热点挖掘：LSTM模型

数据集

2022年5月16日到9月12日全国新增确诊人数与新增无症状感染者数量

思路

初步想法是直接将前60%的数据制作成训练集，后40%用于预测，偏离预测值较大的即为当天出现热点信息。但由于数据集较小，且通过抽取前几日确诊人数特征预测当日确诊人数，缺乏一定的逻辑合理性，因此，改换思路，将新增无症状感染者数据作为训练集，将新增确诊人数作为测试集，然后再将偏离值较大的选出，作为本次热点分析结果，这是一个朴素的想法，无症状感染者与确诊者有较强的关联性，通过挖掘无症状感染者的数量变化规律可以较好的预测出确诊人数，如若不然，就说明当天有其他因素影响了确诊人数的变化，需要作为热点重点分析。

模型

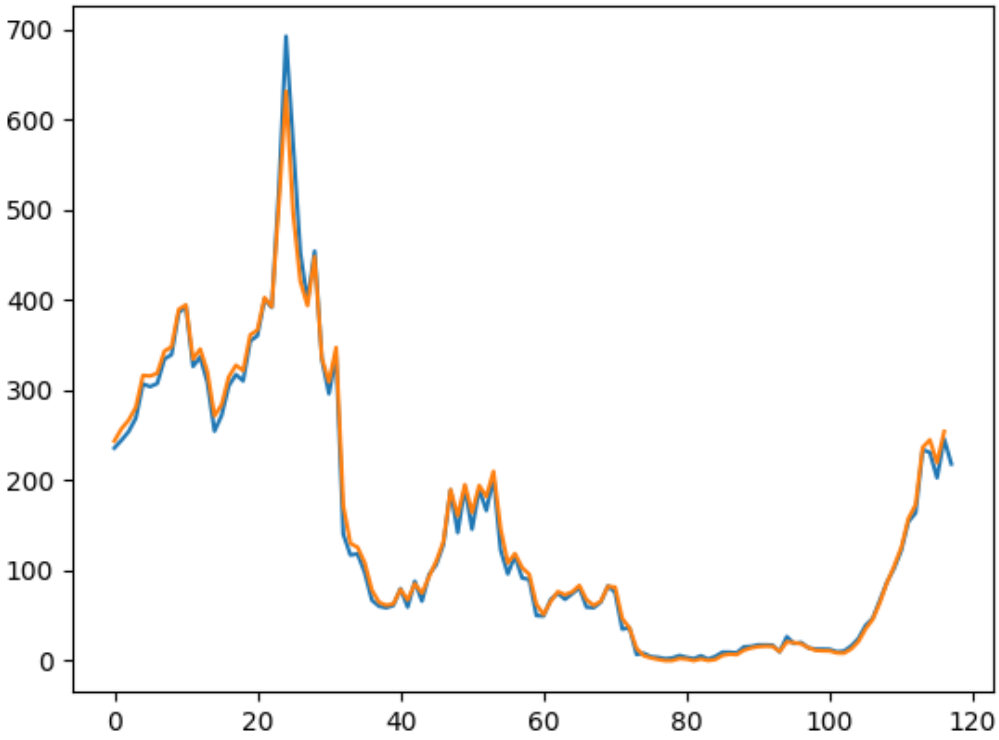
```
model = Sequential()
model.add(LSTM(4, input_shape=(None,1)))
model.add(Dense(1))
adam = optimizers.Adam(learning_rate=0.01, beta_1=0.9, beta_2=0.999,
amsgrad=False)
model.compile(loss='mean_squared_error', optimizer=adam)
```

