```
# Latihan 1
# import library pandas
import pandas as pd

# Import library numpy
import numpy as np

# Import library matplotlib untuk visualisasi
import matplotlib.pyplot as plt

# import library for build model
from keras.layers import Dense, Dropout, SimpleRNN, LSTM
from keras.models import Sequential

# import library untuk data preprocessing
from sklearn.preprocessing import MinMaxScaler
from sklearn.model_selection import train_test_split
from sklearn.metrics import r2_score

dataset ="Stock.csv"
data = pd.read_csv(dataset)

data.head()
```

	Date	Open	High	Low	Close	Volume	Name
0	2006-01-03	56.45	56.66	55.46	56.53	3716500	UTX
1	2006-01-04	56.80	56.80	55.84	56.19	3114500	UTX
2	2006-01-05	56.30	56.49	55.63	55.98	3118900	UTX
3	2006-01-06	56.45	56.67	56.10	56.16	2874300	UTX
4	2006-01-09	56.37	56.90	56.16	56.80	2467200	UTX

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3020 entries, 0 to 3019
Data columns (total 7 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   Date    3020 non-null   object
 1   Open    3019 non-null   float64
 2   High    3020 non-null   float64
 3   Low     3020 non-null   float64
 4   Close   3020 non-null   float64
 5   Volume  3020 non-null   int64
 6   Name    3020 non-null   object
dtypes: float64(4), int64(1), object(2)
memory usage: 165.3+ KB
```

```
# Kolom 'low' yang akan kita gunakan dalam membangun model
# Slice kolom 'low'
```

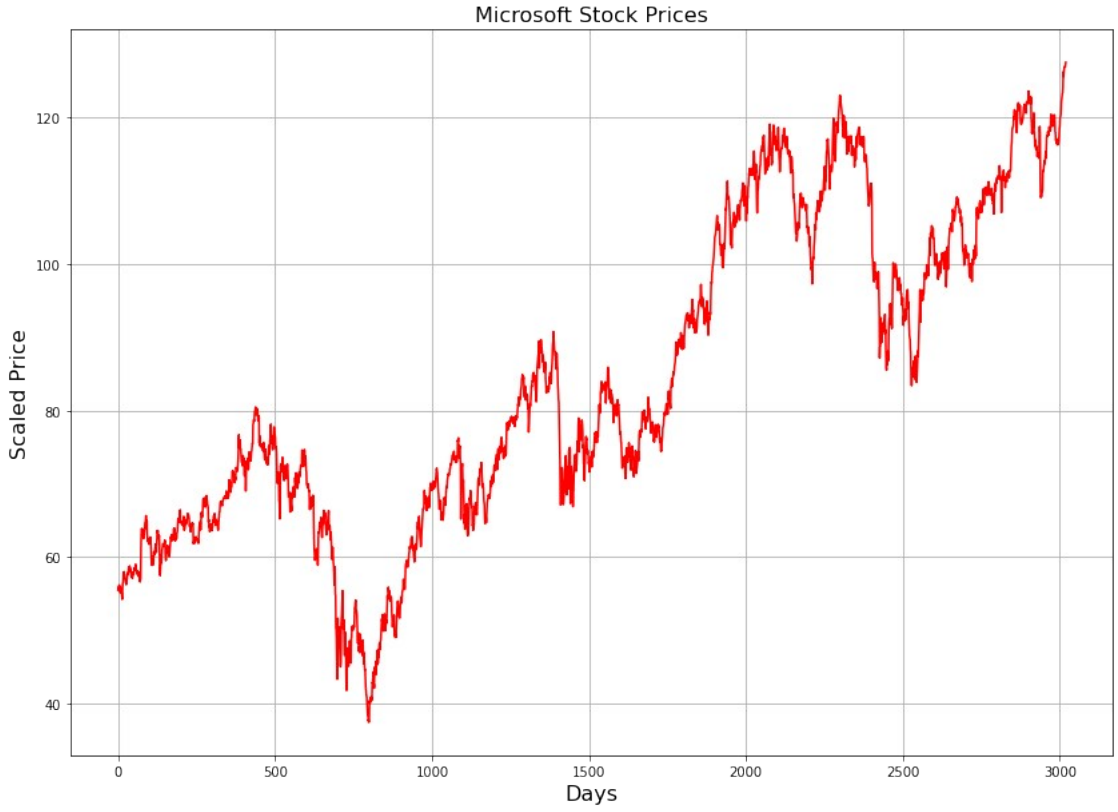
```
Low_data = data.iloc[:,3:4].values

