```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import yfinance as yf
from sklearn.preprocessing import MinMaxScaler
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import SimpleRNN, Dense, Dropout
from keras.callbacks import EarlyStopping


symbol = "GOOGL"  # Google's stock symbol
start_date = "2015-01-01"
end_date = "2021-12-31"

data = yf.download(symbol, start=start_date, end=end_date)
data.head()
```

```
[**********100%%**********]  1 of 1 completed
```

Date	Open	High	Low	Close	Adj Close	Volume
2015-01-02	26.629999	26.790001	26.393999	26.477501	26.477501	26480000
2015-01-05	26.357500	26.399500	25.887501	25.973000	25.973000	41182000
2015-01-06	26.025000	26.060499	25.277500	25.332001	25.332001	54456000
2015-01-07	25.547501	25.574499	25.182501	25.257500	25.257500	46918000
2015-01-08	25.075500	25.375000	24.750999	25.345501	25.345501	73054000

```
scaler = MinMaxScaler()
data['Close_scaled'] = scaler.fit_transform(data['Close'].values.reshape(-1, 1))



sequence_length = 10

X, y = [], []

for i in range(len(data) - sequence_length):
    X.append(data['Close_scaled'].values[i:i+sequence_length])
    y.append(data['Close_scaled'].values[i+sequence_length])

X = np.array(X)
y = np.array(y)



train_size = int(0.8 * len(X))
X_train, X_test = X[:train_size], X[train_size:]
y_train, y_test = y[:train_size], y[train_size:]



# Reshape and normalize data
X_train = X_train.reshape(-1, sequence_length, 1).astype(np.float32)
y_train = y_train.astype(np.float32)

# Build and compile the RNN model
model = Sequential([
    SimpleRNN(units=50, activation='relu', return_sequences=True, input_shape=(sequence_length, 1)),
    SimpleRNN(units=50, activation='relu', return_sequences=True),
    SimpleRNN(units=50, activation='relu'),
    Dense(units=1)
])

model.compile(optimizer='adam',loss='mse',metrics='mean_absolute_error')

# Train the model
callbacks = [EarlyStopping(monitor='loss',patience=10,restore_best_weights=True)]
model.fit(X_train, y_train, epochs=200, batch_size=32, callbacks=callbacks)
```

```
Epoch 1/200
44/44 [==============================] - 3s 14ms/step - loss: 0.0014 - mean_absolute_error: 0.0217
Epoch 2/200
44/44 [==============================] - 1s 17ms/step - loss: 1.0353e-04 - mean_absolute_error: 0.0072
Epoch 3/200
44/44 [==============================] - 0s 10ms/step - loss: 8.9143e-05 - mean_absolute_error: 0.0067
Epoch 4/200
44/44 [==============================] - 0s 9ms/step - loss: 8.4336e-05 - mean_absolute_error: 0.0065
Epoch 5/200
```