超参数	值
time_step(look_back)	2
epoch	30
batch_size	3
learning_rate	0.01

结果

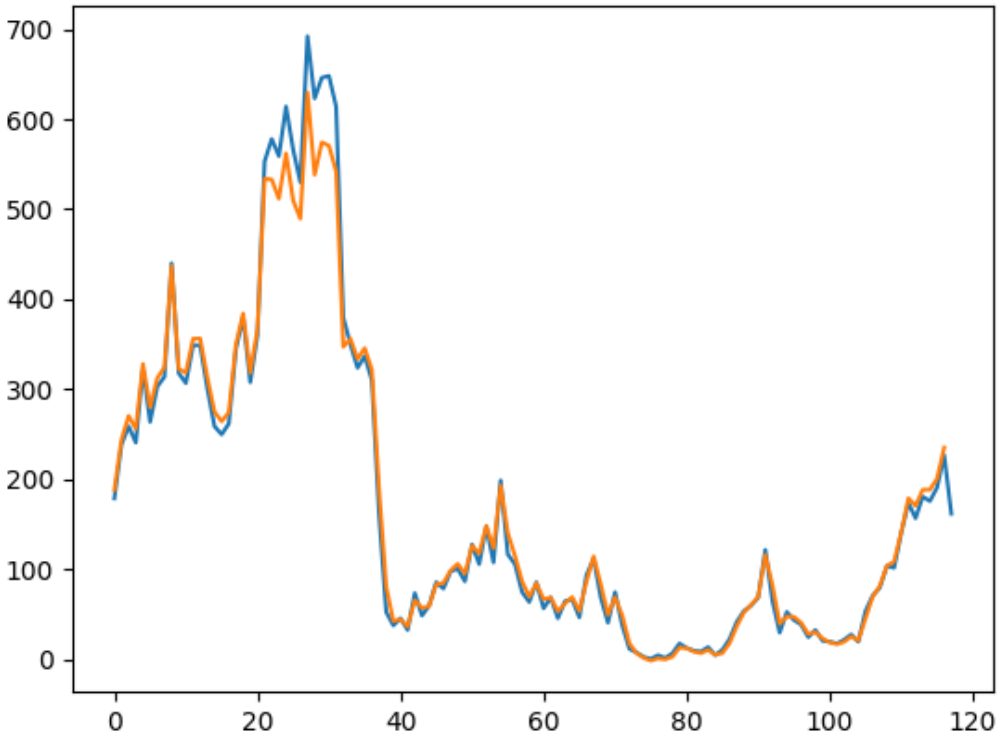
- 蓝线为标签
- 橙线为预测

训练结果




```
//loss 收敛
40/40 - 0s - loss: 0.0036 - 343ms/epoch - 9ms/step
Epoch 26/30
40/40 - 0s - loss: 0.0039 - 379ms/epoch - 9ms/step
Epoch 27/30
40/40 - 0s - loss: 0.0035 - 362ms/epoch - 9ms/step
Epoch 28/30
40/40 - 0s - loss: 0.0037 - 335ms/epoch - 8ms/step
Epoch 29/30
40/40 - 0s - loss: 0.0036 - 346ms/epoch - 9ms/step
Epoch 30/30
40/40 - 0s - loss: 0.0039 - 361ms/epoch - 9ms/step
```

预测结果



热点挖掘

结果

```
日期下标  真实值  预测值    偏差百分比
    25 566   [509] [10.07067138]
    28 623   [538] [13.64365971]
    29 646   [574] [11.14551084]
    30 648   [570] [12.03703704]
    31 614   [541] [11.88925081]
    37 162   [189] [16.66666667]
    38 53    [81] [52.83018868]
    39 38    [42] [10.52631579]
    42 74    [65] [12.16216216]
    43 49    [57] [16.32653061]
    51 106   [117] [10.37735849]
    53 108   [123] [13.88888889]
    55 117   [140] [19.65811966]
    57 75    [86] [14.66666667]
    60 56    [67] [19.64285714]
    62 46    [53] [15.2173913]
    65 47    [53] [12.76595745]
    68 69    [83] [20.28985507]
    69 41    [49] [19.51219512]
    71 38    [48] [26.31578947]
    72 12    [18] [50.]
    73 8     [7] [12.5]
    74 3     [2] [33.33333333]
    75 1     [-1] [200.]
    76 5     [1] [80.]
    77 2     [0] [100.]
```

```
    78 6    [3] [50.]
    79 18   [13] [27.77777778]
    81 10   [8] [20.]
    82 9    [7] [22.22222222]
    83 13   [10] [23.07692308]
    85 11   [7] [36.36363636]
    86 23   [18] [21.73913043]
    87 42   [37] [11.9047619]
    92 65   [82] [26.15384615]
    93 30   [39] [30.]
    97 25   [28] [12.]
    102 22  [19] [13.63636364]
    105 54  [45] [16.66666667]
```

