying dropout regularisation increased the validation accuracy when compared to the baseline model. Thus, it is expected that different modifications to neural network models will have different loss functions and accuracy. The Model Hyper produced the best accuracy and loss, indicating that three thick layers with a dropout rate of 0.5 would be advantageous for the IMDB dataset. Compared to binary cross-entropy, the MSE loss function had a smaller loss value. The vanishing gradient problem lowers the tanh activation function's precision. Effective calculation of the model was shown to be possible.