

Deep Learning Challenge Report

1. Background

The nonprofit foundation Alphabet Soup wants a tool that can help it select the applicants for funding with the best chance of success in their ventures. With your knowledge of machine learning and neural networks, you'll use the features in the provided dataset to create a binary classifier that can predict whether applicants will be successful if funded by Alphabet Soup.

From Alphabet Soup's business team, you have received a CSV containing more than 34,000 organizations that have received funding from Alphabet Soup over the years. Within this dataset are a number of columns that capture metadata about each organization, such as:

- **EIN** and **NAME**—Identification columns
- **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
- **INCOME_AMT**—Income classification
- **SPECIAL_CONSIDERATIONS**—Special considerations for application
- **ASK_AMT**—Funding amount requested
- **IS_SUCCESSFUL**—Was the money used effectively

2. Step 1: Preprocess the data

I preprocessed the data by:

- dropping non-beneficial columns,
- finding the number of data points for each unique value for each of the columns that had more than 10 unique values - APPLICATION_TYPE and CLASSIFICATION,
- choosing a cutoff point of 600 and 300, respectively, to bin rare categorical values together into a new value called "Other",
- using `pd.get_dummies()` to convert categorical data to numeric,
- dividing the data into a target array (IS_SUCCESSFUL) and features arrays,
- applying the `train_test_split` to create a testing and a training dataset,
- and finally, using `StandardScaler` to scale the training and testing sets. The resulting data included 44 features. The target variable (y) was IS_SUCCESSFUL. The data was split into training and test subsets.

3. Step 2: Compile, Train, and Evaluate the Model

The model was required to achieve a target predictive accuracy higher than 75%. I made three official attempts using machine learning and neural networks. They all resulted in the same accuracy rate – right around 72%, so a little short of the required target accuracy. Results from each model attempt are detailed below:

ATTEMPT #1

The first attempt (Resources/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
 - layer1 = 9 neurons / activation function 'relu'
 - layer2 = 18 neurons / activation function 'relu'
- epochs = 100

ATTEMPT #2

For my second attempt (Resources/AlphabetSoupCharity2.h5) I have added an extra layer. This attempt resulted in an accuracy score of 72.6%. This means that 72.5% of the model's predicted values align with the dataset's true values.

The hyperparameters used were:

- layers = 3
 - layer1 = 9 neurons / activation function 'relu'
 - layer2 = 18 neurons / activation function 'relu'
 - layer3 = 27 neurons / activation function 'relu'
- epochs = 100

ATTEMPT #3

In my third and final attempt

(Resources/AlphabetSoupCharity3.h5) I have kept the third layer and have 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
 - layer1 = 9 neurons / activation function 'relu'
 - layer2 = 18 neurons / activation function 'tanh'
 - layer3 = 27 neurons / activation function 'tanh'
- epochs = 100

4. Step 4 :Summary

In the three attempts that I have made, the model was unable to achieve a target predictive accuracy higher than 72.8%. Hypertuning resulted in virtually no visible improvement. I would be considering using another classification model to see if it is a better way to predict whether applicants will be successful if funded by Alphabet Soup.