完整代码

```
from pickletools import optimize
import numpy
import matplotlib.pyplot as plt
from keras.models import Sequential
from keras.layers import Dense
from keras.layers import LSTM
import  pandas as pd
import  os
from keras.models import Sequential, load_model
from sklearn.preprocessing import MinMaxScaler
from keras import optimizers

def create_dataset(dataset, look_back):
#这里的look_back与timestep相同
    dataX, dataY = [], []
    for i in range(len(dataset)-look_back):
        a = dataset[i:(i+look_back)]
        dataX.append(a)
        dataY.append(dataset[i + look_back])
    return numpy.array(dataX),numpy.array(dataY)

dataframe1 = pd.read_excel('data.xlsx', usecols=[2])
dataframe2 = pd.read_excel('data.xlsx', usecols=[1])


dataset1 = dataframe1.values
dataset2 = dataframe2.values

# 将整型变为float
dataset1 = dataset1.astype('float32')
dataset2 = dataset2.astype('float32')
#归一化
scaler = MinMaxScaler(feature_range=(0, 1))
dataset1 = scaler.fit_transform(dataset1)
dataset2 = scaler.fit_transform(dataset2)

# train_size = int(len(dataset) * 0.65)
trainlist = dataset1
testlist = dataset2


```

```
42
43  #训练数据太少 look_back并不能过大
44  look_back = 2
45  trainX,trainY  = create_dataset(trainlist,look_back)
46
47  testX,testY = create_dataset(testlist,look_back)
48
49  trainX = numpy.reshape(trainX, (trainX.shape[0], trainX.shape[1], 1))
50  testX = numpy.reshape(testX, (testX.shape[0], testX.shape[1] ,1 ))
51
52  # # create and fit the LSTM network
53  # model = Sequential()
54  # model.add(LSTM(4, input_shape=(None,1)))
55  # model.add(Dense(1))
56  # adam = optimizers.Adam(learning_rate=0.01, beta_1=0.9, beta_2=0.999,
    amsgrad=False)
57  # model.compile(loss='mean_squared_error', optimizer=adam)
58
59
60  # model.fit(trainX, trainY, epochs=30, batch_size=3, verbose=2)
61  # model.save(os.path.join("DATA","Test" + ".h5"))
62
63  # make predictions
64  model = load_model(os.path.join("DATA","Test" + ".h5"))
65  trainPredict = model.predict(trainX)
66  testPredict = model.predict(testX)
67
68  #反归一化
69  trainPredict = scaler.inverse_transform(trainPredict)
70  trainY = scaler.inverse_transform(trainY)
71  testPredict = scaler.inverse_transform(testPredict)
72  testY = scaler.inverse_transform(testY)
73
74
75  testY = testY.astype(int)
76  testPredict = testPredict.astype(int)
77  testY = testY.reshape(-1)
78
79  print("选出偏差百分比大于20%的数据")
80  print("日期下标\t真实值\t预测值\t偏差百分比")
81
82  df1 = pd.DataFrame({'predict': testY})
83  df1.to_excel('predict.xlsx', sheet_name='Sheet1', index=False) # index false
    为不写入索引
84  for i in range(len(testY)-1):
85      delta = (testY[i] - testPredict[i+1])/testY[i] * 100
86      delta = abs(delta)
87      if delta > 10:
88          print(i,testY[i],testPredict[i+1],delta)
89
90  # plt.plot(trainY)
91  # plt.plot(trainPredict[1:])
92  # plt.show()
93  # plt.plot(testY)
94  # plt.plot(testPredict[1:])
95  # plt.show()
```