Alphabet Soup
Funding Applicants Evaluation Report

OVERVIEW

The aim of this project is to design an algorithm using machine learning and neural networks to predict if applicants will achieve success if they were to receive financial support from the fictional non-profit organization, Alphabet Soup.

Alphabet Soup made available a CSV file with more than 34000 organization data, which have received funding from them previously. This dataset was used to make all the predictions of this project.

DATA PREPROCESSING

COLUMN	DESCRIPTION	DATA PREPROCESSING
EIN	Identification column	DISCARDED DATA
NAME	Identification column	DISCARDED DATA
APPLICATION_TYPE	Alphabet Soup application type	FEATURE
AFFILIATION	Affiliated sector of industry	FEATURE
CLASSIFICATION	Government organization classification	FEATURE
USE_CASE	Use case for funding	FEATURE
ORGANIZATION	Organization type	FEATURE
STATUS	Active status	FEATURE
INCOME_AMT	Income classification	FEATURE
SPECIAL_CONSIDERATIONS	Special considerations for application	FEATURE
ASK_AMT	Funding amount requested	FEATURE
IS_SUCCESSFUL	Was the money used effectively	TARGET

COMPILING, TRAINING, AND EVALUATING THE MODEL

Concepts:

Loss value: Is the value of the loss function after evaluating the model on all test data. In this case, a lower loss value is better, indicating that the model's predictions are, on average, closer to the true values.

Accuracy: Is the classification accuracy of the model. It means that approximately ~72% of the model's predictions were correct. In classification tasks, higher accuracy is typically better. For this project, the goal was to reach at least 75% of accuracy, but it wasn't possible.

Hiperparameters:

Number of Layers: This refers to how many layers are in your neural network, including input, hidden, and output layers. Increasing the number of layers can help the network learn more complex representations, but it can also lead to longer training times and the potential for overfitting.

Units: Each layer can have a different number of neurons. More neurons can allow the network to capture more complex patterns but can also make the model prone to overfitting and increase computational requirements.

Activation function: An activation function is a mathematical function used in artificial neural networks to introduce non-linearity into the model. While the individual neurons compute a weighted sum of their input signals, the activation function is applied to this sum to determine the neuron's output. This output can then be used as an input to the next layer in the network. On this project we used **Rectified Linear Unit (ReLU)**, **sigmoid** and **tanh** functions.

Epoch: In machine learning, an epoch refers to one complete pass through the entire training dataset when training a model.

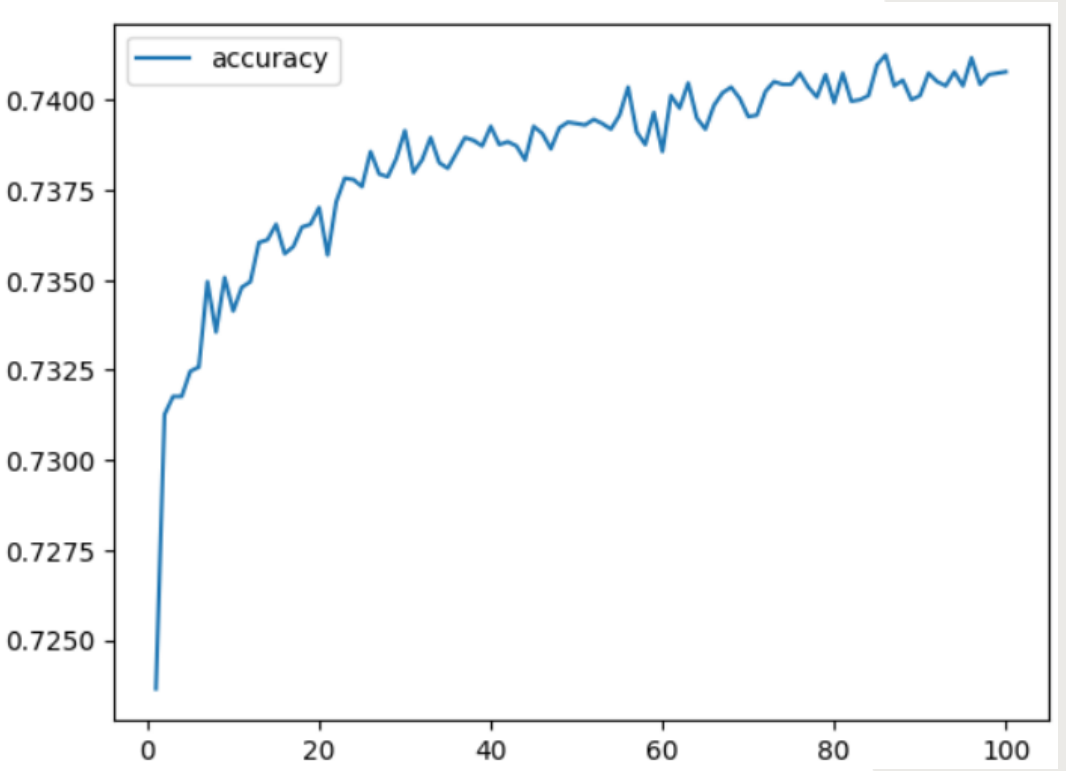
COMPILING, TRAINING, AND EVALUATING THE MODEL