# cek output low_data
Low_data

array([[ 55.46],
       [ 55.84],
       [ 55.63],
       ...,
       [126.92],
       [127.29],
       [127.57]])

# Visualizing low_data

plt.figure(figsize=(14,10))
plt.plot(Low_data,c="red")
plt.title("Microsoft Stock Prices",fontsize=16)
plt.xlabel("Days",fontsize=16)
plt.ylabel("Scaled Price",fontsize=16)
plt.grid()
plt.show()
```




```
# Latihan 2
# Menskalakan data antara 1 dan 0 (scaling) pada low data
```

```
sc = MinMaxScaler(feature_range=(0,1))
training_set_scaled = sc.fit_transform(Low_data)

# definisikan variabel step dan train

step_size = 21

train_x = []
train_y = []

# membuat fitur dan lists label

for i in range(step_size, 3019):
    train_x.append(training_set_scaled[i-step_size:i,0])
    train_y.append(training_set_scaled[i,0])

# mengonversi list yang telah dibuat sebelumnya ke array

train_x = np.array(train_x)
train_y = np.array(train_y)

# cek dimensi data dengan function .shape

print(train_x.shape)
```

```
(2998, 21)
```

```
# 498 hari terakhir akan digunakan dalam pengujian
# 2500 hari pertama akan digunakan dalam pelatihan

test_x = train_x[2500:]
train_x = train_x[:2500]
test_y = train_y[2500:]
train_y = train_y[:2500]

# reshape data untuk dimasukkan kedalam Keras model

train_x = np.reshape(train_x, (2500, step_size, 1))
test_x = np.reshape(test_x, (498, step_size, 1))

# cek kembali dimensi data yang telah di reshape dengan
function .shape

print(train_x.shape)
print(test_x.shape)
```

```
(2500, 21, 1)
(498, 21, 1)
```

```
# Latihan 3
# buat varibel penampung model RNN
rnn_model = Sequential()

# Output dari SimpleRNN akan menjadi bentuk tensor 2D (batch_size, 40)
dengan Dropout sebesar 0.15

rnn_model.add(SimpleRNN(40, activation="tanh", return_sequences=True,
input_shape=(train_x.shape[1],1)))
rnn_model.add(Dropout(0.15))

rnn_model.add(SimpleRNN(40, activation="tanh", return_sequences=True))
rnn_model.add(Dropout(0.15))

rnn_model.add(SimpleRNN(40, activation="tanh",
return_sequences=False))
rnn_model.add(Dropout(0.15))

# Add a Dense layer with 1 units.
rnn_model.add(Dense(1))

# menambahkan loss function kedalam model RNN dengan tipe MSE

rnn_model.compile(optimizer="adam",loss="MSE")

# fit the model RNN, dengan epoch 20 dan batch size 25

rnn_model.fit(train_x,train_y,epochs=20,batch_size=25)
```

```
Epoch 1/20
100/100 [==============================] - 4s 14ms/step - loss: 0.1203
Epoch 2/20
100/100 [==============================] - 1s 14ms/step - loss: 0.0355
Epoch 3/20
100/100 [==============================] - 1s 14ms/step - loss: 0.0208
Epoch 4/20
100/100 [==============================] - 1s 14ms/step - loss: 0.0151
Epoch 5/20
100/100 [==============================] - 1s 14ms/step - loss: 0.0114
Epoch 6/20
100/100 [==============================] - 1s 14ms/step - loss: 0.0101
Epoch 7/20
100/100 [==============================] - 1s 14ms/step - loss: 0.0077
Epoch 8/20
100/100 [==============================] - 1s 14ms/step - loss: 0.0065
Epoch 9/20
100/100 [==============================] - 1s 14ms/step - loss: 0.0057
Epoch 10/20
100/100 [==============================] - 1s 14ms/step - loss: 0.0053
Epoch 11/20
```

