#Phapale Apeksha Roll NO: 4231 Div:B
 # DL Practical NO.4

```
import pandas as pd
import numpy as np
train_df =
pd.read_csv(r'C:\Users\apeksha\Downloads\DL\pract_4\Google_Stock_Price_Train.csv')
print(train_df)
test_df = pd.read_csv(r'C:\Users\Pallavi
Nile\Downloads\DL\pract_4\Google_Stock_Price_Test.csv')
print(test_df)
print( test_df.info())

#Data preprocessing
from sklearn.preprocessing import MinMaxScaler
# Convert 'Close' column to string type and remove commas
train_df['Close'] = train_df['Close'].astype(str).str.replace(',', '').astype(float)
test_df['Close'] = test_df['Close'].astype(str).str.replace(',', '').astype(float)
# Normalize the training and testing data separately
train_scaler = MinMaxScaler()
train_df['Normalized Close'] = train_scaler.fit_transform(train_df['Close'].
values.reshape(-1, 1))
test_scaler = MinMaxScaler()
test_df['Normalized Close'] = test_scaler.fit_transform(test_df['Close'].values.
reshape(-1, 1))

# Convert the data to the appropriate format for RNN
x_train = train_df['Normalized Close'].values[:-1].reshape(-1, 1, 1)
y_train = train_df['Normalized Close'].values[1:].reshape(-1, 1, 1)
x_test = test_df['Normalized Close'].values[:-1].reshape(-1, 1, 1)
y_test = test_df['Normalized Close'].values[1:].reshape(-1, 1, 1)

print("x_train shape: ",x_train.shape)
print("y_train shape: ",y_train.shape)
print("x_test shape: ",x_test.shape)
print("y_test shape: ",y_test.shape)

print(train_df)
```

```
print(test_df)
print(test_df.info())

from keras.models import Sequential
from keras.layers import LSTM, Dense
model = Sequential()
model.add(LSTM(4, input_shape=(1, 1)))
model.add(Dense(1))
model.compile(loss='mean_squared_error', optimizer='adam')
model.summary()

#model training
model.fit(x_train, y_train, epochs=100, batch_size=1, verbose=1)

#model evaluation
test_loss = model.evaluate(x_test, y_test)
print('Testing loss: ', test_loss)

#model testing
y_pred = model.predict(x_test)
# Inverse transform the normalized values to get the actual values
y_test_actual = test_scaler.inverse_transform(y_test.reshape(-1, 1))
y_pred_actual = test_scaler.inverse_transform(y_pred.reshape(-1, 1))
i=1
print("Actual value: {:.2f}".format(y_test_actual[i][0]))
print("Predicted value: {:.2f}".format(y_pred_actual[i][0]))
```

Output:

```
Data columns (total 7 columns):
 #   Column           Non-Null Count  Dtype
---  ------           --------------  -----
 0   Date             20 non-null     object
 1   Open             20 non-null     float64
 2   High             20 non-null     float64
 3   Low              20 non-null     float64
 4   Close            20 non-null     float64
 5   Volume           20 non-null     object
 6   Normalized Close  20 non-null     float64
```

dtypes: float64(5), object(2)
memory usage: 1.2+ KB
None
Model: "sequential_3"

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Layer (type)	Output Shape	Param #
lstm_2 (LSTM)	(None, 4)	96
dense_5 (Dense)	(None, 1)	5

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Total params: 101
Trainable params: 101
Non-trainable params: 0

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Epoch 1/100
1257/1257 [==============================] - 3s 1ms/step - loss: 0.0280
Epoch 2/100
1257/1257 [==============================] - 2s 1ms/step - loss: 0.0014
Epoch 3/100
1257/1257 [==============================] - 1s 1ms/step - loss: 7.5121e-04
Epoch 4/100
1257/1257 [==============================] - 1s 1ms/step - loss: 7.5840e-04
Epoch 5/100
1257/1257 [==============================] - 1s 1ms/step - loss: 7.2355e-04
Epoch 6/100
1257/1257 [==============================] - 1s 1ms/step - loss: 8.0052e-04
Epoch 7/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5993e-04
Epoch 8/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.7384e-04
Epoch 9/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5678e-04
Epoch 10/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5570e-04
Epoch 11/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6202e-04