The study contemplates three attempts to achieve at least 75% accuracy on the model. Unfortunately, the accuracy was around 72% in all of them, even after changing several parameters on the model.

Parameters as number of layers, number of units (neurons), number of epochs and activation function types were changed to get higher accuracy models. However, this technique to enhance the model accuracy did not delivery the expected result and the accuracy practically did not change between the trials.

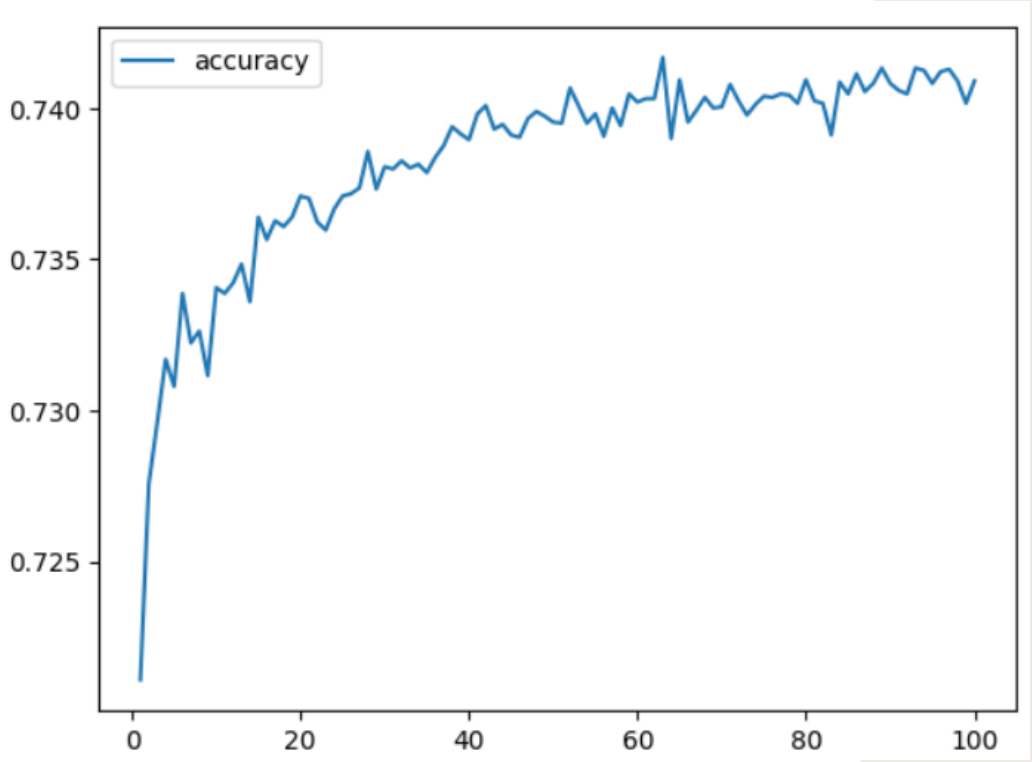
COMPILING, TRAINING, AND EVALUATING THE MODEL

