

Overview:

Deep learning and neural networks were used to create an algorithm to predict whether or not applicants for funding will be successful for the non-profit Alphabet Soup. Using the provided dataset, we will use our knowledge of machine learning and neural networks to create the algorithm that will be able to predict whether applicants will be successful if funded by Alphabet Soup.

Results:

We begin by removing any unnecessary information such as the EIN and NAME columns. The data was then split for training and testing sets. The target variable for the model was labeled "IS_SUCCESSFUL". APPLICATION_TYPE and CLASSIFICATION were also analyzed.

Compiling, Training, and Evaluating the Model:

There were two layers for the model after applying Neural Networks. The number of hidden nodes were dictated by the number of features.

```
# Define the model - deep neural net, i.e., the number of input features and hidden nodes for each layer.
input_features = x_train_scaled.shape[1]

hidden_node1 = 80
hidden_node2 = 45

nn = tf.keras.models.Sequential()

# First hidden layer
nn.add(tf.keras.layers.Dense(units=hidden_node1, activation='relu', input_dim=input_features))

# Second hidden layer
nn.add(tf.keras.layers.Dense(units=hidden_node2, activation='relu', input_dim=input_features))

# Output layer
nn.add(tf.keras.layers.Dense(units=1, activation='sigmoid'))

# Check the structure of the model
nn.summary()
```

7211 parameters were created by a two-layer training model. The results were just over 72% accuracy which was under the desired 75%.

Layer (type)	Output Shape	Param #
dense_1 (Dense)	(None, 80)	3520
dense_2 (Dense)	(None, 45)	3645
dense_3 (Dense)	(None, 1)	46
Total params: 7211 (28.17 KB)		
Trainable params: 7211 (28.17 KB)		
Non-trainable params: 0 (0.00 Byte)		

```
# Evaluate the model using the test data
model_loss, model_accuracy = nn.evaluate(x_test_scaled, y_test, verbose=2)
print(f"Loss: {model_loss}, Accuracy: {model_accuracy}")
```

```
268/268 - 1s - loss: 0.5685 - accuracy: 0.7282 - 940ms/epoch - 4ms/step
Loss: 0.568522572517395, Accuracy: 0.7281632423400879
```

Summary:

Deep learning models should have multiple layers since it is machine based it teaches the system to filter inputs through multiple layers. This will assist the algorithm to create more accurate predictions. For this particular model it is suggested that NAME be added back to the dataset as it would add another layer and further assist with more accurate predictions.