Epoch 12/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6457e-04
Epoch 13/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5565e-04
Epoch 14/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5255e-04
Epoch 15/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6610e-04
Epoch 16/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6055e-04
Epoch 17/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5997e-04
Epoch 18/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5733e-04
Epoch 19/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6517e-04
Epoch 20/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.4971e-04
Epoch 21/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6198e-04
Epoch 22/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.4764e-04
Epoch 23/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6130e-04
Epoch 24/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6126e-04
Epoch 25/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.4789e-04
Epoch 26/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.7258e-04
Epoch 27/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5755e-04
Epoch 28/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6110e-04
Epoch 29/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6231e-04
Epoch 30/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.4707e-04

Epoch 31/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5658e-04
Epoch 32/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6453e-04
Epoch 33/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5216e-04
Epoch 34/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.4584e-04
Epoch 35/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5470e-04
Epoch 36/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.4857e-04
Epoch 37/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6248e-04
Epoch 38/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6770e-04
Epoch 39/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6173e-04
Epoch 40/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5110e-04
Epoch 41/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6038e-04
Epoch 42/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.4611e-04
Epoch 43/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6135e-04
Epoch 44/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6493e-04
Epoch 45/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.4718e-04
Epoch 46/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.4901e-04
Epoch 47/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5801e-04
Epoch 48/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5971e-04
Epoch 49/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5674e-04

Epoch 50/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5868e-04
Epoch 51/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5481e-04
Epoch 52/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5386e-04
Epoch 53/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5523e-04
Epoch 54/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6254e-04
Epoch 55/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5177e-04
Epoch 56/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5200e-04
Epoch 57/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5651e-04
Epoch 58/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.4635e-04
Epoch 59/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.4019e-04
Epoch 60/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.4784e-04
Epoch 61/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.7016e-04
Epoch 62/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6614e-04
Epoch 63/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.4779e-04
Epoch 64/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5891e-04
Epoch 65/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5930e-04
Epoch 66/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5890e-04
Epoch 67/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5841e-04
Epoch 68/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5539e-04

Epoch 69/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5397e-04
Epoch 70/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6236e-04
Epoch 71/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5471e-04
Epoch 72/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5061e-04
Epoch 73/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.4939e-04
Epoch 74/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6361e-04
Epoch 75/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.4909e-04
Epoch 76/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5398e-04
Epoch 77/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5492e-04
Epoch 78/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5263e-04
Epoch 79/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5514e-04
Epoch 80/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5153e-04
Epoch 81/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5168e-04
Epoch 82/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.4175e-04
Epoch 83/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5439e-04
Epoch 84/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.4195e-04
Epoch 85/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6719e-04
Epoch 86/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5232e-04
Epoch 87/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.4816e-04

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Epoch 88/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6150e-04
Epoch 89/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6817e-04
Epoch 90/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.4801e-04
Epoch 91/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6080e-04
Epoch 92/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5341e-04
Epoch 93/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.3580e-04
Epoch 94/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5394e-04
Epoch 95/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.7037e-04
Epoch 96/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6110e-04
Epoch 97/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.5788e-04
Epoch 98/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6228e-04
Epoch 99/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6557e-04
Epoch 100/100
1257/1257 [==============================] - 2s 1ms/step - loss: 7.6197e-04
1/1 [==============================] - 0s 392ms/step - loss: 0.0251

Testing loss:  0.025147425010800036

1/1 [==============================] - 0s 323ms/step

Actual value: 794.02
Predicted value: 786.94
```