Stock Market Prediction And Forecasting Using Stacked LSTM

In [ ]:
```
### Keras and Tensorflow >2.0
```

In [403…
```
### Data Collection
import pandas_datareader as pdr
key=""
```

In [404…
```
df = pdr.get_data_tiingo('AAPL', api_key=key)
```

In [283…
```
df.to_csv('AAPL.csv')
```

In [405…
```
import pandas as pd
```

In [406…
```
df=pd.read_csv('AAPL.csv')
```

In [407…
```
df.head()
```

Out[407]:

	Unnamed: 0	symbol	date	close	high	low	open	volume	adjClose	adjHigh	
0	0	AAPL	2015-05-27 00:00:00+00:00	132.045	132.260	130.05	130.34	45833246	121.682558	121.880685	119
1	1	AAPL	2015-05-28 00:00:00+00:00	131.780	131.950	131.10	131.86	30733309	121.438354	121.595013	120
2	2	AAPL	2015-05-29 00:00:00+00:00	130.280	131.450	129.90	131.23	50884452	120.056069	121.134251	119
3	3	AAPL	2015-06-01 00:00:00+00:00	130.535	131.390	130.05	131.20	32112797	120.291057	121.078960	119
4	4	AAPL	2015-06-02 00:00:00+00:00	129.960	130.655	129.32	129.86	33667627	119.761181	120.401640	119

In [409…
```
df.tail()
```

Out[409]:

	Unnamed: 0	symbol	date	close	high	low	open	volume	adjClose	adjHigh	adjL
1253	1253	AAPL	2020-05-18 00:00:00+00:00	314.96	316.50	310.3241	313.17	33843125	314.96	316.50	310.3
1254	1254	AAPL	2020-05-19 00:00:00+00:00	313.14	318.52	313.0100	315.03	25432385	313.14	318.52	313.0
1255	1255	AAPL	2020-05-20 00:00:00+00:00	319.23	319.52	316.2000	316.68	27876215	319.23	319.52	316.2
1256	1256	AAPL	2020-05-21 00:00:00+00:00	316.85	320.89	315.8700	318.66	25672211	316.85	320.89	315.8
1257	1257	AAPL	2020-05-22 00:00:00+00:00	318.89	319.23	315.3500	315.77	20450754	318.89	319.23	315.3

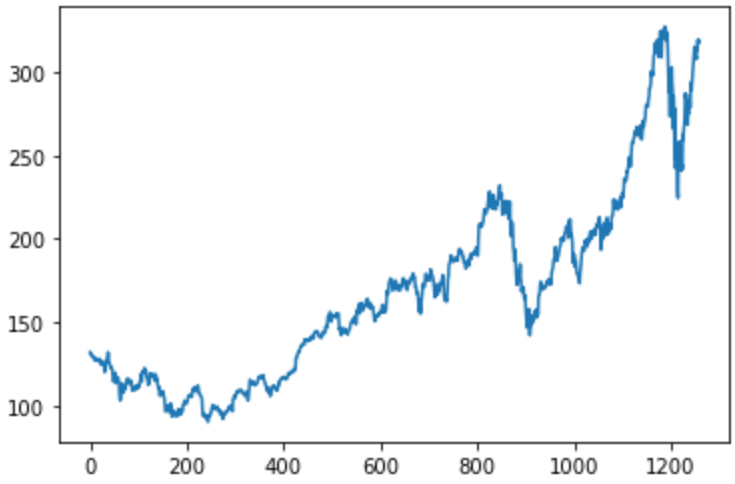
In [410…
```
df1=df.reset_index()['close']
```

In [412…
```
df1
```

Out[412]:
```
0       132.045
1       131.780
2       130.280
3       130.535
4       129.960
         ...
1253    314.960
1254    313.140
1255    319.230
1256    316.850
1257    318.890
Name: close, Length: 1258, dtype: float64
```

In [413…
```
import matplotlib.pyplot as plt
plt.plot(df1)
```

Out[413]:
```
[<matplotlib.lines.Line2D at 0x2d1a92724e0>]
```



In [291…
```
### LSTM are sensitive to the scale of the data. so we apply MinMax scaler
```

In [292…
```
import numpy as np
```

In [414…
```
df1
```

Out[414]:
```
0       132.045
1       131.780
2       130.280
3       130.535
4       129.960
         ...
1253    314.960
1254    313.140
1255    319.230
1256    316.850
1257    318.890
Name: close, Length: 1258, dtype: float64
```

In [415…
```
from sklearn.preprocessing import MinMaxScaler
scaler=MinMaxScaler(feature_range=(0,1))
df1=scaler.fit_transform(np.array(df1).reshape(-1,1))
```

In [417…
```
print(df1)
```

```
[[0.17607447]
 [0.17495567]
 [0.16862282]
 ...
 [0.96635143]
 [0.9563033 ]
 [0.96491598]]
```

In [418…
```
##splitting dataset into train and test split
training_size=int(len(df1)*0.65)
test_size=len(df1)-training_size
train_data,test_data=df1[0:training_size,:],df1[training_size:len(df1),:1]
```

In [419…
```
training_size,test_size
```

Out[419]:
```
(817, 441)
```

In [422…
```
train_data
```

Out[422]:
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```

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```

```
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[0.5062062 ],
[0.51920966],
[0.53719497],
[0.52824453],
[0.52647133]])
```

In [423…

```python
import numpy
# convert an array of values into a dataset matrix
def create_dataset(dataset, time_step=1):
        dataX, dataY = [], []
        for i in range(len(dataset)-time_step-1):
                a = dataset[i:(i+time_step), 0]   ###i=0, 0,1,2,3-----99   100
                dataX.append(a)
                dataY.append(dataset[i + time_step, 0])
        return numpy.array(dataX), numpy.array(dataY)
```

In [424…
```
# reshape into X=t,t+1,t+2,t+3 and Y=t+4
time_step = 100
X_train, y_train = create_dataset(train_data, time_step)
X_test, ytest = create_dataset(test_data, time_step)
```

In [426…
```
print(X_train.shape), print(y_train.shape)
```

```
(716, 100)
(716,)
```
Out[426]: (None, None)

In [299…
```
print(X_test.shape), print(ytest.shape)
```

```
(340, 100)
(340,)
```
Out[299]: (None, None)

In [427…
```
# reshape input to be [samples, time steps, features] which is required for LSTM
X_train =X_train.reshape(X_train.shape[0],X_train.shape[1] , 1)
X_test = X_test.reshape(X_test.shape[0],X_test.shape[1] , 1)
```

In [428…
```
### Create the Stacked LSTM model
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense
from tensorflow.keras.layers import LSTM
```

In [429…
```
model=Sequential()
model.add(LSTM(50,return_sequences=True,input_shape=(100,1)))
model.add(LSTM(50,return_sequences=True))
model.add(LSTM(50))
model.add(Dense(1))
model.compile(loss='mean_squared_error',optimizer='adam')
```

In [430…
```
model.summary()
```

```
Model: "sequential_3"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
lstm_7 (LSTM)                (None, 100, 50)           10400
_________________________________________________________________
lstm_8 (LSTM)                (None, 100, 50)           20200
_________________________________________________________________
lstm_9 (LSTM)                (None, 50)                20200
_________________________________________________________________
dense_3 (Dense)              (None, 1)                 51
=================================================================
Total params: 50,851
Trainable params: 50,851
Non-trainable params: 0
_________________________________________________________________
```

In [306…
```
model.summary()
```

```
Model: "sequential_2"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
lstm_4 (LSTM)                (None, 100, 50)           10400
_________________________________________________________________
lstm_5 (LSTM)                (None, 100, 50)           20200
_________________________________________________________________
lstm_6 (LSTM)                (None, 50)                20200
_________________________________________________________________
dense_2 (Dense)              (None, 1)                 51
=================================================================
Total params: 50,851
Trainable params: 50,851
Non-trainable params: 0
_________________________________________________________________
```

In [ ]:

