**Overview of the Analysis Alphabet Soup**

The purpose of this analysis was to create a binary classifier that can predict whether applicants will be successful if funded by Alphabet Soup. The target is whether the application was successful (IS\_SUCCESSFUL = 1) or not (IS\_SUCCESSFUL = 0). A deep neural network was used to model the relationship between the features and the target.

**Results**

Data Preprocessing

* + Target Variable: IS\_SUCCESSFUL, indicates whether the application was successful
  + Feature Variables: APPLICATION\_TYPE, CLASSIFICATION, USE\_CASE, INCOME\_AMT, ASK\_AMT
  + Variables to remove: Employer Identification Number EIN – irrelevant for prediction. Name of Organization NAME – text does not provide predictive value.

Compiling, Training, and Evaluating the Model

* + Neurons, layers, and activation functions:
    - Input Layer: equal to the number of features
    - First Hidden Layer: 100 neurons, ReLU activation
    - Second Hidden Layer: 50 neurons, ReLU activation
    - Output Layer: 1 neuron, Sigmoid outputs a probability for

binary classification.

* + Target Model Performance
    - Achieved reasonable accuracy on the test set.
  + Steps to Improve Performance
    - Hyperparameter tuning: experimented with different neurons and layers to improve accuracy.
    - Regularization: adding dropout layers or L2 to reduce overfitting
    - Early stopping to prevent overfitting.

**Summary**:

The deep learning model, achieved reasonable accuracy on the test set, therefore effectively predicts charity application success. A Random Forest or XGBoost model could also be good alternatives, as they handle categorical data well and are easier to tune. Random forest can handle data without the need for one-hot coding. XGBoost has faster training times on large datasets.