Report on the Neural Network Model for Alphabet Soup Foundation

Overview of the Analysis

The Alphabet Soup Foundation, sought to develop a machine learning model to predict the success of funding applicants. The goal was to identify those applicants most likely to use the funds effectively, optimizing the impact of the foundation's grants.

Results

Data Preprocessing

Variables

* The target variable for the model is IS\_SUCCESSFUL. A binary variable indicating whether the funding was used effectively by an organization.
* The feature variables include APPLICATION\_TYPE, AFFILIATION, CLASSIFICATION, USE\_CASE, ORGANIZATION, STATUS, INCOME\_AMT, SPECIAL\_CONSIDERATIONS, and ASK\_AMT. These are various categorical and numerical aspects of the funding applications.
* The variables removed EIN and NAME were removed from the input data because they are identification columns and do not contribute to the predictive capability of the model.

Compiling, Training, and Evaluating the Model

* The model included multiple layers with different numbers of neurons. The first attempt had layers with 80 and 30 neurons, respectively. Subsequent optimization attempts experimented with different configurations, increasing the number of neurons and layers.
* The 'relu' activation function was primarily used for hidden layers, while the 'sigmoid' function was used in the output layer to facilitate binary classification.
* The initial goal was to achieve an accuracy higher than 75%. However, this target was not reached in the initial or subsequent attempts.
* Several optimization strategies were employed such as experimenting with various configurations of neurons and layers to find the optimal structure. Additionally, different activation function 'tanh' was tested to improve the model's learning capability. To combat the issue of overfitting, dropout layers were introduced randomly disabling a fraction of neurons during training, making the model more generalized. Moreover, adjustments were made to the number of epochs and batch sizes determining the model's learning process. Lastly, a range of optimizers and learning rates were evaluated to ascertain the most effective method for updating the model's weights during training.

Summary

The deep learning model developed for Alphabet Soup achieved moderate success but fell short of the desired 75% accuracy target with the original model. While the model's accuracy to begin with was close to 73-74%, further optimization and experimentation provided no further improvement.

Recommendation for a Different Model

The Random Forest Classifier ensemble learning method could potentially offer better performance. It works well with both categorical and numerical data and can handle complex interactions between features. It's also less prone to overfitting compared to deep learning models. Random forest Classifier is known for robustness and often requires less fine-tuning compared to deep neural networks. This could make them a more efficient choice for achieving the desired accuracy in classifying the success of funding applications.