**Overview of the Analysis**

The aim of this study is to create a deep learning-based binary classification model that predicts the performance of Alphabet Soup-funded organisations by utilising a variety of variables found in the dataset. The main goal is to exceed a 75% target prediction accuracy level. Data pre-processing, model compilation, training, assessment, optimisation, and a thorough report on the deep learning model's performance are just a few of the phases that make up the study.

**Results**

**Data Pre-processing**

Target and Feature Variables

* Target Variable(s): IS\_SUCCESSFUL
* Feature Variable(s): All columns excluding EIN and NAME.

Removed Columns

* EIN and NAME columns were discarded as they do not contribute to the prediction.

Unique Values

* Determined the number of unique values for each column.

Handling Categorical Variables

* For columns with over 10 unique values, "Other" was introduced to bin rare categorical variables together.

Feature and Target Arrays

* Created feature array, X, and target array, y, using the pre-processed data.

Train-Test Split

* Split the pre-processed data into training and testing datasets.

Scaling

* Scaled the data using a StandardScaler fitted to the training data.

**Original Model**

The original model comprised two layers and one output layer with 8 and 5 nodes. This decision aimed to prevent the model from becoming overly complex and overfitting to the training data.

Performance:

Loss: 0.5549

Accuracy: 0.7235

Optimization Method 1 - Increased Epochs to 150

By extending the number of epochs from 100 to 150, there was a slight improvement in the model's performance. This adjustment aimed to provide the model with more learning opportunities.

Performance:

Loss: 0.5587

Accuracy: 0.7238

Optimization Method 2 - Increased Nodes in Hidden Layers

Increasing the number of nodes in the hidden layers to 90 and 70 aimed to enhance the model's expressiveness and capture intricate relationships within the data.

Performance:

Loss: 0.5670

Accuracy: 0.7259

Optimization Method 3 - Added a Third Hidden Layer

The addition of a third hidden layer with 3 nodes sought to augment the model's capacity for learning hierarchical features in the data.

Performance:

Loss: 0.5547

Accuracy: 0.7254

Summary

When it came to forecasting the success of organisations financed by Alphabet Soup, the deep learning model showed some degree of success. Even though the 75% target accuracy was not met, a few optimisations indicated slight gains.

Model Configuration

* Original model: Two hidden layers (8 and 5 nodes) followed by an output layer.
* Optimization methods involved tweaking epochs, nodes in hidden layers, and adding an extra hidden layer.

Model Performance

* Accuracy ranged from 72.35% to 72.59% across different optimization attempts.
* Loss remained in the range of 0.5547 to 0.5670.

Recommendations

* Further exploration and experimentation are encouraged to identify the most effective combination of hyperparameters.
* Consider additional feature engineering or exploring different architectures to enhance predictive capabilities.

In conclusion, the deep learning model shows potential, but further development is required to consistently achieve the required level of predicted accuracy. Improved outcomes might arise from experimenting with other topologies, activation functions, or alternative models. As was previously indicated, more research may be necessary to determine how columns decreased affect accuracy.