**BACKGROUND**

We were tasked with creating a machine learning algorithm and using neural networks to predict if applicants will be successful when getting funded by the fictional non-profit foundation Alphabet Soup, using a .csv file with ~34,000 rows of test data.

**DATA PREPROCESSING**

Per the instructions in the homework assignment, I read in the .csv file in the resources folder into a DataFrame using Pandas to prepare it by:

1. Dropping the EIN and NAME columns.
2. Determining the number of unique values for each column.
3. For those columns that had more than 10 unique values, determining the number of data points for each unique value.
4. Using the number of data points for each unique value to pick cutoff points of 600 and 300 to bin "rare" categorical variables together in a new value, Other, and then check if the binning was successful.
5. Use pd.get\_dummies() to encode categorical variables.

**COMPILING, TRAINING, AND EVALUATING THE MODEL**

We were aiming to achieve a target predictive accuracy higher than 75%.

I made three total attempts using machine learning and neural networks.

They all fell short of the mark and resulted in about the same accuracy rate of ~72%.

**Results from each attempt are detailed below:**

ATTEMPT #1

The first attempt (Models/AlphabetSoupCharity1.h5) resulted in an accuracy score of 72.8%. This was the highest accuracy score of the three models. This means that 72.8% of the model’s predicted values align with the dataset’s true values. The hyperparameters used were:

* layers = 2
  + layer 1 = 9 neurons and ‘relu’ activation function
  + layer 2 = 18 neurons and ‘relu’ activation function
* epochs = 100

Chart, line chart

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ATTEMPT #2

For my second attempt (Models/AlphabetSoupCharity2.h5) I added an additional layer. This attempt resulted in an accuracy score of 72.6%. This means that 72.6% of the model’s predicted values align with the dataset’s true values. The hyperparameters used were:

* layers = 3
  + layer 1 = 9 neurons : activation function = ‘relu’
  + layer 2 = 18 neurons : activation function = ‘relu’
  + layer 3 = 27 neurons : activation function = ‘relu’
* epochs = 100

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ATTEMPT #3

The final attempt (Models/AlphabetSoupCharity3.h5) I kept the third layer and changed the activation function for layers 2 and 3. This attempt resulted in an accuracy score of 72.7%. This means that 72.7% of the model’s predicted values align with the dataset’s true values. The hyperparameters used were:

* layers = 3
  + layer 1 = 9 neurons : activation function = ‘relu’
  + layer 2 = 18 neurons : activation function = ‘tanh’
  + layer 3 = 27 neurons : activation function = ‘tanh’
* epochs = 100

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**SUMMARY**

In the three attempts I made, the model was unable to achieve the target predictive accuracy higher than 72.8%. Hypertuning resulted in no real improvement. We could consider using another classification model to see if it is better at predicting whether applicants will be successful if funded by Alphabet Soup.