Deep Learning- Charity Funding Predictor

Overview:

Deep learning and neural networks were used to determine if Alphabet Soup, whom previously funded over 34,000 organizations, would successfully fund applicants.

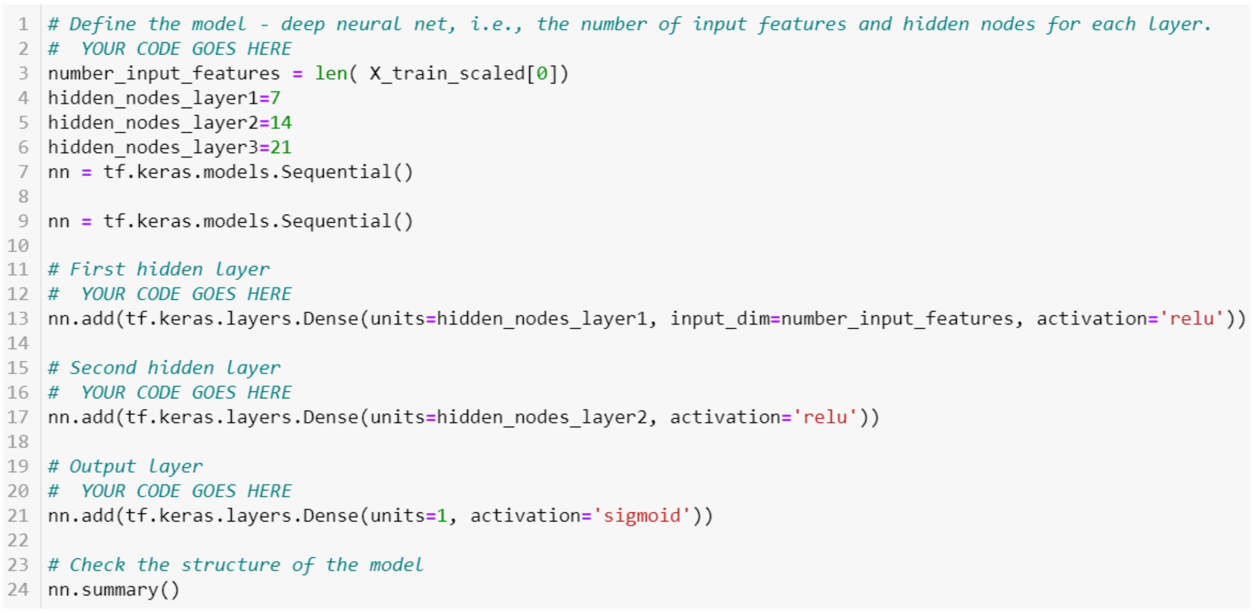
Results:

Data Processing

Any irrelevant information was removed from the dataset. After dropping EIN and NAME, the remaining columns were considered the features for the model. Although NAME was added back in the second test. CLASSIFICATION and APPLICATION_TYPE was replaced with 'Other' due to high fluctuation. The data was split into training and testing sets of data. The target variable for the model is "IS_SUCCESSFUL" which is verified by the value, 1 was considered yes and 0 was no. APPLICATION data was analyzed and CLASSIFICATION's value was used for binning. Each unique value used several data point as a cutoff point to bin "rare" categorical variable together in a new value, 'Other'. Afterwards, binning was checked for success. In addition, the categorical variables were encoded by pd.get_dummies ().