In [431…

```
model.fit(X_train,y_train,validation_data=(X_test,ytest),epochs=100,batch_size=64,verbos
```

```
Epoch 1/100
12/12 [==============================] - 6s 487ms/step - loss: 0.0206 - val_loss: 0.0505
Epoch 2/100
12/12 [==============================] - 4s 309ms/step - loss: 0.0035 - val_loss: 0.0046
Epoch 3/100
12/12 [==============================] - 4s 300ms/step - loss: 0.0014 - val_loss: 0.0040
Epoch 4/100
12/12 [==============================] - 3s 287ms/step - loss: 8.1361e-04 - val_loss: 0.
0073
Epoch 5/100
12/12 [==============================] - 3s 290ms/step - loss: 6.6860e-04 - val_loss: 0.
0062
Epoch 6/100
12/12 [==============================] - 3s 255ms/step - loss: 6.4653e-04 - val_loss: 0.
0062
Epoch 7/100
12/12 [==============================] - 3s 291ms/step - loss: 6.6186e-04 - val_loss: 0.
0062
Epoch 8/100
12/12 [==============================] - 4s 300ms/step - loss: 6.2498e-04 - val_loss: 0.
0049
Epoch 9/100
12/12 [==============================] - 4s 297ms/step - loss: 6.2745e-04 - val_loss: 0.
0042
Epoch 10/100
12/12 [==============================] - 4s 303ms/step - loss: 6.0206e-04 - val_loss: 0.
0050
Epoch 11/100
12/12 [==============================] - 4s 298ms/step - loss: 5.9884e-04 - val_loss: 0.
0061
Epoch 12/100
12/12 [==============================] - 4s 304ms/step - loss: 6.1458e-04 - val_loss: 0.
0044
Epoch 13/100
12/12 [==============================] - 4s 304ms/step - loss: 5.6830e-04 - val_loss: 0.
0041
Epoch 14/100
12/12 [==============================] - 3s 262ms/step - loss: 5.5734e-04 - val_loss: 0.
0038
Epoch 15/100
12/12 [==============================] - 3s 244ms/step - loss: 5.5456e-04 - val_loss: 0.
0034
Epoch 16/100
12/12 [==============================] - 3s 277ms/step - loss: 5.3865e-04 - val_loss: 0.
0034
Epoch 17/100
12/12 [==============================] - 3s 271ms/step - loss: 5.3872e-04 - val_loss: 0.
0032
Epoch 18/100
12/12 [==============================] - 3s 260ms/step - loss: 5.2315e-04 - val_loss: 0.
0030
Epoch 19/100
12/12 [==============================] - 3s 275ms/step - loss: 5.1791e-04 - val_loss: 0.
0029
Epoch 20/100
12/12 [==============================] - 3s 274ms/step - loss: 5.0077e-04 - val_loss: 0.
0028
Epoch 21/100
12/12 [==============================] - 3s 273ms/step - loss: 4.8672e-04 - val_loss: 0.
0032
Epoch 22/100
12/12 [==============================] - 3s 270ms/step - loss: 4.9148e-04 - val_loss: 0.
0026
Epoch 23/100
```

```
12/12 [==============================] - 3s 283ms/step - loss: 4.9279e-04 - val_loss: 0.
0026
Epoch 24/100
12/12 [==============================] - 4s 308ms/step - loss: 5.2013e-04 - val_loss: 0.
0024
Epoch 25/100
12/12 [==============================] - 3s 275ms/step - loss: 5.7301e-04 - val_loss: 0.
0024
Epoch 26/100
12/12 [==============================] - 4s 295ms/step - loss: 5.5014e-04 - val_loss: 0.
0030
Epoch 27/100
12/12 [==============================] - 4s 301ms/step - loss: 4.8608e-04 - val_loss: 0.
0022
Epoch 28/100
12/12 [==============================] - 3s 278ms/step - loss: 4.4525e-04 - val_loss: 0.
0022
Epoch 29/100
12/12 [==============================] - 4s 299ms/step - loss: 4.2446e-04 - val_loss: 0.
0028
Epoch 30/100
12/12 [==============================] - 4s 302ms/step - loss: 4.9896e-04 - val_loss: 0.
0023
Epoch 31/100
12/12 [==============================] - 3s 278ms/step - loss: 4.7568e-04 - val_loss: 0.
0022
Epoch 32/100
12/12 [==============================] - 4s 294ms/step - loss: 4.3184e-04 - val_loss: 0.
0027
Epoch 33/100
12/12 [==============================] - 4s 292ms/step - loss: 4.1365e-04 - val_loss: 0.
0025
Epoch 34/100
12/12 [==============================] - 3s 276ms/step - loss: 4.0967e-04 - val_loss: 0.
0022
Epoch 35/100
12/12 [==============================] - 3s 250ms/step - loss: 3.9084e-04 - val_loss: 0.
0018
Epoch 36/100
12/12 [==============================] - 3s 291ms/step - loss: 3.8744e-04 - val_loss: 0.
0016
Epoch 37/100
12/12 [==============================] - 3s 254ms/step - loss: 3.6441e-04 - val_loss: 0.
0024
Epoch 38/100
12/12 [==============================] - 3s 272ms/step - loss: 4.3088e-04 - val_loss: 0.
0025
Epoch 39/100
12/12 [==============================] - 3s 259ms/step - loss: 4.1398e-04 - val_loss: 0.
0016
Epoch 40/100
12/12 [==============================] - 3s 274ms/step - loss: 3.8981e-04 - val_loss: 0.
0016
Epoch 41/100
12/12 [==============================] - 3s 261ms/step - loss: 3.4896e-04 - val_loss: 0.
0028
Epoch 42/100
12/12 [==============================] - 3s 282ms/step - loss: 3.7910e-04 - val_loss: 0.
0014
Epoch 43/100
12/12 [==============================] - 3s 274ms/step - loss: 3.6404e-04 - val_loss: 0.
0022
Epoch 44/100
12/12 [==============================] - 3s 277ms/step - loss: 3.8073e-04 - val_loss: 0.
```

```
0014
Epoch 45/100
12/12 [==============================] - 3s 276ms/step - loss: 4.0008e-04 - val_loss: 0.
0016
Epoch 46/100
12/12 [==============================] - 3s 273ms/step - loss: 4.0253e-04 - val_loss: 0.
0015
Epoch 47/100
12/12 [==============================] - 3s 286ms/step - loss: 3.5930e-04 - val_loss: 0.
0018
Epoch 48/100
12/12 [==============================] - 3s 264ms/step - loss: 3.0690e-04 - val_loss: 0.
0016
Epoch 49/100
12/12 [==============================] - 3s 288ms/step - loss: 3.0504e-04 - val_loss: 0.
0022
Epoch 50/100
12/12 [==============================] - 3s 277ms/step - loss: 3.1205e-04 - val_loss: 0.
0016
Epoch 51/100
12/12 [==============================] - 3s 291ms/step - loss: 2.8386e-04 - val_loss: 0.
0014
Epoch 52/100
12/12 [==============================] - 3s 282ms/step - loss: 2.9832e-04 - val_loss: 0.
0016
Epoch 53/100
12/12 [==============================] - 3s 287ms/step - loss: 2.8287e-04 - val_loss: 0.
0018
Epoch 54/100
12/12 [==============================] - 3s 286ms/step - loss: 2.8193e-04 - val_loss: 0.
0013
Epoch 55/100
12/12 [==============================] - 4s 295ms/step - loss: 2.8989e-04 - val_loss: 0.
0026
Epoch 56/100
12/12 [==============================] - 3s 262ms/step - loss: 2.7761e-04 - val_loss: 0.
0014
Epoch 57/100
12/12 [==============================] - 3s 270ms/step - loss: 2.6088e-04 - val_loss: 0.
0016
Epoch 58/100
12/12 [==============================] - 3s 289ms/step - loss: 2.7300e-04 - val_loss: 0.
0013
Epoch 59/100
12/12 [==============================] - 3s 288ms/step - loss: 2.6058e-04 - val_loss: 0.
0020
Epoch 60/100
12/12 [==============================] - 3s 285ms/step - loss: 2.5682e-04 - val_loss: 0.
0014
Epoch 61/100
12/12 [==============================] - 3s 285ms/step - loss: 2.4091e-04 - val_loss: 0.
0013
Epoch 62/100
12/12 [==============================] - 4s 296ms/step - loss: 2.2724e-04 - val_loss: 0.
0016
Epoch 63/100
12/12 [==============================] - 3s 258ms/step - loss: 2.3206e-04 - val_loss: 0.
0012
Epoch 64/100
12/12 [==============================] - 3s 277ms/step - loss: 2.4468e-04 - val_loss: 0.
0014
Epoch 65/100
12/12 [==============================] - 3s 266ms/step - loss: 2.2395e-04 - val_loss: 0.
0012
```

```
Epoch 66/100
12/12 [==============================] - 3s 263ms/step - loss: 2.1142e-04 - val_loss: 0.
0012
Epoch 67/100
12/12 [==============================] - 3s 281ms/step - loss: 2.0540e-04 - val_loss: 0.
0016
Epoch 68/100
12/12 [==============================] - 4s 297ms/step - loss: 2.0560e-04 - val_loss: 0.
0012
Epoch 69/100
12/12 [==============================] - 3s 218ms/step - loss: 1.9982e-04 - val_loss: 0.
0014
Epoch 70/100
12/12 [==============================] - 3s 257ms/step - loss: 2.3622e-04 - val_loss: 0.
0015
Epoch 71/100
12/12 [==============================] - 3s 283ms/step - loss: 2.6216e-04 - val_loss: 0.
0012
Epoch 72/100
12/12 [==============================] - 3s 282ms/step - loss: 2.4869e-04 - val_loss: 0.
0017
Epoch 73/100
12/12 [==============================] - 3s 280ms/step - loss: 2.1853e-04 - val_loss: 0.
0013
Epoch 74/100
12/12 [==============================] - 3s 244ms/step - loss: 2.2121e-04 - val_loss: 0.
0014
Epoch 75/100
12/12 [==============================] - 3s 283ms/step - loss: 1.9690e-04 - val_loss: 0.
0011
Epoch 76/100
12/12 [==============================] - 3s 261ms/step - loss: 2.2144e-04 - val_loss: 0.
0011
Epoch 77/100
12/12 [==============================] - 3s 282ms/step - loss: 1.8420e-04 - val_loss: 0.
0011
Epoch 78/100
12/12 [==============================] - 3s 282ms/step - loss: 1.7841e-04 - val_loss: 0.
0014
Epoch 79/100
12/12 [==============================] - 3s 260ms/step - loss: 1.9611e-04 - val_loss: 0.
0013
Epoch 80/100
12/12 [==============================] - 3s 281ms/step - loss: 2.0224e-04 - val_loss: 0.
0012
Epoch 81/100
12/12 [==============================] - 3s 290ms/step - loss: 2.1049e-04 - val_loss: 0.
0020
Epoch 82/100
12/12 [==============================] - 3s 288ms/step - loss: 1.9466e-04 - val_loss: 0.
0010
Epoch 83/100
12/12 [==============================] - 3s 284ms/step - loss: 1.5801e-04 - val_loss: 0.
0010
Epoch 84/100
12/12 [==============================] - 3s 272ms/step - loss: 1.6260e-04 - val_loss: 9.
4397e-04
Epoch 85/100
12/12 [==============================] - 3s 249ms/step - loss: 1.5695e-04 - val_loss: 0.
0013
Epoch 86/100
12/12 [==============================] - 3s 242ms/step - loss: 2.0192e-04 - val_loss: 9.
7445e-04
Epoch 87/100
```

```
12/12 [==============================] - 3s 271ms/step - loss: 2.2179e-04 - val_loss: 0.
0020
Epoch 88/100
12/12 [==============================] - 3s 249ms/step - loss: 2.5509e-04 - val_loss: 0.
0015
Epoch 89/100
12/12 [==============================] - 3s 261ms/step - loss: 1.9912e-04 - val_loss: 0.
0011
Epoch 90/100
12/12 [==============================] - 3s 265ms/step - loss: 1.6930e-04 - val_loss: 8.
9285e-04
Epoch 91/100
12/12 [==============================] - 3s 276ms/step - loss: 1.6435e-04 - val_loss: 9.
1264e-04
Epoch 92/100
12/12 [==============================] - 3s 259ms/step - loss: 1.6799e-04 - val_loss: 0.
0014
Epoch 93/100
12/12 [==============================] - 3s 282ms/step - loss: 1.9593e-04 - val_loss: 0.
0016
Epoch 94/100
12/12 [==============================] - 3s 287ms/step - loss: 1.8104e-04 - val_loss: 0.
0010
Epoch 95/100
12/12 [==============================] - 3s 277ms/step - loss: 1.3988e-04 - val_loss: 8.
5343e-04
Epoch 96/100
12/12 [==============================] - 3s 280ms/step - loss: 1.4097e-04 - val_loss: 9.
3255e-04
Epoch 97/100
12/12 [==============================] - 3s 287ms/step - loss: 1.4070e-04 - val_loss: 8.
3848e-04
Epoch 98/100
12/12 [==============================] - 3s 290ms/step - loss: 1.3528e-04 - val_loss: 8.
4349e-04
Epoch 99/100
12/12 [==============================] - 3s 288ms/step - loss: 1.4087e-04 - val_loss: 9.
8092e-04
Epoch 100/100
12/12 [==============================] - 3s 285ms/step - loss: 1.4775e-04 - val_loss: 9.
3230e-04
```

