Alphabet Soup - Neural Network Model Report

* **Overview** of the analysis: Alphabet Soup data will be used in deep learning and neural networks to determine if applicants were successfully funded. The dataset has over 34,000 entries to determine the level of those that were funded.
* **Results**:
  + **Model 1 results “Alphabet\_Soup” file:**

Model: "sequential"

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Layer (type) Output Shape Param #

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dense (Dense) (None, 10) 540

dense\_1 (Dense) (None, 5) 55

dense\_2 (Dense) (None, 1) 6

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Total params: 601 (2.35 KB)

Trainable params: 601 (2.35 KB)

Non-trainable params: 0 (0.00 Byte)

**MODEL 1 EVALUATION:**

268/268 - 0s - loss: 0.5524 - accuracy: 0.7283 - 373ms/epoch - 1ms/step

Loss: 0.552360475063324, **Accuracy: 0.7282798886299133**

* + **Model 2 results “AlphabetSoupCharity\_Optimization” file:**

Model: "sequential"

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Layer (type) Output Shape Param #

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dense (Dense) (None, 20) 9580

dense\_1 (Dense) (None, 20) 420

dense\_2 (Dense) (None, 8) 168

dense\_3 (Dense) (None, 1) 9

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Total params: 10177 (39.75 KB)

Trainable params: 10177 (39.75 KB)

Non-trainable params: 0 (0.00 Byte)

**MODEL 2 EVALUATION:**

268/268 - 0s - loss: 0.4763 - accuracy: 0.7861 - 359ms/epoch - 1ms/step

Loss: 0.47633615136146545, **Accuracy: 0.7861224412918091**

* Data Preprocessing
  1. What variable(s) are the target(s) for your model?
* The target variable is the ‘IS\_SUCCESSFUL’ column within application\_df with a 1 (yes) and 0 (no).
  1. What variable(s) are the features for your model?

There were many features for the first model:

NAME 19568

APPLICATION\_TYPE 17

AFFILIATION 6

CLASSIFICATION 71

USE\_CASE 5

ORGANIZATION 4

STATUS 2

INCOME\_AMT 9

SPECIAL\_CONSIDERATIONS 2

ASK\_AMT 8747

* 1. What variable(s) should be removed from the input data because they are neither targets nor features?
* The variables that were removed from the input data were the columns ‘EIN’ and ‘NAME’ because neither one of them were targets nor features in the first model.
* Compiling, Training, and Evaluating the Model
  1. How many neurons, layers, and activation functions did you select for your neural network model, and why?
     + The first model had two hidden layers with ten hidden neurons in the first layer and five hidden neurons in the second layer which produced 601 parameters and epochs were set to 100.
  2. Were you able to achieve the target model performance?
     + The first model did not achieve the target 75% model accuracy target in the “Alphabet\_Soup” model. The accuracy came up short with a 72.8% accuracy. The second model did achieve the accuracy goal of over 75% with a score of 78.6% in the “AlphabetSoupCharity\_Optimization” file.
  3. What steps did you take in your attempts to increase model performance?
     + There were several adjustments that were made to increase model performance. Dropped only one column ‘EIN’ and kept ‘NAME’ as compared to the first model. Adding the name column into the dataset greatly increased the accuracy of the model. Classification counts were set to 10 and a third hidden layer was added. The parameters increased to 10177 and epochs were adjusted to 50. The layers were adjusted as follows: first\_hidden\_layer = 20

second\_hidden\_layer = 20

third\_hidden\_layer = 8

* **Summary**: The first model came up short with an accuracy score of 72.8%. The second optimization model with all the adjustments gave a much better accuracy of 78.6% and would be the better model to use for to determine if applicants were successfully funded.