Compiling, Training, and Evaluating the Model

Neural Network was applied on each model multiple layers, three layers total. The number of features dictated the number of hidden nodes.



```python
# Define the model - deep neural net, i.e., the number of input features and hidden nodes for each layer.
#  YOUR CODE GOES HERE
number_input_features = len( X_train_scaled[0])
hidden_nodes_layer1=7
hidden_nodes_layer2=14
hidden_nodes_layer3=21
nn = tf.keras.models.Sequential()

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# First hidden layer
#  YOUR CODE GOES HERE
nn.add(tf.keras.layers.Dense(units=hidden_nodes_layer1, input_dim=number_input_features, activation='relu'))

# Second hidden layer
#  YOUR CODE GOES HERE
nn.add(tf.keras.layers.Dense(units=hidden_nodes_layer2, activation='relu'))

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

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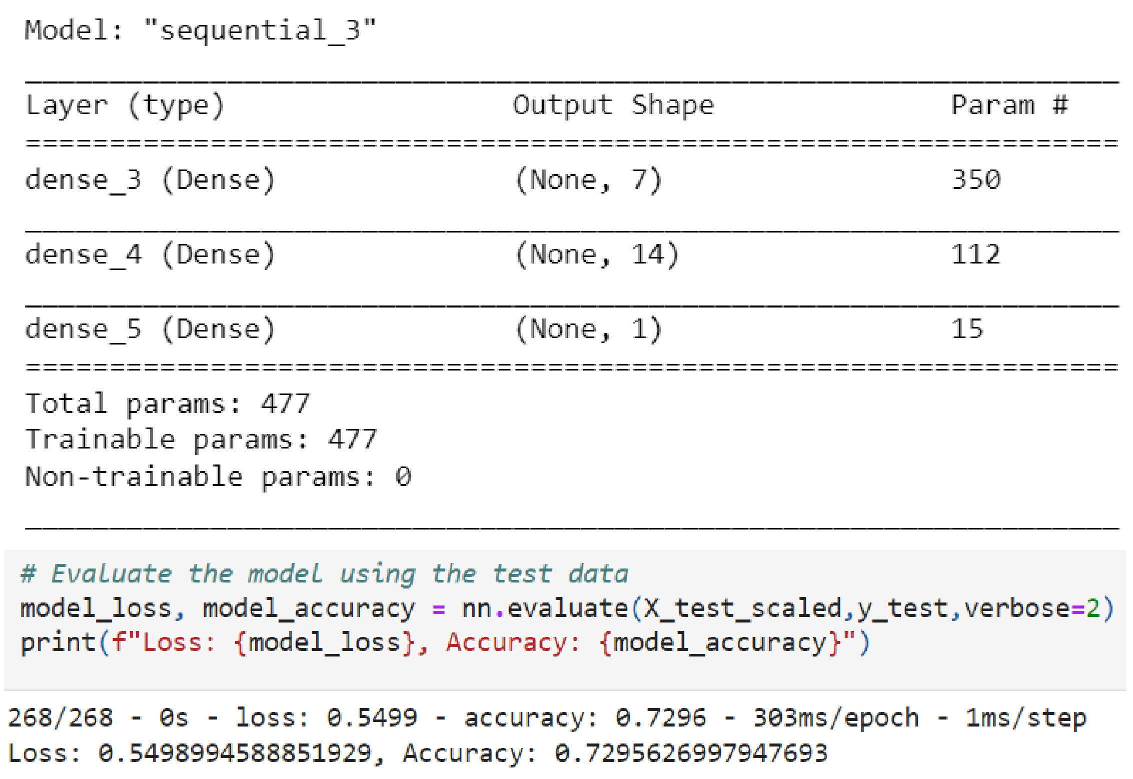

A three-layer training model generated 477 parameters. The first attempt came close at 72%, which was under the desired 75%.



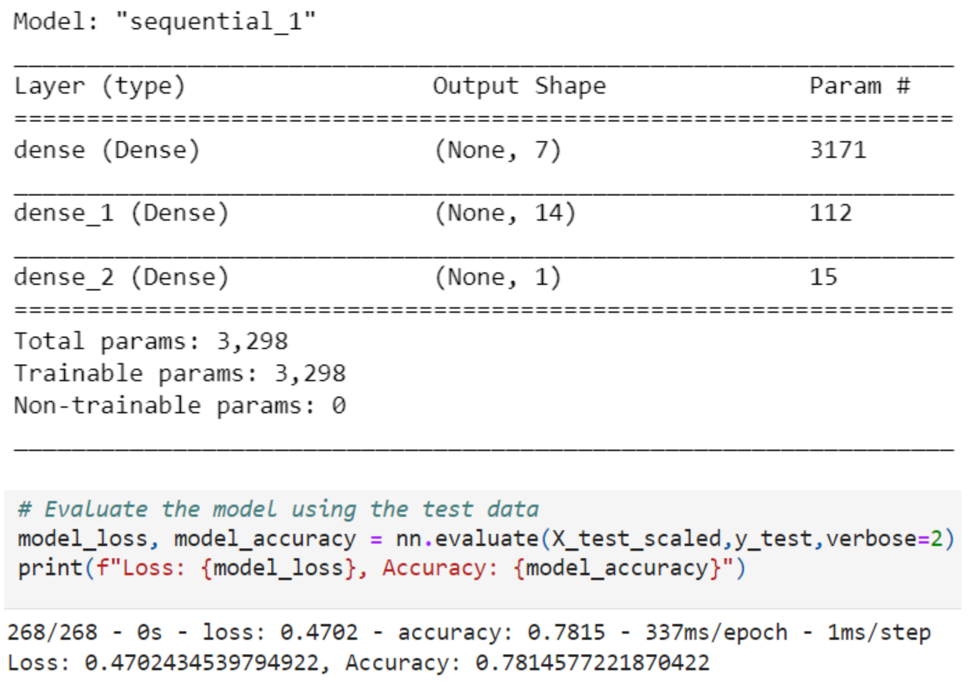
```
Model: "sequential_3"
_________________________________________________________________
Layer (type)                Output Shape              Param #
=================================================================
dense_3 (Dense)             (None, 7)                 350

_________________________________________________________________
dense_4 (Dense)             (None, 14)                112

_________________________________________________________________
dense_5 (Dense)             (None, 1)                 15

=================================================================
Total params: 477
Trainable params: 477
Non-trainable params: 0

_________________________________________________________________
```

```
# 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 - 0s - loss: 0.5499 - accuracy: 0.7296 - 303ms/epoch - 1ms/step
Loss: 0.5498994588851929, Accuracy: 0.7295626997947693
```

Optimization

The second attempt added 'NAME' back into the dataset and achieved 78%, which was over 3% target. A total of 3,298 params.



```
Model: "sequential_1"
_________________________________________________________________
Layer (type)                Output Shape              Param #
=================================================================
dense (Dense)               (None, 7)                 3171

_________________________________________________________________
dense_1 (Dense)             (None, 14)                112

_________________________________________________________________
dense_2 (Dense)             (None, 1)                 15

=================================================================
Total params: 3,298
Trainable params: 3,298
Non-trainable params: 0

_________________________________________________________________
```

```
# 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 - 0s - loss: 0.4702 - accuracy: 0.7815 - 337ms/epoch - 1ms/step
Loss: 0.4702434539794922, Accuracy: 0.7814577221870422
```

Summary:

Multiple layers should be used for deep learning models since it learns how to predict and classify information based on computer filtering inputs through layers.