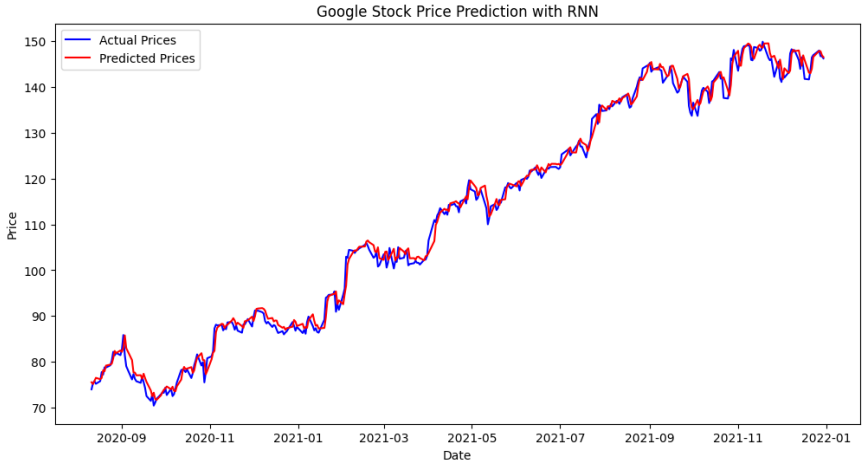
```
44/44 [==============================] - 0s 8ms/step - loss: 7.4253e-05 - mean_absolute_error: 0.0061
Epoch 6/200
44/44 [==============================] - 0s 8ms/step - loss: 8.4241e-05 - mean_absolute_error: 0.0065
Epoch 7/200
44/44 [==============================] - 0s 8ms/step - loss: 7.0061e-05 - mean_absolute_error: 0.0059
Epoch 8/200
44/44 [==============================] - 0s 8ms/step - loss: 8.1830e-05 - mean_absolute_error: 0.0064
Epoch 9/200
44/44 [==============================] - 0s 8ms/step - loss: 6.6673e-05 - mean_absolute_error: 0.0056
Epoch 10/200
44/44 [==============================] - 0s 8ms/step - loss: 6.9998e-05 - mean_absolute_error: 0.0058
Epoch 11/200
44/44 [==============================] - 0s 8ms/step - loss: 6.2361e-05 - mean_absolute_error: 0.0055
Epoch 12/200
44/44 [==============================] - 0s 8ms/step - loss: 5.8092e-05 - mean_absolute_error: 0.0052
Epoch 13/200
44/44 [==============================] - 0s 11ms/step - loss: 5.8433e-05 - mean_absolute_error: 0.0052
Epoch 14/200
44/44 [==============================] - 1s 13ms/step - loss: 5.7221e-05 - mean_absolute_error: 0.0052
Epoch 15/200
44/44 [==============================] - 1s 13ms/step - loss: 6.1325e-05 - mean_absolute_error: 0.0054
Epoch 16/200
44/44 [==============================] - 1s 13ms/step - loss: 5.7386e-05 - mean_absolute_error: 0.0053
Epoch 17/200
44/44 [==============================] - 1s 13ms/step - loss: 5.3439e-05 - mean_absolute_error: 0.0049
Epoch 18/200
44/44 [==============================] - 0s 11ms/step - loss: 5.9059e-05 - mean_absolute_error: 0.0054
Epoch 19/200
44/44 [==============================] - 0s 8ms/step - loss: 5.1683e-05 - mean_absolute_error: 0.0048
Epoch 20/200
44/44 [==============================] - 0s 7ms/step - loss: 5.3199e-05 - mean_absolute_error: 0.0050
Epoch 21/200
44/44 [==============================] - 0s 8ms/step - loss: 5.4371e-05 - mean_absolute_error: 0.0051
Epoch 22/200
44/44 [==============================] - 0s 7ms/step - loss: 6.1838e-05 - mean_absolute_error: 0.0055
Epoch 23/200
44/44 [==============================] - 0s 8ms/step - loss: 7.6070e-05 - mean_absolute_error: 0.0063
Epoch 24/200
44/44 [==============================] - 0s 7ms/step - loss: 6.2281e-05 - mean_absolute_error: 0.0055
Epoch 25/200
44/44 [==============================] - 0s 7ms/step - loss: 6.9573e-05 - mean_absolute_error: 0.0059
Epoch 26/200
44/44 [==============================] - 0s 8ms/step - loss: 6.1143e-05 - mean_absolute_error: 0.0054
Epoch 27/200
44/44 [==============================] - 0s 8ms/step - loss: 1.0909e-04 - mean_absolute_error: 0.0080
Epoch 28/200
44/44 [==============================] - 0s 7ms/step - loss: 5.9044e-05 - mean_absolute_error: 0.0054
Epoch 29/200
44/44 [==============================] - 0s 7ms/step - loss: 5.8641e-05 - mean_absolute_error: 0.0054
```

```
y_pred = model.predict(X_test)
```

```
11/11 [==============================] - 0s 3ms/step
```

```
y_test = y_test.reshape(-1, 1)
y_pred = y_pred.reshape(-1, 1)
y_test_original = scaler.inverse_transform(y_test)
y_pred_original = scaler.inverse_transform(y_pred)


plt.figure(figsize=(12, 6))
plt.plot(data.index[train_size+sequence_length:], y_test_original, label='Actual Prices', color='blue')
plt.plot(data.index[train_size+sequence_length:], y_pred_original, label='Predicted Prices', color='red')
plt.title('Google Stock Price Prediction with RNN')
plt.xlabel('Date')
plt.ylabel('Price')
plt.legend()
plt.show()
```


Google Stock Price Prediction with RNN
Actual Prices
Predicted Prices
Price
Date
150
140
130
120
110
100
90
80
70
2020-09
2020-11
2021-01
2021-03
2021-05
2021-07
2021-09
2021-11
2022-01