

Deep Learning

Overview- the purpose of this analysis

The purpose of this analysis is to develop an algorithm employing machine learning and neural networks to predict the likelihood of applicants' success if they receive funding from the nonprofit foundation, Alphabet Soup.

Results

Data Preprocessing

What variable(s) are the target(s) for your model?

-column 'IS_SUCCESSFUL'.

What variable(s) are the features for your model?

-Classification and Application Type were features for the model.

What variable(s) should be removed from the input data because they are neither targets nor features?

-EIN and Name were considered as unnecessary variables removed from the dataset.

Compiling, Training, and Evaluating the Model

How many neurons, layers, and activation functions did you select for your neural network model, and why?

Cutoff points are 400 and 200, and epochs is 100.

Attempts 1:

layers = 2

- layer1 = 80 neurons and 'relu' activation function
- layer2 = 30 neurons and 'relu' activation function

```
Model: "sequential"
```

Layer (type)	Output Shape	Param #
dense (Dense)	(None, 80)	3680
dense_1 (Dense)	(None, 30)	2430
dense_2 (Dense)	(None, 1)	31

```
=====
Total params: 6141 (23.99 KB)
Trainable params: 6141 (23.99 KB)
Non-trainable params: 0 (0.00 Byte)
```

Attempts 2:

layers = 3

- layer1 = 27 neurons and 'relu' activation function
- layer2 = 18 neurons and 'relu' activation function

- layer3 = 9 neurons and 'relu' activation function

Model: "sequential"

Layer (type)	Output Shape	Param #
dense (Dense)	(None, 27)	1188
dense_1 (Dense)	(None, 18)	504
dense_2 (Dense)	(None, 9)	171
dense_3 (Dense)	(None, 1)	10
Total params: 1873 (7.32 KB)		
Trainable params: 1873 (7.32 KB)		
Non-trainable params: 0 (0.00 Byte)		

Attempts 3:

layers = 3

- layer1 = 60 neurons and 'sigmoid' activation function
- layer2 = 30 neurons and 'sigmoid' activation function
- layer3 = 15 neurons and 'sigmoid' activation function

Model: "sequential"

Layer (type)	Output Shape	Param #
dense (Dense)	(None, 60)	2760
dense_1 (Dense)	(None, 30)	1830
dense_2 (Dense)	(None, 15)	465
dense_3 (Dense)	(None, 1)	16
Total params: 5071 (19.81 KB)		
Trainable params: 5071 (19.81 KB)		
Non-trainable params: 0 (0.00 Byte)		

Were you able to achieve the target model performance?

-Sadly no.

Attempts 1: accuracy result is 72.98%.

```
268/268 - 0s - loss: 0.5589 - accuracy: 0.7298 - 404ms/epoch - 2ms/step
Loss: 0.5588800311088562, Accuracy: 0.7297959327697754
```

Attempts 2: accuracy result is 72.81%.

```
268/268 - 1s - loss: 0.5587 - accuracy: 0.7282 - 1s/epoch - 4ms/step
Loss: 0.5586938261985779, Accuracy: 0.7281632423400879
```

Attempts 3: accuracy result is 73.17%.

```
268/268 - 0s - loss: 0.5544 - accuracy: 0.7317 - 432ms/epoch - 2ms/step
Loss: 0.5544024705886841, Accuracy: 0.7316617965698242
```

What steps did you take in your attempts to increase model performance?

-I may change cutoff point, or drop different columns and keep 'NAME' column then try again.

Summary

Across three attempts I made, the models were failed to achieve the target model performance 75%. The highest accuracy score of the three models is 73.17%. I only changed the layers and activation functions across the attempts. Considering these results, I would try to change cutoff point or epochs, or drop different columns and keep 'NAME' column to achieve performance goal in predicting the success of applicants funded by Alphabet Soup.