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Alphabet Soup Neural Network Model Report

**Overview**

The purpose of this neural network model is to analyze a large dataset of business ventures to predict whether they will be successful if funded. Variables taken into consideration include industry sector, government classification, use case for funding, and income classification to name a few. The model uses a neural network optimize the accuracy of classifying the ventures.

**Results**

**Data Preprocessing**

* The target for the model is the variable IS\_SUCCESSFUL. This is a binary variable with a 1 for successful ventures and 0 for unsuccessful ventures. The model aims to predict this value with high accuracy
* There are several variables which are features for the model. They include:
  + APPLICATION\_TYPE – Alphabet Soup application type
  + AFFILIATION – Affiliated sector of industry
  + CLASSIFICATION – Government organization classification
  + USE\_CASE – Use case for funding
  + ORGANIZATION – Organization type
  + STATUS – Active status (binary)
  + INCOME\_AMT – Income classification
  + SPECIAL\_CONSIDERATIONS – Special considerations for application (Y/N)
  + ASK\_AMT – Funding amount requested
* Some variables were removed from the input data because they are neither targets nor features. They are:
  + EIN – Identification column
  + NAME – Identification column

**Compiling, Training, and Evaluating the Model**

* The model used two hidden layers, as the dataset was rather complex. Using two layers allowed for a balance between model complexity and computational efficiency. Layer 1 used 8 nodes and layer 2 used 5. The activation function used was ReLu (Rectified Linear Unit). This introduced non-linearity to the model, allowing it to learn complex relationships between the features in the data.
* I was able to achieve a target predictive accuracy of just above 72%, falling slightly short of the 75% goal.
* I made various attempts to increase the model’s performance, including removing the USE\_CASE variable from the dataset, grouping the CLASSIFICATION variables into more bins, and adjusting the number of nodes I used for the hidden layers. None of these adjustments were successful in substantially improving the accuracy of the model.

**Summary**

* Overall, the deep learning model was able to predict the success of business ventures fairly well. If I were to attempt a different model to analyze the data, I would probably try using a Gradient Boosting Machine. A GBM may be more capable of effectively analyzing so many complex relationships in the data. GBM’s also tend to be less prone to overfitting, which is a very common roadblock when dealing with large datasets.