1st Attempt			
Parameter	Hidden layer 1	Hidden layer 2	Output Layer
Units	80	30	1
Activation function	relu	relu	sigmoid
Epochs		100	
Accuracy		0.7266	
Loss		0.5552	



COMPILING, TRAINING, AND EVALUATING THE MODEL

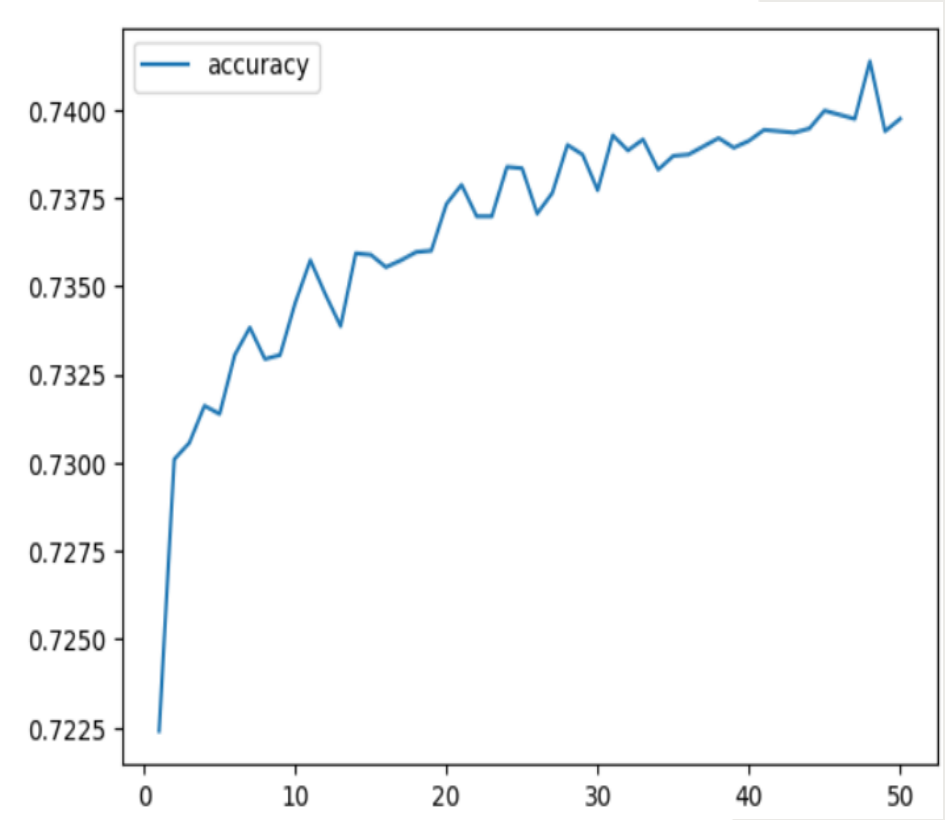
2nd Attempt			
Parameter	Hidden layer 1	Hidden layer 2	Output Layer
Units	80	30	1
Activation function	relu	tanh	sigmoid
Epochs		100	
Accuracy		0.7230	
Loss		0.5553	



Changed in relation to the previous attempt

COMPILING, TRAINING, AND EVALUATING THE MODEL

3rd Attempt				
Parameter	Hidden layer 1	Hidden layer 2	Hidden layer 3	Output Layer
Units	80	30	30	1
Activation function	relu	tanh	tanh	sigmoid
Epochs	50			
Accuracy	0.7275			
Loss	0.5540			



Changed in relation to the previous attempts

SUMMARY

The model was unable to achieve acceptable accuracy values (at least 75%). Even hypertuning the model changing the number of layers, neurons per layer, type of Activation function or number of epochs the accuracy did not improve.

The current dataset is quite small and therefore a simple machine learning model may prove optimal. Due to the binary nature of the problem, as well as several features which may have direct relationships to the target, a decision tree may be a more direct and efficient route.