Out[431]:
```
<tensorflow.python.keras.callbacks.History at 0x2d1aa544a58>
```

In [37]:
```
import tensorflow as tf
```

In [39]:
```
tf.__version__
```

Out[39]:
```
'2.1.0'
```

In [432…
```
### Lets Do the prediction and check performance metrics
train_predict=model.predict(X_train)
test_predict=model.predict(X_test)
```

In [433…
```
##Transformback to original form
train_predict=scaler.inverse_transform(train_predict)
test_predict=scaler.inverse_transform(test_predict)
```

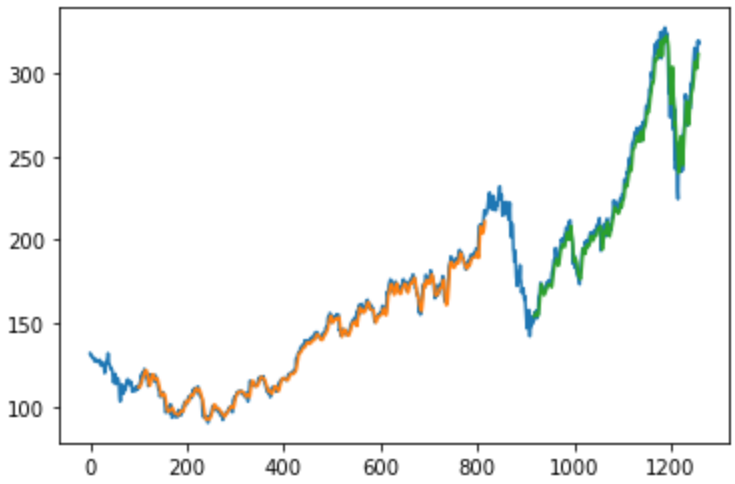
In [434…
```
### Calculate RMSE performance metrics
import math
from sklearn.metrics import mean_squared_error
math.sqrt(mean_squared_error(y_train,train_predict))
```

Out[434]: 140.9909210035748

In [435…
```
### Test Data RMSE
math.sqrt(mean_squared_error(ytest,test_predict))
```

Out[435]: 235.7193088627771

In [436…
```
### Plotting
# shift train predictions for plotting
look_back=100
trainPredictPlot = numpy.empty_like(df1)
trainPredictPlot[:, :] = np.nan
trainPredictPlot[look_back:len(train_predict)+look_back, :] = train_predict
# shift test predictions for plotting
testPredictPlot = numpy.empty_like(df1)
testPredictPlot[:, :] = numpy.nan
testPredictPlot[len(train_predict)+(look_back*2)+1:len(df1)-1, :] = test_predict
# plot baseline and predictions
plt.plot(scaler.inverse_transform(df1))
plt.plot(trainPredictPlot)
plt.plot(testPredictPlot)
plt.show()
```



In [437…
```
len(test_data)
```

Out[437]: 441

In [438…
```
x_input=test_data[341:].reshape(1,-1)
x_input.shape
```

Out[438]: (1, 100)

In [ ]:

In [ ]:

In [439…
```
temp_input=list(x_input)
temp_input=temp_input[0].tolist()
```

In [440…
```
temp_input
```

Out[440]:
```
[0.8583551465000423,
 0.8866418981676942,
 0.8743139407244789,
 0.8843198513890065,
 0.8783669678290975,
 0.8986321033521913,
 0.925821160179009,
 0.9287764924427933,
 0.9567677108840666,
 0.9386979650426415,
 0.933040614709111,
 0.9495060373216249,
 0.9642404796082076,
 0.9551211686228154,
 0.9598919192772104,
 0.9663514312251966,
 0.9624672802499368,
 0.9229502659799038,
 0.9598497002448705,
 0.9879253567508233,
 0.985941062230854,
 0.9253145317909315,
 0.9217259140420504,
 0.964747107996285,
 0.9757240564046274,
 0.9915984125643842,
 0.9697289538123788,
 0.9761462467280253,
 0.9679557544541082,
 1.0000000000000002,
 0.9901629654648318,
 0.9905007177235499,
 0.9653803934813816,
 0.9848855864223593,
 0.9708688676855528,
 0.9402600692392133,
 0.8774803681499621,
 0.8348391454867856,
 0.8541332432660644,
 0.7733682344000676,
 0.7726927298826314,
 0.8801401671873683,
 0.8400743054969182,
 0.8967322468969012,
 0.8552731571392387,
 0.8388499535590646,
 0.7423372456303303,
 0.8232711306256861,
 0.7814320695769654,
 0.6665963016127672,
 0.7921557037912694,
 0.6411804441442204,
 0.6861437135860848,
 0.6600101325677616,
 0.6520307354555435,
 0.5864223591995272,
 0.5658616904500551,
 0.660896732246897,
 0.6551549438486872,
 0.7097019336316812,
 0.664527569028118,
 0.6943764248923416,
 0.692181035210673,
 0.6356919699400492,
```

```
0.6526640209406402,
0.637802921557038,
0.7267162036646122,
0.7138816178333194,
0.7419150553069325,
0.7500211095161702,
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0.8304905851557884,
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0.8289706999915563,
0.8125474964113824,
0.7877649244279323,
0.7516254327450818,
0.7842607447437306,
0.7797433082833742,
0.8132652199611587,
0.8141096006079542,
0.7947310647639958,
0.8333614793548934,
0.8589884319851391,
0.8390188296884238,
0.8562864139153934,
0.8748627881448958,
0.887824031073208,
0.9009541501308793,
0.9279321117959978,
0.9485349995778098,
0.9333361479354896,
0.9174617917757326,
0.925441188887951,
0.9177151059697712,
0.9483239044161109,
0.9406400405302711,
0.9663514312251966,
0.9563033015283293,
0.964915984125644]
```

