Deep Learning Challenge: Charity Funding Predictor

Overview:
The objective of this analysis is to create a binary classifier using a deep learning model to predict the success of applicants funded by Alphabet Soup, a nonprofit foundation. The provided dataset contains various features that can be utilized to train the model and make predictions about the likelihood of success in the ventures.

Results:

Data Preprocessing:
Target Variable:
- The target variable for the model is "IS_SUCCESSFUL," which indicates whether the applicant was successful if funded by Alphabet Soup.

Features:
- The features for the model include various columns from the dataset, such as 'APPLICATION_TYPE,' 'AFFILIATION,' 'CLASSIFICATION,' 'USE_CASE,' 'ORGANIZATION,' 'STATUS,' 'INCOME_AMT,' 'SPECIAL_CONSIDERATIONS,' 'ASK_AMT,' and the 'NAME' column.

Variables Removed:The 'EIN' column has been removed as it is a non-beneficial identifier. As was "NAME" but that was added back in afterwards for the optimization.
Binning:

- Binning has been applied to 'APPLICATION_TYPE,' 'CLASSIFICATION,' and 'NAME' columns to handle categories with low counts.

Compiling, Training, and Evaluating the Model:

Neural Network Architecture:
- The neural network model architecture consists of three layers:
  - Input layer: Dense layer with 64 neurons and ReLU activation function.
  - Hidden layer: Dense layer with 32 neurons and ReLU activation function.
  - Output layer: Dense layer with 1 neuron and Sigmoid activation function for binary classification.
Training Performance:
- The model was trained for 100 epochs with a batch size of 64.
- Training accuracy improved gradually over epochs, reaching approximately 76.87% by the end of training.
Evaluation Performance:

- The model was evaluated on the test data, resulting in an accuracy of approximately 72.5%.

```
1  # Evaluate the model using the test data
2  model_loss, model_accuracy = nn.evaluate(X_test_scaled,y_test,verbose=2)
3  print(f"Loss: {model_loss}, Accuracy: {model_accuracy}")
[15]  ✓  0.6s
...    268/268 - 1s - loss: 0.5529 - accuracy: 0.7250 - 552ms/epoch - 2ms/step
       Loss: 0.5529047250747681, Accuracy: 0.7250145673751831
```

Model Performance and Optimization:

Achieving Target Model Performance:
- The target model performance was achieved, with the final test accuracy surpassing 75% with a rating of 75.29%.

Steps Taken for Model Improvement:
- Binning was applied to the 'NAME' column to handle low-frequency categories.
- The model architecture was designed with two hidden layers and a sufficient number of neurons to capture complex patterns.
- The learning rate was set to 0.001, and the Adam optimizer was used.
- The model was trained for 100 epochs to allow sufficient learning.

```
...
Epoch 100/100
402/402 [==============================] - 1s 2ms/step - loss: 0.4695 - accuracy: 0.7687
268/268 - 1s - loss: 0.5044 - accuracy: 0.7529 - 538ms/epoch - 2ms/step
Loss: 0.5044302344322205, Accuracy: 0.7528862953186035
Output is truncated. View as a scrollable element or open in a text editor. Adjust cell output settings...
```

Conclusion:

The deep learning model successfully achieved the target accuracy of at least 75%. The inclusion of the 'NAME' column for binning purposes and careful adjustment of model architecture and hyperparameters contributed to the overall success of the model in predicting the success of applicants funded by Alphabet Soup. Further optimization and fine-tuning can be explored for potential improvements, and ongoing monitoring is recommended to ensure model robustness.