```
100/100 [==============================] - 1s 14ms/step - loss: 0.0047
Epoch 12/20
100/100 [==============================] - 1s 14ms/step - loss: 0.0043
Epoch 13/20
100/100 [==============================] - 1s 14ms/step - loss: 0.0039
Epoch 14/20
100/100 [==============================] - 1s 14ms/step - loss: 0.0035
Epoch 15/20
100/100 [==============================] - 1s 14ms/step - loss: 0.0032
Epoch 16/20
100/100 [==============================] - 1s 14ms/step - loss: 0.0030
Epoch 17/20
100/100 [==============================] - 1s 14ms/step - loss: 0.0029
Epoch 18/20
100/100 [==============================] - 1s 14ms/step - loss: 0.0027
Epoch 19/20
100/100 [==============================] - 1s 14ms/step - loss: 0.0024
Epoch 20/20
100/100 [==============================] - 1s 14ms/step - loss: 0.0025

<keras.callbacks.History at 0x7f8b263c4290>
```

```
# Prediksi Model RNN
rnn_predictions = rnn_model.predict(test_x)

rnn_score = r2_score(test_y,rnn_predictions)

rnn_score
```

```
0.9551457000466379
```

```
# Latihan 4
lstm_model = Sequential()

# Add a LSTM layer with 40 internal units. dengan Dropout sebesar 0.15
lstm_model.add(LSTM(40, activation="tanh", return_sequences=True,
input_shape=(train_x.shape[1],1)))
lstm_model.add(Dropout(0.15))

lstm_model.add(LSTM(40, activation="tanh", return_sequences=True))
lstm_model.add(Dropout(0.15))

lstm_model.add(LSTM(40, activation="tanh", return_sequences=False))
lstm_model.add(Dropout(0.15))

# Add a Dense layer with 1 units.
lstm_model.add(Dense(1))

# menambahkan loss function kedalam model lstm dengan tipe MSE

lstm_model.compile(optimizer="adam",loss="MSE")
```

```
# fit lstm model, dengan epoch 20 dan batch size 25

lstm_model.fit(train_x,train_y,epochs=20,batch_size=25)
```

```
Epoch 1/20
100/100 [==============================] - 7s 24ms/step - loss: 0.0142
Epoch 2/20
100/100 [==============================] - 2s 24ms/step - loss: 0.0035
Epoch 3/20
100/100 [==============================] - 2s 24ms/step - loss: 0.0030
Epoch 4/20
100/100 [==============================] - 2s 24ms/step - loss: 0.0027
Epoch 5/20
100/100 [==============================] - 2s 24ms/step - loss: 0.0025
Epoch 6/20
100/100 [==============================] - 2s 24ms/step - loss: 0.0022
Epoch 7/20
100/100 [==============================] - 2s 24ms/step - loss: 0.0024
Epoch 8/20
100/100 [==============================] - 2s 24ms/step - loss: 0.0021
Epoch 9/20
100/100 [==============================] - 2s 25ms/step - loss: 0.0021
Epoch 10/20
100/100 [==============================] - 2s 24ms/step - loss: 0.0021
Epoch 11/20
100/100 [==============================] - 2s 24ms/step - loss: 0.0021
Epoch 12/20
100/100 [==============================] - 2s 24ms/step - loss: 0.0019
Epoch 13/20
100/100 [==============================] - 2s 24ms/step - loss: 0.0019
Epoch 14/20
100/100 [==============================] - 2s 24ms/step - loss: 0.0017
Epoch 15/20
100/100 [==============================] - 2s 24ms/step - loss: 0.0018
Epoch 16/20
100/100 [==============================] - 2s 24ms/step - loss: 0.0018
Epoch 17/20
100/100 [==============================] - 2s 24ms/step - loss: 0.0016
Epoch 18/20
100/100 [==============================] - 2s 24ms/step - loss: 0.0015
Epoch 19/20
100/100 [==============================] - 2s 24ms/step - loss: 0.0017
Epoch 20/20
100/100 [==============================] - 2s 24ms/step - loss: 0.0015
```