In [441…

```
# demonstrate prediction for next 10 days
from numpy import array

lst_output=[]
n_steps=100
i=0
while(i<30):

    if(len(temp_input)>100):
        #print(temp_input)
        x_input=np.array(temp_input[1:])
        print("{} day input {}".format(i,x_input))
        x_input=x_input.reshape(1,-1)
        x_input = x_input.reshape((1, n_steps, 1))
        #print(x_input)
        yhat = model.predict(x_input, verbose=0)
        print("{} day output {}".format(i,yhat))
        temp_input.extend(yhat[0].tolist())
        temp_input=temp_input[1:]
        #print(temp_input)
        lst_output.extend(yhat.tolist())
        i=i+1
    else:
        x_input = x_input.reshape((1, n_steps,1))
        yhat = model.predict(x_input, verbose=0)
        print(yhat[0])
        temp_input.extend(yhat[0].tolist())
```

```
        print(len(temp_input))
        lst_output.extend(yhat.tolist())
        i=i+1


print(lst_output)
```

```
[0.94413203]
101
1 day input [0.8866419  0.87431394 0.88431985 0.87836697 0.8986321  0.92582116
 0.92877649 0.95676771 0.93869797 0.93304061 0.94950604 0.96424048
 0.95512117 0.95989192 0.96635143 0.96246728 0.92295027 0.9598497
 0.98792536 0.98594106 0.92531453 0.92172591 0.96474711 0.97572406
 0.99159841 0.96972895 0.97614625 0.96795575 1.         0.99016297
 0.99050072 0.96538039 0.98488559 0.97086887 0.94026007 0.87748037
 0.83483915 0.85413324 0.77336823 0.77269273 0.88014017 0.84007431
 0.89673225 0.85527316 0.83884995 0.74233725 0.82327113 0.78143207
 0.6665963  0.7921557  0.64118044 0.68614371 0.66001013 0.65203074
 0.58642236 0.56586169 0.66089673 0.65515494 0.70970193 0.66452757
 0.69437642 0.69218104 0.63569197 0.65266402 0.63780292 0.7267162
 0.71388162 0.74191506 0.75002111 0.77222832 0.83049059 0.8194292
 0.8289707  0.8125475  0.78776492 0.75162543 0.78426074 0.77974331
 0.81326522 0.8141096  0.79473106 0.83336148 0.85898843 0.83901883
 0.85628641 0.87486279 0.88782403 0.90095415 0.92793211 0.948535
 0.93333615 0.91746179 0.92544119 0.91771511 0.9483239  0.94064004
 0.96635143 0.9563033  0.96491598 0.94413203]
1 day output [[0.9379593]]
2 day input [0.87431394 0.88431985 0.87836697 0.8986321  0.92582116 0.92877649
 0.95676771 0.93869797 0.93304061 0.94950604 0.96424048 0.95512117
 0.95989192 0.96635143 0.96246728 0.92295027 0.9598497  0.98792536
 0.98594106 0.92531453 0.92172591 0.96474711 0.97572406 0.99159841
 0.96972895 0.97614625 0.96795575 1.         0.99016297 0.99050072
 0.96538039 0.98488559 0.97086887 0.94026007 0.87748037 0.83483915
 0.85413324 0.77336823 0.77269273 0.88014017 0.84007431 0.89673225
 0.85527316 0.83884995 0.74233725 0.82327113 0.78143207 0.6665963
 0.7921557  0.64118044 0.68614371 0.66001013 0.65203074 0.58642236
 0.56586169 0.66089673 0.65515494 0.70970193 0.66452757 0.69437642
 0.69218104 0.63569197 0.65266402 0.63780292 0.7267162  0.71388162
 0.74191506 0.75002111 0.77222832 0.83049059 0.8194292  0.8289707
 0.8125475  0.78776492 0.75162543 0.78426074 0.77974331 0.81326522
 0.8141096  0.79473106 0.83336148 0.85898843 0.83901883 0.85628641
 0.87486279 0.88782403 0.90095415 0.92793211 0.948535   0.93333615
 0.91746179 0.92544119 0.91771511 0.9483239  0.94064004 0.96635143
 0.9563033  0.96491598 0.94413203 0.93795931]
2 day output [[0.9286534]]
3 day input [0.88431985 0.87836697 0.8986321  0.92582116 0.92877649 0.95676771
 0.93869797 0.93304061 0.94950604 0.96424048 0.95512117 0.95989192
 0.96635143 0.96246728 0.92295027 0.9598497  0.98792536 0.98594106
 0.92531453 0.92172591 0.96474711 0.97572406 0.99159841 0.96972895
 0.97614625 0.96795575 1.         0.99016297 0.99050072 0.96538039
 0.98488559 0.97086887 0.94026007 0.87748037 0.83483915 0.85413324
 0.77336823 0.77269273 0.88014017 0.84007431 0.89673225 0.85527316
 0.83884995 0.74233725 0.82327113 0.78143207 0.6665963  0.7921557
 0.64118044 0.68614371 0.66001013 0.65203074 0.58642236 0.56586169
 0.66089673 0.65515494 0.70970193 0.66452757 0.69437642 0.69218104
 0.63569197 0.65266402 0.63780292 0.7267162  0.71388162 0.74191506
 0.75002111 0.77222832 0.83049059 0.8194292  0.8289707  0.8125475
 0.78776492 0.75162543 0.78426074 0.77974331 0.81326522 0.8141096
 0.79473106 0.83336148 0.85898843 0.83901883 0.85628641 0.87486279
 0.88782403 0.90095415 0.92793211 0.948535   0.93333615 0.91746179
 0.92544119 0.91771511 0.9483239  0.94064004 0.96635143 0.9563033
 0.96491598 0.94413203 0.93795931 0.92865342]
3 day output [[0.91987926]]
4 day input [0.87836697 0.8986321  0.92582116 0.92877649 0.95676771 0.93869797
 0.93304061 0.94950604 0.96424048 0.95512117 0.95989192 0.96635143
 0.96246728 0.92295027 0.9598497  0.98792536 0.98594106 0.92531453
 0.92172591 0.96474711 0.97572406 0.99159841 0.96972895 0.97614625
 0.96795575 1.         0.99016297 0.99050072 0.96538039 0.98488559
 0.97086887 0.94026007 0.87748037 0.83483915 0.85413324 0.77336823
 0.77269273 0.88014017 0.84007431 0.89673225 0.85527316 0.83884995
 0.74233725 0.82327113 0.78143207 0.6665963  0.7921557  0.64118044
```

```
 0.68614371 0.66001013 0.65203074 0.58642236 0.56586169 0.66089673
 0.65515494 0.70970193 0.66452757 0.69437642 0.69218104 0.63569197
 0.65266402 0.63780292 0.7267162  0.71388162 0.74191506 0.75002111
 0.77222832 0.83049059 0.8194292  0.8289707  0.8125475  0.78776492
 0.75162543 0.78426074 0.77974331 0.81326522 0.8141096  0.79473106
 0.83336148 0.85898843 0.83901883 0.85628641 0.87486279 0.88782403
 0.90095415 0.92793211 0.948535   0.93333615 0.91746179 0.92544119
 0.91771511 0.9483239  0.94064004 0.96635143 0.9563033  0.96491598
 0.94413203 0.93795931 0.92865342 0.91987926]
4 day output [[0.9128097]]
5 day input [0.8986321  0.92582116 0.92877649 0.95676771 0.93869797 0.93304061
 0.94950604 0.96424048 0.95512117 0.95989192 0.96635143 0.96246728
 0.92295027 0.9598497  0.98792536 0.98594106 0.92531453 0.92172591
 0.96474711 0.97572406 0.99159841 0.96972895 0.97614625 0.96795575
 1.         0.99016297 0.99050072 0.96538039 0.98488559 0.97086887
 0.94026007 0.87748037 0.83483915 0.85413324 0.77336823 0.77269273
 0.88014017 0.84007431 0.89673225 0.85527316 0.83884995 0.74233725
 0.82327113 0.78143207 0.6665963  0.7921557  0.64118044 0.68614371
 0.66001013 0.65203074 0.58642236 0.56586169 0.66089673 0.65515494
 0.70970193 0.66452757 0.69437642 0.69218104 0.63569197 0.65266402
 0.63780292 0.7267162  0.71388162 0.74191506 0.75002111 0.77222832
 0.83049059 0.8194292  0.8289707  0.8125475  0.78776492 0.75162543
 0.78426074 0.77974331 0.81326522 0.8141096  0.79473106 0.83336148
 0.85898843 0.83901883 0.85628641 0.87486279 0.88782403 0.90095415
 0.92793211 0.948535   0.93333615 0.91746179 0.92544119 0.91771511
 0.9483239  0.94064004 0.96635143 0.9563033  0.96491598 0.94413203
 0.93795931 0.92865342 0.91987926 0.91280973]
5 day output [[0.90777564]]
6 day input [0.92582116 0.92877649 0.95676771 0.93869797 0.93304061 0.94950604
 0.96424048 0.95512117 0.95989192 0.96635143 0.96246728 0.92295027
 0.9598497  0.98792536 0.98594106 0.92531453 0.92172591 0.96474711
 0.97572406 0.99159841 0.96972895 0.97614625 0.96795575 1.
 0.99016297 0.99050072 0.96538039 0.98488559 0.97086887 0.94026007
 0.87748037 0.83483915 0.85413324 0.77336823 0.77269273 0.88014017
 0.84007431 0.89673225 0.85527316 0.83884995 0.74233725 0.82327113
 0.78143207 0.6665963  0.7921557  0.64118044 0.68614371 0.66001013
 0.65203074 0.58642236 0.56586169 0.66089673 0.65515494 0.70970193
 0.66452757 0.69437642 0.69218104 0.63569197 0.65266402 0.63780292
 0.7267162  0.71388162 0.74191506 0.75002111 0.77222832 0.83049059
 0.8194292  0.8289707  0.8125475  0.78776492 0.75162543 0.78426074
 0.77974331 0.81326522 0.8141096  0.79473106 0.83336148 0.85898843
 0.83901883 0.85628641 0.87486279 0.88782403 0.90095415 0.92793211
 0.948535   0.93333615 0.91746179 0.92544119 0.91771511 0.9483239
 0.94064004 0.96635143 0.9563033  0.96491598 0.94413203 0.93795931
 0.92865342 0.91987926 0.91280973 0.90777564]
6 day output [[0.9047326]]
7 day input [0.92877649 0.95676771 0.93869797 0.93304061 0.94950604 0.96424048
 0.95512117 0.95989192 0.96635143 0.96246728 0.92295027 0.9598497
 0.98792536 0.98594106 0.92531453 0.92172591 0.96474711 0.97572406
 0.99159841 0.96972895 0.97614625 0.96795575 1.         0.99016297
 0.99050072 0.96538039 0.98488559 0.97086887 0.94026007 0.87748037
 0.83483915 0.85413324 0.77336823 0.77269273 0.88014017 0.84007431
 0.89673225 0.85527316 0.83884995 0.74233725 0.82327113 0.78143207
 0.6665963  0.7921557  0.64118044 0.68614371 0.66001013 0.65203074
 0.58642236 0.56586169 0.66089673 0.65515494 0.70970193 0.66452757
 0.69437642 0.69218104 0.63569197 0.65266402 0.63780292 0.7267162
 0.71388162 0.74191506 0.75002111 0.77222832 0.83049059 0.8194292
 0.8289707  0.8125475  0.78776492 0.75162543 0.78426074 0.77974331
