

## Predicting Success using Neural Network Analysis of Alphabet Soup's Charitable Ventures

Alphabet Soup is a charitable organization that wants to be as effective as possible with its charitable contributions to organizations. Towards that aim this analysis has been done to determine if the data included in a grant proposal is enough to reasonably predict whether or not a specific project will be successful.

Using machine learning, the aim is to train an algorithm to predict the success of future ventures by feeding it past ventures with basic data and the outcome of those ventures as a target. The training features are basic data points that are easily discernible and mostly categorical. Such as affiliation, income amount, and use case.

```
APPLICATION_TYPE      17
AFFILIATION           6
CLASSIFICATION        71
USE_CASE              5
ORGANIZATION          4
STATUS                2
INCOME_AMT            9
SPECIAL_CONSIDERATIONS 2
ASK_AMT              8747
IS_SUCCESSFUL         2
dtype: int64
```

Unnecessary information such as organization name and EIN will be removed from training data.

A four layer neural network with 32 neurons per layer in the first three layers and one in the last was used for this calculation. A ReLU activation function was used for the first two layers as it is the industry standard. Tanh and Sigmoid were used for the last two layers, respectively, to add variety and some je ne sais quoi to the algorithm.

Target model performance was nearly, but not technically, achieved.

Steps taken to improve model performance:

- Increasing amount neurons per layer
- Increasing amount of hidden layers
- Increasing amount of epochs ran

With this model we were able to predict the success of grant proposals with 72% accuracy.

```
[27] # Evaluate the model using the test data
      model_loss, model_accuracy = nn_model2.evaluate(X_test_scaled,y_test,verbose=2)
      print(f"Loss: {model_loss}, Accuracy: {model_accuracy}")

268/268 - 1s - loss: 0.5723 - accuracy: 0.7287 - 528ms/epoch - 2ms/step
Loss: 0.5722675323486328, Accuracy: 0.7287463545799255
```

While short of the target of 75%, it no less is helpful in determining whether or not to donate funds to particular projects. In the future, using a random forest model to try to predict success may be informative because we can determine which factors are most influential in properly predicting the success of these ventures and use the information to fine tune further neural network testing with more relevant feature data.