```
<keras.callbacks.History at 0x7f8b26019510>
```

```
# Prediksi Model LSTM
lstm_predictions = lstm_model.predict(test_x)

lstm_score = r2_score(test_y,lstm_predictions)
```

```
lstm_score
```

```
0.9586084988197332
```

```
# Latihan 5
# Cetak nilai prediksi masing-masing model dengan menggunakan r^2
square
```

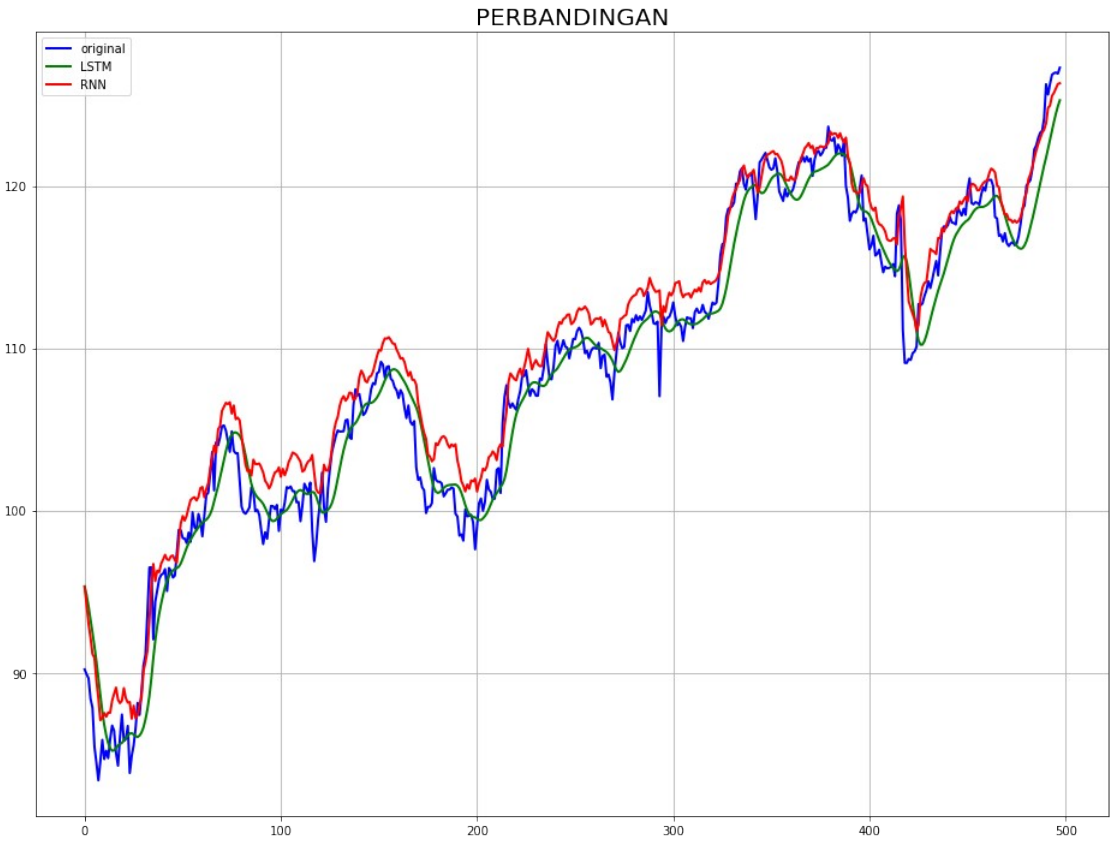
```
print("R^2 Score of RNN", rnn_score)
print("R^2 Score of LSTM", lstm_score)
```

```
R^2 Score of RNN 0.9551457000466379
R^2 Score of LSTM 0.9586084988197332
```

```
lstm_predictions = sc.inverse_transform(lstm_predictions)
rnn_predictions = sc.inverse_transform(rnn_predictions)
test_y = sc.inverse_transform(test_y.reshape(-1,1))
```

```
plt.figure(figsize=(16,12))
```

```
plt.plot(test_y, c="blue",linewidth=2, label="original")
plt.plot(lstm_predictions, c="green",linewidth=2, label="LSTM")
plt.plot(rnn_predictions, c="red",linewidth=2, label="RNN")
plt.legend()
plt.title("PERBANDINGAN",fontsize=20)
plt.grid()
plt.show()
```



Kesimpulan : Dari visualisasi hasil antara Original, LSTM dan RNN menampilkan grafik yang hampir sama semakin tinngi prediksi maka akan semakin naik pula grafiknya