 0.81326522 0.8141096  0.79473106 0.83336148 0.85898843 0.83901883
 0.85628641 0.87486279 0.88782403 0.90095415 0.92793211 0.948535
 0.93333615 0.91746179 0.92544119 0.91771511 0.9483239  0.94064004
 0.96635143 0.9563033  0.96491598 0.94413203 0.93795931 0.92865342
 0.91987926 0.91280973 0.90777564 0.90473258]
7 day output [[0.9033923]]
```

```
8 day input [0.95676771 0.93869797 0.93304061 0.94950604 0.96424048 0.95512117
 0.95989192 0.96635143 0.96246728 0.92295027 0.9598497  0.98792536
 0.98594106 0.92531453 0.92172591 0.96474711 0.97572406 0.99159841
 0.96972895 0.97614625 0.96795575 1.         0.99016297 0.99050072
 0.96538039 0.98488559 0.97086887 0.94026007 0.87748037 0.83483915
 0.85413324 0.77336823 0.77269273 0.88014017 0.84007431 0.89673225
 0.85527316 0.83884995 0.74233725 0.82327113 0.78143207 0.6665963
 0.7921557  0.64118044 0.68614371 0.66001013 0.65203074 0.58642236
 0.56586169 0.66089673 0.65515494 0.70970193 0.66452757 0.69437642
 0.69218104 0.63569197 0.65266402 0.63780292 0.7267162  0.71388162
 0.74191506 0.75002111 0.77222832 0.83049059 0.8194292  0.8289707
 0.8125475  0.78776492 0.75162543 0.78426074 0.77974331 0.81326522
 0.8141096  0.79473106 0.83336148 0.85898843 0.83901883 0.85628641
 0.87486279 0.88782403 0.90095415 0.92793211 0.948535   0.93333615
 0.91746179 0.92544119 0.91771511 0.9483239  0.94064004 0.96635143
 0.9563033  0.96491598 0.94413203 0.93795931 0.92865342 0.91987926
 0.91280973 0.90777564 0.90473258 0.90339231]
8 day output [[0.90332204]]
9 day input [0.93869797 0.93304061 0.94950604 0.96424048 0.95512117 0.95989192
 0.96635143 0.96246728 0.92295027 0.9598497  0.98792536 0.98594106
 0.92531453 0.92172591 0.96474711 0.97572406 0.99159841 0.96972895
 0.97614625 0.96795575 1.         0.99016297 0.99050072 0.96538039
 0.98488559 0.97086887 0.94026007 0.87748037 0.83483915 0.85413324
 0.77336823 0.77269273 0.88014017 0.84007431 0.89673225 0.85527316
 0.83884995 0.74233725 0.82327113 0.78143207 0.6665963  0.7921557
 0.64118044 0.68614371 0.66001013 0.65203074 0.58642236 0.56586169
 0.66089673 0.65515494 0.70970193 0.66452757 0.69437642 0.69218104
 0.63569197 0.65266402 0.63780292 0.7267162  0.71388162 0.74191506
 0.75002111 0.77222832 0.83049059 0.8194292  0.8289707  0.8125475
 0.78776492 0.75162543 0.78426074 0.77974331 0.81326522 0.8141096
 0.79473106 0.83336148 0.85898843 0.83901883 0.85628641 0.87486279
 0.88782403 0.90095415 0.92793211 0.948535   0.93333615 0.91746179
 0.92544119 0.91771511 0.9483239  0.94064004 0.96635143 0.9563033
 0.96491598 0.94413203 0.93795931 0.92865342 0.91987926 0.91280973
 0.90777564 0.90473258 0.90339231 0.90332204]
9 day output [[0.9040391]]
10 day input [0.93304061 0.94950604 0.96424048 0.95512117 0.95989192 0.96635143
 0.96246728 0.92295027 0.9598497  0.98792536 0.98594106 0.92531453
 0.92172591 0.96474711 0.97572406 0.99159841 0.96972895 0.97614625
 0.96795575 1.         0.99016297 0.99050072 0.96538039 0.98488559
 0.97086887 0.94026007 0.87748037 0.83483915 0.85413324 0.77336823
 0.77269273 0.88014017 0.84007431 0.89673225 0.85527316 0.83884995
 0.74233725 0.82327113 0.78143207 0.6665963  0.7921557  0.64118044
 0.68614371 0.66001013 0.65203074 0.58642236 0.56586169 0.66089673
 0.65515494 0.70970193 0.66452757 0.69437642 0.69218104 0.63569197
 0.65266402 0.63780292 0.7267162  0.71388162 0.74191506 0.75002111
 0.77222832 0.83049059 0.8194292  0.8289707  0.8125475  0.78776492
 0.75162543 0.78426074 0.77974331 0.81326522 0.8141096  0.79473106
 0.83336148 0.85898843 0.83901883 0.85628641 0.87486279 0.88782403
 0.90095415 0.92793211 0.948535   0.93333615 0.91746179 0.92544119
 0.91771511 0.9483239  0.94064004 0.96635143 0.9563033  0.96491598
 0.94413203 0.93795931 0.92865342 0.91987926 0.91280973 0.90777564
 0.90473258 0.90339231 0.90332204 0.90403908]
10 day output [[0.9050924]]
11 day input [0.94950604 0.96424048 0.95512117 0.95989192 0.96635143 0.96246728
 0.92295027 0.9598497  0.98792536 0.98594106 0.92531453 0.92172591
 0.96474711 0.97572406 0.99159841 0.96972895 0.97614625 0.96795575
 1.         0.99016297 0.99050072 0.96538039 0.98488559 0.97086887
 0.94026007 0.87748037 0.83483915 0.85413324 0.77336823 0.77269273
 0.88014017 0.84007431 0.89673225 0.85527316 0.83884995 0.74233725
 0.82327113 0.78143207 0.6665963  0.7921557  0.64118044 0.68614371
 0.66001013 0.65203074 0.58642236 0.56586169 0.66089673 0.65515494
 0.70970193 0.66452757 0.69437642 0.69218104 0.63569197 0.65266402
 0.63780292 0.7267162  0.71388162 0.74191506 0.75002111 0.77222832
```

```
 0.83049059 0.8194292  0.8289707  0.8125475  0.78776492 0.75162543
 0.78426074 0.77974331 0.81326522 0.8141096  0.79473106 0.83336148
 0.85898843 0.83901883 0.85628641 0.87486279 0.88782403 0.90095415
 0.92793211 0.948535   0.93333615 0.91746179 0.92544119 0.91771511
 0.9483239  0.94064004 0.96635143 0.9563033  0.96491598 0.94413203
 0.93795931 0.92865342 0.91987926 0.91280973 0.90777564 0.90473258
 0.90339231 0.90332204 0.90403908 0.90509242]
11 day output [[0.906118]]
12 day input [0.96424048 0.95512117 0.95989192 0.96635143 0.96246728 0.92295027
 0.9598497  0.98792536 0.98594106 0.92531453 0.92172591 0.96474711
 0.97572406 0.99159841 0.96972895 0.97614625 0.96795575 1.
 0.99016297 0.99050072 0.96538039 0.98488559 0.97086887 0.94026007
 0.87748037 0.83483915 0.85413324 0.77336823 0.77269273 0.88014017
 0.84007431 0.89673225 0.85527316 0.83884995 0.74233725 0.82327113
 0.78143207 0.6665963  0.7921557  0.64118044 0.68614371 0.66001013
 0.65203074 0.58642236 0.56586169 0.66089673 0.65515494 0.70970193
 0.66452757 0.69437642 0.69218104 0.63569197 0.65266402 0.63780292
 0.7267162  0.71388162 0.74191506 0.75002111 0.77222832 0.83049059
 0.8194292  0.8289707  0.8125475  0.78776492 0.75162543 0.78426074
 0.77974331 0.81326522 0.8141096  0.79473106 0.83336148 0.85898843
 0.83901883 0.85628641 0.87486279 0.88782403 0.90095415 0.92793211
 0.948535   0.93333615 0.91746179 0.92544119 0.91771511 0.9483239
 0.94064004 0.96635143 0.9563033  0.96491598 0.94413203 0.93795931
 0.92865342 0.91987926 0.91280973 0.90777564 0.90473258 0.90339231
 0.90332204 0.90403908 0.90509242 0.90611798]
12 day output [[0.90686554]]
13 day input [0.95512117 0.95989192 0.96635143 0.96246728 0.92295027 0.9598497
 0.98792536 0.98594106 0.92531453 0.92172591 0.96474711 0.97572406
 0.99159841 0.96972895 0.97614625 0.96795575 1.         0.99016297
 0.99050072 0.96538039 0.98488559 0.97086887 0.94026007 0.87748037
 0.83483915 0.85413324 0.77336823 0.77269273 0.88014017 0.84007431
 0.89673225 0.85527316 0.83884995 0.74233725 0.82327113 0.78143207
 0.6665963  0.7921557  0.64118044 0.68614371 0.66001013 0.65203074
 0.58642236 0.56586169 0.66089673 0.65515494 0.70970193 0.66452757
 0.69437642 0.69218104 0.63569197 0.65266402 0.63780292 0.7267162
 0.71388162 0.74191506 0.75002111 0.77222832 0.83049059 0.8194292
 0.8289707  0.8125475  0.78776492 0.75162543 0.78426074 0.77974331
 0.81326522 0.8141096  0.79473106 0.83336148 0.85898843 0.83901883
 0.85628641 0.87486279 0.88782403 0.90095415 0.92793211 0.948535
 0.93333615 0.91746179 0.92544119 0.91771511 0.9483239  0.94064004
 0.96635143 0.9563033  0.96491598 0.94413203 0.93795931 0.92865342
 0.91987926 0.91280973 0.90777564 0.90473258 0.90339231 0.90332204
 0.90403908 0.90509242 0.90611798 0.90686554]
13 day output [[0.90720606]]
14 day input [0.95989192 0.96635143 0.96246728 0.92295027 0.9598497  0.98792536
 0.98594106 0.92531453 0.92172591 0.96474711 0.97572406 0.99159841
 0.96972895 0.97614625 0.96795575 1.         0.99016297 0.99050072
 0.96538039 0.98488559 0.97086887 0.94026007 0.87748037 0.83483915
 0.85413324 0.77336823 0.77269273 0.88014017 0.84007431 0.89673225
 0.85527316 0.83884995 0.74233725 0.82327113 0.78143207 0.6665963
 0.7921557  0.64118044 0.68614371 0.66001013 0.65203074 0.58642236
 0.56586169 0.66089673 0.65515494 0.70970193 0.66452757 0.69437642
 0.69218104 0.63569197 0.65266402 0.63780292 0.7267162  0.71388162
 0.74191506 0.75002111 0.77222832 0.83049059 0.8194292  0.8289707
 0.8125475  0.78776492 0.75162543 0.78426074 0.77974331 0.81326522
 0.8141096  0.79473106 0.83336148 0.85898843 0.83901883 0.85628641
 0.87486279 0.88782403 0.90095415 0.92793211 0.948535   0.93333615
 0.91746179 0.92544119 0.91771511 0.9483239  0.94064004 0.96635143
 0.9563033  0.96491598 0.94413203 0.93795931 0.92865342 0.91987926
 0.91280973 0.90777564 0.90473258 0.90339231 0.90332204 0.90403908
 0.90509242 0.90611798 0.90686554 0.90720606]
14 day output [[0.9071163]]
15 day input [0.96635143 0.96246728 0.92295027 0.9598497  0.98792536 0.98594106
 0.92531453 0.92172591 0.96474711 0.97572406 0.99159841 0.96972895
```

```
 0.97614625 0.96795575 1.         0.99016297 0.99050072 0.96538039
