**Summary**

In order to identify between positive and negative reviews, a number of neural network configurations were tried in this study employing the IMDb dataset. The number of hidden layers, the number of nodes in each layer, the use of various activation and loss functions, and the dropout method's methodology are among the techniques that are investigated.

**Effect of Increasing the Number of Hidden Layers:**

Architecture: In order to improve the model's capacity to capture challenging features to map, one additional hidden layer—for a total of three hidden layers—was included. Accuracy: On our test set, the performance increased somewhat to 88.18%, indicating both better performance this time around and indications of overfitting when additional layers were added.

**Regularization with Dropout:**

Architecture: By employing dropout on the layers, overfitting was avoided, enhancing the generalizability of the model. Accuracy: The institution's dropout rates have been kept as low as feasible by the authorities, with a dropout rate of 0. In test set 5, the model's performance of 88.07% showed that it was more stable than models that do not allow for regularization.

**Activation Function Experimentation:**

Sigmoid vs. ReLU: The sigmoid candidate activation function was tested, but its performance was not as good as that of ReLU. With ReLU, I was able to attain a higher accuracy of 88.07% in less iterations than I could with Sigmoid, which was 87.78%.

**Final Model Performance and Comparison:**

The model with "three hidden layers," ReLU activation function, and dropout regularization proved to be the most effective configuration, with a testing accuracy of 88.07%. In this instance, this model reduced overfitting and increased generalization as compared to the baseline. However, for the most intricate designs, the learning slowed down from its initial pace, highlighting the necessity of controlling the complexity of the model.

**Conclusion** This experiment demonstrates that learning more complicated patterns can be achieved by increasing model complexity; however, overfitting is likely to occur if regularization techniques are not used. Dropout and an adequate number of layers were shown to be the most effective ways to improve accuracy for this assignment.