Report on Deep Learning Model Performance for Alphabet Soup

Overview of the Analysis:

The purpose of this analysis is to develop a deep learning model to predict the success or failure of funding applications submitted to Alphabet Soup, a charitable organization. The goal is to create a model that can effectively classify these applications, helping Alphabet Soup make informed decisions about which applications to fund. The analysis involves preprocessing the data, designing, compiling, training, and evaluating a deep neural network model.

Results:

Data Preprocessing:

Target Variable: The target variable for our model is "IS_SUCCESSFUL," which indicates whether an application was successful (1) or not (0).

Features: The features for our model include various columns from the dataset, including "APPLICATION_TYPE," "AFFILIATION," "CLASSIFICATION," "USE_CASE," and others.

Variables Removed: In the preprocessing step, we removed the following variables from the input data because they are neither targets nor features: "EIN" (Employer Identification Number), "NAME" (organization name), "STATUS," "SPECIAL_CONSIDERATIONS," and "ASK_AMT" (the amount asked for in the application).

Compiling, Training, and Evaluating the Model:

First Attempt Model

- Number of Hidden Layers: 2
- Number of Neurons in Hidden Layer 1: 80
- Number of Neurons in Hidden Layer 2: 50
- Activation Functions: ReLU for hidden layers and sigmoid for the output layer
- Loss Function: Binary Crossentropy

- Optimizer: Adam
- Epochs: 100

Result of First Attempt

- Accuracy: 72%

Second Attempt Model

- Number of Hidden Layers: 2
- Number of Neurons in Hidden Layer 1: 85
- Number of Neurons in Hidden Layer 2: 60
- Activation Functions: ReLU for hidden layers and sigmoid for the output layer
- Loss Function: Binary Crossentropy
- Optimizer: Adam
- Epochs: 100

Result OF Second Attempt

- Accuracy: 72%

Third Attempt Model

- Number of Hidden Layers: 3
- Number of Neurons in Hidden Layer 1: 80
- Number of Neurons in Hidden Layer 2: 50
- Number of Neurons in Hidden Layer 3: 10
- Activation Functions: ReLU for hidden layers and sigmoid for the output layer
- Loss Function: Binary Crossentropy
- Optimizer: Adam
- Epochs: 150

Result of Third Attempt

- Accuracy: 72%

Despite making multiple attempts to optimize the model, we were unable to achieve the target model performance of 75% accuracy.

Summary:

In summary, the deep learning models we designed and trained for Alphabet Soup's funding application classification did not achieve the desired accuracy target of 75%. Even after multiple attempts with varying neural network architectures and hyperparameters, we consistently obtained an accuracy of 72%.

Recommendation: Given the current performance of the model, it may be beneficial to explore alternative approaches to solving this classification problem. Some recommendations include:

1. **Feature Engineering:** Consider additional feature engineering to extract more relevant information from the existing data, which could improve model performance.
2. **Ensemble Methods:** Explore ensemble methods such as Random Forest or Gradient Boosting, which can combine multiple models to potentially achieve better results.
3. **Hyperparameter Tuning:** Continue fine-tuning hyperparameters to find the optimal configuration for the neural network.
4. **Collect More Data:** If feasible, collecting more data or obtaining additional relevant features may help improve the model's ability to make accurate predictions.
5. **Different Model Architectures:** Experiment with different neural network architectures, such as convolutional neural networks (CNNs) or recurrent neural networks (RNNs), to see if they are better suited for this problem.

In conclusion, while the current deep learning model did not meet the target accuracy, further exploration and refinement of the modeling approach may lead to better results in classifying funding applications for Alphabet Soup.