 0.98488559 0.97086887 0.94026007 0.87748037 0.83483915 0.85413324
 0.77336823 0.77269273 0.88014017 0.84007431 0.89673225 0.85527316
 0.83884995 0.74233725 0.82327113 0.78143207 0.6665963  0.7921557
 0.64118044 0.68614371 0.66001013 0.65203074 0.58642236 0.56586169
 0.66089673 0.65515494 0.70970193 0.66452757 0.69437642 0.69218104
 0.63569197 0.65266402 0.63780292 0.7267162  0.71388162 0.74191506
 0.75002111 0.77222832 0.83049059 0.8194292  0.8289707  0.8125475
 0.78776492 0.75162543 0.78426074 0.77974331 0.81326522 0.8141096
 0.79473106 0.83336148 0.85898843 0.83901883 0.85628641 0.87486279
 0.88782403 0.90095415 0.92793211 0.948535   0.93333615 0.91746179
 0.92544119 0.91771511 0.9483239  0.94064004 0.96635143 0.9563033
 0.96491598 0.94413203 0.93795931 0.92865342 0.91987926 0.91280973
 0.90777564 0.90473258 0.90339231 0.90332204 0.90403908 0.90509242
 0.90611798 0.90686554 0.90720606 0.90711629]
15 day output [[0.9066538]]
16 day input [0.96246728 0.92295027 0.9598497  0.98792536 0.98594106 0.92531453
 0.92172591 0.96474711 0.97572406 0.99159841 0.96972895 0.97614625
 0.96795575 1.         0.99016297 0.99050072 0.96538039 0.98488559
 0.97086887 0.94026007 0.87748037 0.83483915 0.85413324 0.77336823
 0.77269273 0.88014017 0.84007431 0.89673225 0.85527316 0.83884995
 0.74233725 0.82327113 0.78143207 0.6665963  0.7921557  0.64118044
 0.68614371 0.66001013 0.65203074 0.58642236 0.56586169 0.66089673
 0.65515494 0.70970193 0.66452757 0.69437642 0.69218104 0.63569197
 0.65266402 0.63780292 0.7267162  0.71388162 0.74191506 0.75002111
 0.77222832 0.83049059 0.8194292  0.8289707  0.8125475  0.78776492
 0.75162543 0.78426074 0.77974331 0.81326522 0.8141096  0.79473106
 0.83336148 0.85898843 0.83901883 0.85628641 0.87486279 0.88782403
 0.90095415 0.92793211 0.948535   0.93333615 0.91746179 0.92544119
 0.91771511 0.9483239  0.94064004 0.96635143 0.9563033  0.96491598
 0.94413203 0.93795931 0.92865342 0.91987926 0.91280973 0.90777564
 0.90473258 0.90339231 0.90332204 0.90403908 0.90509242 0.90611798
 0.90686554 0.90720606 0.90711629 0.90665382]
16 day output [[0.90592706]]
17 day input [0.92295027 0.9598497  0.98792536 0.98594106 0.92531453 0.92172591
 0.96474711 0.97572406 0.99159841 0.96972895 0.97614625 0.96795575
 1.         0.99016297 0.99050072 0.96538039 0.98488559 0.97086887
 0.94026007 0.87748037 0.83483915 0.85413324 0.77336823 0.77269273
 0.88014017 0.84007431 0.89673225 0.85527316 0.83884995 0.74233725
 0.82327113 0.78143207 0.6665963  0.7921557  0.64118044 0.68614371
 0.66001013 0.65203074 0.58642236 0.56586169 0.66089673 0.65515494
 0.70970193 0.66452757 0.69437642 0.69218104 0.63569197 0.65266402
 0.63780292 0.7267162  0.71388162 0.74191506 0.75002111 0.77222832
 0.83049059 0.8194292  0.8289707  0.8125475  0.78776492 0.75162543
 0.78426074 0.77974331 0.81326522 0.8141096  0.79473106 0.83336148
 0.85898843 0.83901883 0.85628641 0.87486279 0.88782403 0.90095415
 0.92793211 0.948535   0.93333615 0.91746179 0.92544119 0.91771511
 0.9483239  0.94064004 0.96635143 0.9563033  0.96491598 0.94413203
 0.93795931 0.92865342 0.91987926 0.91280973 0.90777564 0.90473258
 0.90339231 0.90332204 0.90403908 0.90509242 0.90611798 0.90686554
 0.90720606 0.90711629 0.90665382 0.90592706]
17 day output [[0.9050646]]
18 day input [0.9598497  0.98792536 0.98594106 0.92531453 0.92172591 0.96474711
 0.97572406 0.99159841 0.96972895 0.97614625 0.96795575 1.
 0.99016297 0.99050072 0.96538039 0.98488559 0.97086887 0.94026007
 0.87748037 0.83483915 0.85413324 0.77336823 0.77269273 0.88014017
 0.84007431 0.89673225 0.85527316 0.83884995 0.74233725 0.82327113
 0.78143207 0.6665963  0.7921557  0.64118044 0.68614371 0.66001013
 0.65203074 0.58642236 0.56586169 0.66089673 0.65515494 0.70970193
 0.66452757 0.69437642 0.69218104 0.63569197 0.65266402 0.63780292
 0.7267162  0.71388162 0.74191506 0.75002111 0.77222832 0.83049059
 0.8194292  0.8289707  0.8125475  0.78776492 0.75162543 0.78426074
 0.77974331 0.81326522 0.8141096  0.79473106 0.83336148 0.85898843
 0.83901883 0.85628641 0.87486279 0.88782403 0.90095415 0.92793211
```

```
 0.948535   0.93333615 0.91746179 0.92544119 0.91771511 0.9483239
 0.94064004 0.96635143 0.9563033  0.96491598 0.94413203 0.93795931
 0.92865342 0.91987926 0.91280973 0.90777564 0.90473258 0.90339231
 0.90332204 0.90403908 0.90509242 0.90611798 0.90686554 0.90720606
 0.90711629 0.90665382 0.90592706 0.90506458]
18 day output [[0.90419257]]
19 day input [0.98792536 0.98594106 0.92531453 0.92172591 0.96474711 0.97572406
 0.99159841 0.96972895 0.97614625 0.96795575 1.         0.99016297
 0.99050072 0.96538039 0.98488559 0.97086887 0.94026007 0.87748037
 0.83483915 0.85413324 0.77336823 0.77269273 0.88014017 0.84007431
 0.89673225 0.85527316 0.83884995 0.74233725 0.82327113 0.78143207
 0.6665963  0.7921557  0.64118044 0.68614371 0.66001013 0.65203074
 0.58642236 0.56586169 0.66089673 0.65515494 0.70970193 0.66452757
 0.69437642 0.69218104 0.63569197 0.65266402 0.63780292 0.7267162
 0.71388162 0.74191506 0.75002111 0.77222832 0.83049059 0.8194292
 0.8289707  0.8125475  0.78776492 0.75162543 0.78426074 0.77974331
 0.81326522 0.8141096  0.79473106 0.83336148 0.85898843 0.83901883
 0.85628641 0.87486279 0.88782403 0.90095415 0.92793211 0.948535
 0.93333615 0.91746179 0.92544119 0.91771511 0.9483239  0.94064004
 0.96635143 0.9563033  0.96491598 0.94413203 0.93795931 0.92865342
 0.91987926 0.91280973 0.90777564 0.90473258 0.90339231 0.90332204
 0.90403908 0.90509242 0.90611798 0.90686554 0.90720606 0.90711629
 0.90665382 0.90592706 0.90506458 0.90419257]
19 day output [[0.9034131]]
20 day input [0.98594106 0.92531453 0.92172591 0.96474711 0.97572406 0.99159841
 0.96972895 0.97614625 0.96795575 1.         0.99016297 0.99050072
 0.96538039 0.98488559 0.97086887 0.94026007 0.87748037 0.83483915
 0.85413324 0.77336823 0.77269273 0.88014017 0.84007431 0.89673225
 0.85527316 0.83884995 0.74233725 0.82327113 0.78143207 0.6665963
 0.7921557  0.64118044 0.68614371 0.66001013 0.65203074 0.58642236
 0.56586169 0.66089673 0.65515494 0.70970193 0.66452757 0.69437642
 0.69218104 0.63569197 0.65266402 0.63780292 0.7267162  0.71388162
 0.74191506 0.75002111 0.77222832 0.83049059 0.8194292  0.8289707
 0.8125475  0.78776492 0.75162543 0.78426074 0.77974331 0.81326522
 0.8141096  0.79473106 0.83336148 0.85898843 0.83901883 0.85628641
 0.87486279 0.88782403 0.90095415 0.92793211 0.948535   0.93333615
 0.91746179 0.92544119 0.91771511 0.9483239  0.94064004 0.96635143
 0.9563033  0.96491598 0.94413203 0.93795931 0.92865342 0.91987926
 0.91280973 0.90777564 0.90473258 0.90339231 0.90332204 0.90403908
 0.90509242 0.90611798 0.90686554 0.90720606 0.90711629 0.90665382
 0.90592706 0.90506458 0.90419257 0.90341312]
20 day output [[0.90279734]]
21 day input [0.92531453 0.92172591 0.96474711 0.97572406 0.99159841 0.96972895
 0.97614625 0.96795575 1.         0.99016297 0.99050072 0.96538039
 0.98488559 0.97086887 0.94026007 0.87748037 0.83483915 0.85413324
 0.77336823 0.77269273 0.88014017 0.84007431 0.89673225 0.85527316
 0.83884995 0.74233725 0.82327113 0.78143207 0.6665963  0.7921557
 0.64118044 0.68614371 0.66001013 0.65203074 0.58642236 0.56586169
 0.66089673 0.65515494 0.70970193 0.66452757 0.69437642 0.69218104
 0.63569197 0.65266402 0.63780292 0.7267162  0.71388162 0.74191506
 0.75002111 0.77222832 0.83049059 0.8194292  0.8289707  0.8125475
 0.78776492 0.75162543 0.78426074 0.77974331 0.81326522 0.8141096
 0.79473106 0.83336148 0.85898843 0.83901883 0.85628641 0.87486279
 0.88782403 0.90095415 0.92793211 0.948535   0.93333615 0.91746179
 0.92544119 0.91771511 0.9483239  0.94064004 0.96635143 0.9563033
 0.96491598 0.94413203 0.93795931 0.92865342 0.91987926 0.91280973
 0.90777564 0.90473258 0.90339231 0.90332204 0.90403908 0.90509242
 0.90611798 0.90686554 0.90720606 0.90711629 0.90665382 0.90592706
 0.90506458 0.90419257 0.90341312 0.90279734]
21 day output [[0.9023812]]
22 day input [0.92172591 0.96474711 0.97572406 0.99159841 0.96972895 0.97614625
 0.96795575 1.         0.99016297 0.99050072 0.96538039 0.98488559
 0.97086887 0.94026007 0.87748037 0.83483915 0.85413324 0.77336823
 0.77269273 0.88014017 0.84007431 0.89673225 0.85527316 0.83884995
```

```
 0.74233725 0.82327113 0.78143207 0.6665963  0.7921557  0.64118044
 0.68614371 0.66001013 0.65203074 0.58642236 0.56586169 0.66089673
 0.65515494 0.70970193 0.66452757 0.69437642 0.69218104 0.63569197
 0.65266402 0.63780292 0.7267162  0.71388162 0.74191506 0.75002111
 0.77222832 0.83049059 0.8194292  0.8289707  0.8125475  0.78776492
 0.75162543 0.78426074 0.77974331 0.81326522 0.8141096  0.79473106
 0.83336148 0.85898843 0.83901883 0.85628641 0.87486279 0.88782403
 0.90095415 0.92793211 0.948535   0.93333615 0.91746179 0.92544119
 0.91771511 0.9483239  0.94064004 0.96635143 0.9563033  0.96491598
 0.94413203 0.93795931 0.92865342 0.91987926 0.91280973 0.90777564
 0.90473258 0.90339231 0.90332204 0.90403908 0.90509242 0.90611798
 0.90686554 0.90720606 0.90711629 0.90665382 0.90592706 0.90506458
 0.90419257 0.90341312 0.90279734 0.90238118]
22 day output [[0.9021694]]
23 day input [0.96474711 0.97572406 0.99159841 0.96972895 0.97614625 0.96795575
 1.         0.99016297 0.99050072 0.96538039 0.98488559 0.97086887
 0.94026007 0.87748037 0.83483915 0.85413324 0.77336823 0.77269273
 0.88014017 0.84007431 0.89673225 0.85527316 0.83884995 0.74233725
 0.82327113 0.78143207 0.6665963  0.7921557  0.64118044 0.68614371
 0.66001013 0.65203074 0.58642236 0.56586169 0.66089673 0.65515494
 0.70970193 0.66452757 0.69437642 0.69218104 0.63569197 0.65266402
 0.63780292 0.7267162  0.71388162 0.74191506 0.75002111 0.77222832
 0.83049059 0.8194292  0.8289707  0.8125475  0.78776492 0.75162543
 0.78426074 0.77974331 0.81326522 0.8141096  0.79473106 0.83336148
 0.85898843 0.83901883 0.85628641 0.87486279 0.88782403 0.90095415
 0.92793211 0.948535   0.93333615 0.91746179 0.92544119 0.91771511
 0.9483239  0.94064004 0.96635143 0.9563033  0.96491598 0.94413203
 0.93795931 0.92865342 0.91987926 0.91280973 0.90777564 0.90473258
 0.90339231 0.90332204 0.90403908 0.90509242 0.90611798 0.90686554
 0.90720606 0.90711629 0.90665382 0.90592706 0.90506458 0.90419257
 0.90341312 0.90279734 0.90238118 0.90216941]
23 day output [[0.90213937]]
24 day input [0.97572406 0.99159841 0.96972895 0.97614625 0.96795575 1.
 0.99016297 0.99050072 0.96538039 0.98488559 0.97086887 0.94026007
 0.87748037 0.83483915 0.85413324 0.77336823 0.77269273 0.88014017
 0.84007431 0.89673225 0.85527316 0.83884995 0.74233725 0.82327113
 0.78143207 0.6665963  0.7921557  0.64118044 0.68614371 0.66001013
 0.65203074 0.58642236 0.56586169 0.66089673 0.65515494 0.70970193
 0.66452757 0.69437642 0.69218104 0.63569197 0.65266402 0.63780292
 0.7267162  0.71388162 0.74191506 0.75002111 0.77222832 0.83049059
 0.8194292  0.8289707  0.8125475  0.78776492 0.75162543 0.78426074
 0.77974331 0.81326522 0.8141096  0.79473106 0.83336148 0.85898843
 0.83901883 0.85628641 0.87486279 0.88782403 0.90095415 0.92793211
 0.948535   0.93333615 0.91746179 0.92544119 0.91771511 0.9483239
 0.94064004 0.96635143 0.9563033  0.96491598 0.94413203 0.93795931
 0.92865342 0.91987926 0.91280973 0.90777564 0.90473258 0.90339231
 0.90332204 0.90403908 0.90509242 0.90611798 0.90686554 0.90720606
 0.90711629 0.90665382 0.90592706 0.90506458 0.90419257 0.90341312
 0.90279734 0.90238118 0.90216941 0.90213937]
24 day output [[0.9022528]]
25 day input [0.99159841 0.96972895 0.97614625 0.96795575 1.         0.99016297
 0.99050072 0.96538039 0.98488559 0.97086887 0.94026007 0.87748037
 0.83483915 0.85413324 0.77336823 0.77269273 0.88014017 0.84007431
 0.89673225 0.85527316 0.83884995 0.74233725 0.82327113 0.78143207
 0.6665963  0.7921557  0.64118044 0.68614371 0.66001013 0.65203074
 0.58642236 0.56586169 0.66089673 0.65515494 0.70970193 0.66452757
 0.69437642 0.69218104 0.63569197 0.65266402 0.63780292 0.7267162
 0.71388162 0.74191506 0.75002111 0.77222832 0.83049059 0.8194292
 0.8289707  0.8125475  0.78776492 0.75162543 0.78426074 0.77974331
 0.81326522 0.8141096  0.79473106 0.83336148 0.85898843 0.83901883
 0.85628641 0.87486279 0.88782403 0.90095415 0.92793211 0.948535
 0.93333615 0.91746179 0.92544119 0.91771511 0.9483239  0.94064004
 0.96635143 0.9563033  0.96491598 0.94413203 0.93795931 0.92865342
 0.91987926 0.91280973 0.90777564 0.90473258 0.90339231 0.90332204
```

```
 0.90403908 0.90509242 0.90611798 0.90686554 0.90720606 0.90711629
 0.90665382 0.90592706 0.90506458 0.90419257 0.90341312 0.90279734
 0.90238118 0.90216941 0.90213937 0.90225279]
25 day output [[0.90246403]]
26 day input [0.96972895 0.97614625 0.96795575 1.         0.99016297 0.99050072
 0.96538039 0.98488559 0.97086887 0.94026007 0.87748037 0.83483915
 0.85413324 0.77336823 0.77269273 0.88014017 0.84007431 0.89673225
 0.85527316 0.83884995 0.74233725 0.82327113 0.78143207 0.6665963
 0.7921557  0.64118044 0.68614371 0.66001013 0.65203074 0.58642236
 0.56586169 0.66089673 0.65515494 0.70970193 0.66452757 0.69437642
 0.69218104 0.63569197 0.65266402 0.63780292 0.7267162  0.71388162
 0.74191506 0.75002111 0.77222832 0.83049059 0.8194292  0.8289707
 0.8125475  0.78776492 0.75162543 0.78426074 0.77974331 0.81326522
 0.8141096  0.79473106 0.83336148 0.85898843 0.83901883 0.85628641
 0.87486279 0.88782403 0.90095415 0.92793211 0.948535   0.93333615
 0.91746179 0.92544119 0.91771511 0.9483239  0.94064004 0.96635143
 0.9563033  0.96491598 0.94413203 0.93795931 0.92865342 0.91987926
 0.91280973 0.90777564 0.90473258 0.90339231 0.90332204 0.90403908
 0.90509242 0.90611798 0.90686554 0.90720606 0.90711629 0.90665382
 0.90592706 0.90506458 0.90419257 0.90341312 0.90279734 0.90238118
 0.90216941 0.90213937 0.90225279 0.90246403]
26 day output [[0.90272856]]
27 day input [0.97614625 0.96795575 1.         0.99016297 0.99050072 0.96538039
 0.98488559 0.97086887 0.94026007 0.87748037 0.83483915 0.85413324
 0.77336823 0.77269273 0.88014017 0.84007431 0.89673225 0.85527316
 0.83884995 0.74233725 0.82327113 0.78143207 0.6665963  0.7921557
 0.64118044 0.68614371 0.66001013 0.65203074 0.58642236 0.56586169
 0.66089673 0.65515494 0.70970193 0.66452757 0.69437642 0.69218104
 0.63569197 0.65266402 0.63780292 0.7267162  0.71388162 0.74191506
 0.75002111 0.77222832 0.83049059 0.8194292  0.8289707  0.8125475
 0.78776492 0.75162543 0.78426074 0.77974331 0.81326522 0.8141096
 0.79473106 0.83336148 0.85898843 0.83901883 0.85628641 0.87486279
 0.88782403 0.90095415 0.92793211 0.948535   0.93333615 0.91746179
 0.92544119 0.91771511 0.9483239  0.94064004 0.96635143 0.9563033
 0.96491598 0.94413203 0.93795931 0.92865342 0.91987926 0.91280973
 0.90777564 0.90473258 0.90339231 0.90332204 0.90403908 0.90509242
 0.90611798 0.90686554 0.90720606 0.90711629 0.90665382 0.90592706
 0.90506458 0.90419257 0.90341312 0.90279734 0.90238118 0.90216941
 0.90213937 0.90225279 0.90246403 0.90272856]
27 day output [[0.90300757]]
28 day input [0.96795575 1.         0.99016297 0.99050072 0.96538039 0.98488559
 0.97086887 0.94026007 0.87748037 0.83483915 0.85413324 0.77336823
 0.77269273 0.88014017 0.84007431 0.89673225 0.85527316 0.83884995
 0.74233725 0.82327113 0.78143207 0.6665963  0.7921557  0.64118044
 0.68614371 0.66001013 0.65203074 0.58642236 0.56586169 0.66089673
 0.65515494 0.70970193 0.66452757 0.69437642 0.69218104 0.63569197
 0.65266402 0.63780292 0.7267162  0.71388162 0.74191506 0.75002111
 0.77222832 0.83049059 0.8194292  0.8289707  0.8125475  0.78776492
 0.75162543 0.78426074 0.77974331 0.81326522 0.8141096  0.79473106
 0.83336148 0.85898843 0.83901883 0.85628641 0.87486279 0.88782403
 0.90095415 0.92793211 0.948535   0.93333615 0.91746179 0.92544119
 0.91771511 0.9483239  0.94064004 0.96635143 0.9563033  0.96491598
 0.94413203 0.93795931 0.92865342 0.91987926 0.91280973 0.90777564
 0.90473258 0.90339231 0.90332204 0.90403908 0.90509242 0.90611798
 0.90686554 0.90720606 0.90711629 0.90665382 0.90592706 0.90506458
 0.90419257 0.90341312 0.90279734 0.90238118 0.90216941 0.90213937
 0.90225279 0.90246403 0.90272856 0.90300757]
28 day output [[0.903272]]
29 day input [1.         0.99016297 0.99050072 0.96538039 0.98488559 0.97086887
 0.94026007 0.87748037 0.83483915 0.85413324 0.77336823 0.77269273
 0.88014017 0.84007431 0.89673225 0.85527316 0.83884995 0.74233725
 0.82327113 0.78143207 0.6665963  0.7921557  0.64118044 0.68614371
 0.66001013 0.65203074 0.58642236 0.56586169 0.66089673 0.65515494
 0.70970193 0.66452757 0.69437642 0.69218104 0.63569197 0.65266402
```

```
 0.63780292 0.7267162  0.71388162 0.74191506 0.75002111 0.77222832
 0.83049059 0.8194292  0.8289707  0.8125475  0.78776492 0.75162543
 0.78426074 0.77974331 0.81326522 0.8141096  0.79473106 0.83336148
 0.85898843 0.83901883 0.85628641 0.87486279 0.88782403 0.90095415
 0.92793211 0.948535   0.93333615 0.91746179 0.92544119 0.91771511
 0.9483239  0.94064004 0.96635143 0.9563033  0.96491598 0.94413203
 0.93795931 0.92865342 0.91987926 0.91280973 0.90777564 0.90473258
 0.90339231 0.90332204 0.90403908 0.90509242 0.90611798 0.90686554
 0.90720606 0.90711629 0.90665382 0.90592706 0.90506458 0.90419257
 0.90341312 0.90279734 0.90238118 0.90216941 0.90213937 0.90225279
 0.90246403 0.90272856 0.90300757 0.90327197]
29 day output [[0.90350425]]
[[0.9441320300102234], [0.9379593133926392], [0.9286534190177917], [0.9198792576789856],
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[0.9032719731330872], [0.9035042524337769]]
```

In [442…
```
day_new=np.arange(1,101)
day_pred=np.arange(101,131)
```

In [443…
```
import matplotlib.pyplot as plt
```

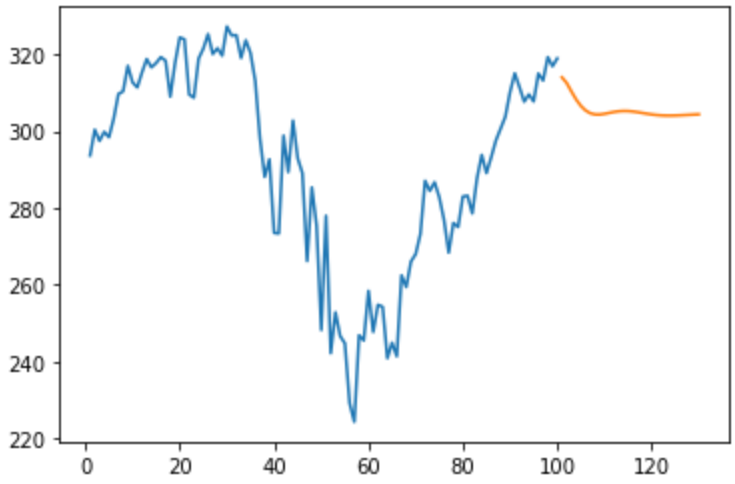
In [391…
```
len(df1)
```

Out[391]:
```
1258
```

In [392…

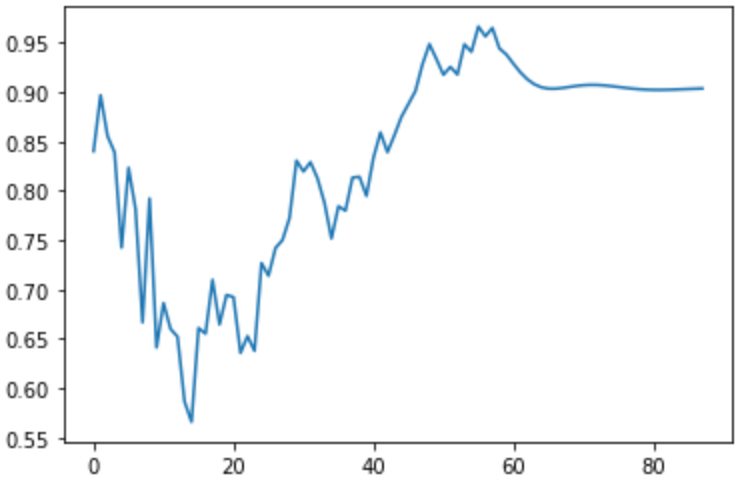
In [444…
```
plt.plot(day_new,scaler.inverse_transform(df1[1158:]))
plt.plot(day_pred,scaler.inverse_transform(lst_output))
```

Out[444]:
```
[<matplotlib.lines.Line2D at 0x2d1b0f352b0>]
```



In [446…
```
df3=df1.tolist()
df3.extend(lst_output)
plt.plot(df3[1200:])
```

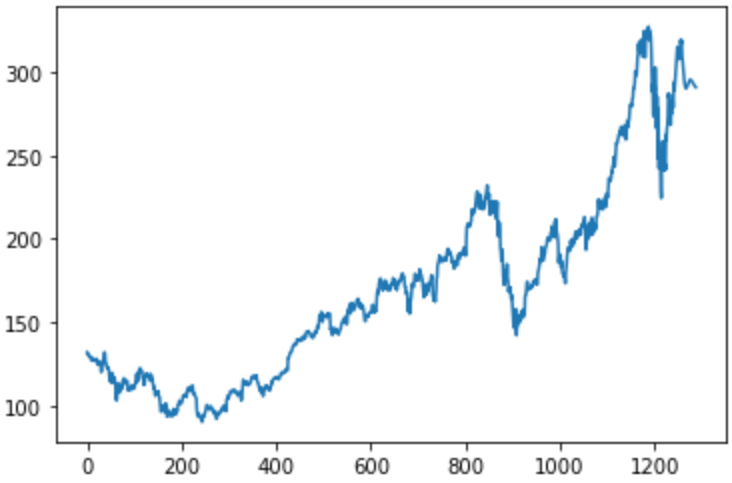
Out[446]:
```
[<matplotlib.lines.Line2D at 0x2d1b0f55ac8>]
```



In [395…
```
df3=scaler.inverse_transform(df3).tolist()
```

In [396…
```
plt.plot(df3)
```

Out[396]:
```
[<matplotlib.lines.Line2D at 0x2d1a904c470>]
```



In [ ]: