WeatherAnalysis

December 18, 2017

In [269]:
```
import pyodbc
import pandas as pd
```

In [270]:
```
SERVER_NAME = 'weathermon-cst2101.database.windows.net'
DATABASE_NAME = 'WeatherMonitor'
USERID = 'engadmin'
PASSWORD = 'c@r!os210688'
DB_DRIVER = 'ODBC Driver 13 for SQL Server'

driver = 'DRIVER={' + DB_DRIVER + '}'
server = 'SERVER=' + SERVER_NAME
database = 'DATABASE=' + DATABASE_NAME
uid = 'UID=' + USERID
pwd = 'PWD=' + PASSWORD

CONNECTION_STRING = ';'.join([driver,server,database,uid,pwd])
CONNECTION_STRING
```

Out[270]:
```
'DRIVER={ODBC Driver 13 for SQL Server};SERVER=weathermon-cst2101.database.windows.net
```

In [271]:
```
conn = pyodbc.connect(CONNECTION_STRING)
df1 = pd.read_sql('''SELECT * FROM [dbo].[PiSensors] ORDER BY eventprocessedutctime AS
conn.close()
df1.describe()
```

Out[271]:

	temperature	humidity	pressure
count	1101.000000	1101.000000	1101.000000
mean	38.946058	17.087293	1005.649410
std	0.620244	1.245860	1.564468
min	37.700000	13.810000	1003.430000
25%	38.620000	16.060000	1004.280000
50%	38.970000	16.820000	1005.350000
75%	39.360000	18.260000	1007.110000
max	40.490000	22.680000	1008.640000

In [272]:
```
conn = pyodbc.connect(CONNECTION_STRING)
df2 = pd.read_sql('''SELECT * FROM [dbo].[OpenWeather] order by [eventprocessedutctime
conn.close()
df2.describe()
```

Out[272]:

	temperature
count	7.000000
mean	-8.571429
std	0.534522
min	-9.000000
25%	-9.000000
50%	-9.000000
75%	-8.000000
max	-8.000000

1 Performing Analysis in SenseHat and Open Weather data

In [273]:
```
df1.sort_values(by='eventprocessedutctime', ascending=False).head(20)
```

Out[273]:

	eventprocessedutctime	deviceid	temperature	humidity	pressure	room_number
1100	2017-12-18T21:14:12.2350521Z	alma-pi	39.10	18.19	1003.45	T114
1099	2017-12-18T21:13:52.1161243Z	alma-pi	39.19	19.88	1003.47	T114
1098	2017-12-18T21:13:31.9021677Z	alma-pi	39.10	18.86	1003.45	T114
1097	2017-12-18T21:13:12.6806586Z	alma-pi	39.13	18.70	1003.46	T114
1096	2017-12-18T21:12:52.4332703Z	alma-pi	39.04	18.71	1003.43	T114
1095	2017-12-18T21:12:32.2324311Z	alma-pi	38.99	19.05	1003.44	T114
1094	2017-12-18T21:12:12.0295952Z	alma-pi	39.15	18.66	1003.45	T114
1093	2017-12-18T21:11:51.8314118Z	alma-pi	39.10	18.44	1003.48	T114
1092	2017-12-18T21:11:32.4950050Z	alma-pi	39.11	18.77	1003.52	T114
1091	2017-12-18T21:11:12.2031371Z	alma-pi	39.06	18.34	1003.50	T114
1090	2017-12-18T21:10:51.9689560Z	alma-pi	39.13	18.53	1003.53	
1089	2017-12-18T21:10:31.7802287Z	alma-pi	39.08	18.08	1003.55	
1088	2017-12-18T21:10:12.4650057Z	alma-pi	39.20	18.41	1003.58	
1087	2017-12-18T21:09:52.2267981Z	alma-pi	39.17	18.79	1003.55	
1086	2017-12-18T21:09:31.9914324Z	alma-pi	39.10	18.59	1003.57	
1085	2017-12-18T21:09:11.7473588Z	alma-pi	39.15	18.47	1003.59	
1084	2017-12-18T21:08:51.5554343Z	alma-pi	39.15	18.75	1003.58	
1083	2017-12-18T21:08:32.3543298Z	alma-pi	39.26	18.29	1003.60	
1082	2017-12-18T21:08:12.0992164Z	alma-pi	39.29	19.36	1003.58	
1081	2017-12-18T21:07:51.9736513Z	alma-pi	39.29	18.29	1003.60	

```
1090        T114
1089        T114
1088        T114
1087        T114
1086        T114
1085        T114
1084        T114
1083        T114
1082        T114
1081        T114
```

```
In [274]: df1['temperature'].max()
```

```
Out[274]: 40.490000000000002
```

```
In [275]: df1['temperature'].min()
```

```
Out[275]: 37.700000000000003
```

```
In [276]: df1['humidity'].max()
```

```
Out[276]: 22.68
```

```
In [277]: df1['humidity'].min()
```

```
Out[277]: 13.81
```

```
In [278]: df1[df1['temperature']>40.25].sort_values(by='eventprocessedutctime', ascending=False)
```

Out[278]:

	eventprocessedutctime	deviceid	temperature	humidity	pressure
345	2017-12-18T17:01:14.6693280Z	alma-pi	40.26	15.75	1006.52
343	2017-12-18T17:00:34.2257712Z	alma-pi	40.30	15.71	1006.56
342	2017-12-18T17:00:14.9865851Z	alma-pi	40.26	15.70	1006.53
341	2017-12-18T16:59:54.7462386Z	alma-pi	40.26	15.96	1006.52
340	2017-12-18T16:59:34.5171688Z	alma-pi	40.33	15.30	1006.48
339	2017-12-18T16:59:14.1734179Z	alma-pi	40.26	16.12	1006.50
338	2017-12-18T16:58:54.9449771Z	alma-pi	40.37	15.73	1006.47
337	2017-12-18T16:58:34.7096863Z	alma-pi	40.33	16.26	1006.45
336	2017-12-18T16:58:14.4660638Z	alma-pi	40.33	15.80	1006.51
335	2017-12-18T16:57:54.2250047Z	alma-pi	40.39	14.93	1006.46
334	2017-12-18T16:57:34.9155274Z	alma-pi	40.42	16.38	1006.45
333	2017-12-18T16:57:14.5860902Z	alma-pi	40.37	16.06	1006.49
332	2017-12-18T16:56:54.4278562Z	alma-pi	40.39	15.49	1006.53
331	2017-12-18T16:56:34.2366166Z	alma-pi	40.33	15.49	1006.53
330	2017-12-18T16:56:14.0611684Z	alma-pi	40.39	15.41	1006.55
329	2017-12-18T16:55:54.8386525Z	alma-pi	40.42	14.28	1006.53
328	2017-12-18T16:55:34.5129801Z	alma-pi	40.37	15.34	1006.53
327	2017-12-18T16:55:14.2847816Z	alma-pi	40.44	15.16	1006.59
326	2017-12-18T16:54:54.0899036Z	alma-pi	40.37	15.00	1006.58

```
     325  2017-12-18T16:54:33.8319276Z  alma-pi        40.33     15.46   1006.61
     324  2017-12-18T16:54:14.6984814Z  alma-pi        40.47     15.68   1006.64
     323  2017-12-18T16:53:54.4288788Z  alma-pi        40.39     15.33   1006.67
     322  2017-12-18T16:53:34.3103207Z  alma-pi        40.40     15.59   1006.66
     321  2017-12-18T16:53:14.0592630Z  alma-pi        40.49     15.97   1006.71
     320  2017-12-18T16:52:53.8367692Z  alma-pi        40.37     15.24   1006.74
     319  2017-12-18T16:52:34.5047086Z  alma-pi        40.37     15.47   1006.74
     318  2017-12-18T16:52:14.2531245Z  alma-pi        40.37     15.48   1006.76

         room_number
     345        T331
     343        T331
     342        T331
     341        T331
     340        T331
     339        T331
     338        T331
     337        T331
     336        T331
     335        T331
     334        T331
     333        T331
     332        T331
     331        T331
     330        T331
     329        T331
     328        T331
     327        T331
     326        T331
     325        T331
     324        T331
     323        T331
     322        T331
     321        T331
     320        T331
     319        T331
     318        T331

In [279]: df2

Out[279]:          eventprocessedutctime  temperature         city
     0  2017-12-18T22:00:00.0000000Z         -9.0   Ottawa, CA
     1  2017-12-18T21:00:00.0000000Z         -8.0   Ottawa, CA
     2  2017-12-18T20:00:00.0000000Z         -8.0   Ottawa, CA
     3  2017-12-18T19:00:00.0000000Z         -8.0   Ottawa, CA
     4  2017-12-18T18:00:00.0000000Z         -9.0   Ottawa, CA
     5  2017-12-18T17:00:00.0000000Z         -9.0  Otttawa, CA
     6  2017-12-18T16:00:00.0000000Z         -9.0   Ottawa, CA
```

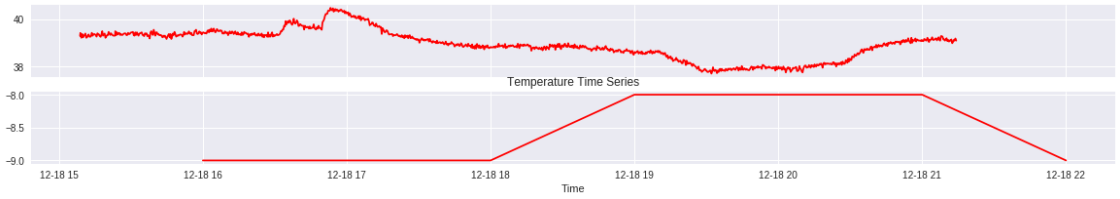
```
In [280]: import numpy as np

In [281]: import matplotlib.pyplot as plt
          %matplotlib inline
          import seaborn; seaborn.set()

In [282]: i = np.array(df1.index)

In [283]: UTCtime = df1['eventprocessedutctime']

In [284]: time = np.array(UTCtime.str[0:10] + ' ' + UTCtime.str[11:19], dtype=np.datetime64)

In [285]: temp = np.array(df1['temperature'])

In [286]: hum = np.array(df1['humidity'])

In [287]: press = np.array(df1['pressure'])
```

2 For Open Weather

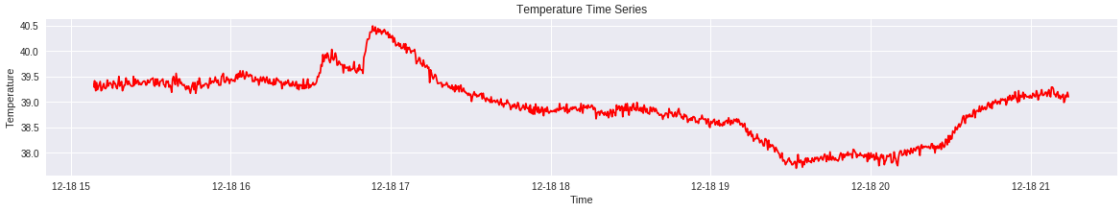
```
In [288]: time2=np.array(df2['eventprocessedutctime'].str[0:10] + ' ' + df2['eventprocessedutcti

In [289]: temp2 = np.array(df2['temperature'])
```

3 Charts

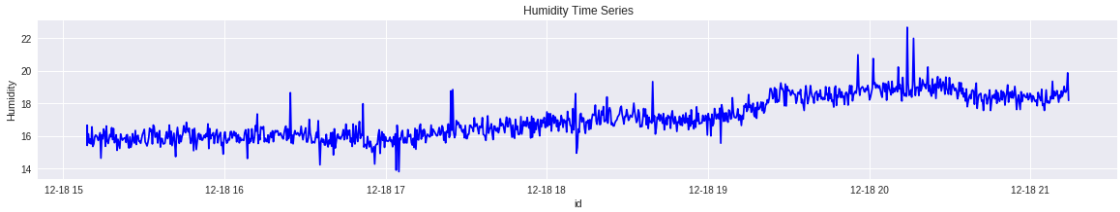
```
In [304]: fig,ax = plt.subplots(2,1,sharex=True,figsize=(20,3))

          ax[0].plot(time, temp, 'r')
          ax[1].plot(time2, temp2, 'r')
          plt.xlabel('Time')
          plt.title('Temperature Time Series')
          plt.show()
```



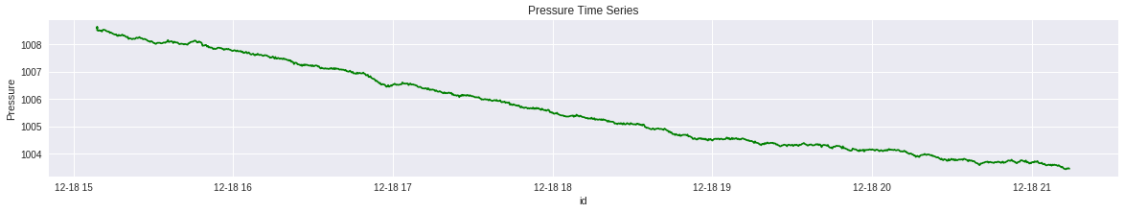

```
In [305]: plt.subplots(nrows=1, figsize=(20,3))

          plt.plot(time, temp, 'r')
          plt.xlabel('Time')
          plt.ylabel('Temperature')
          plt.title('Temperature Time Series')
          plt.show()
```



In [292]:
```
plt.subplots(figsize=(20,3))

plt.plot(time, hum, 'b')
plt.xlabel('id')
plt.ylabel('Humidity')
plt.title('Humidity Time Series')
plt.show()
```

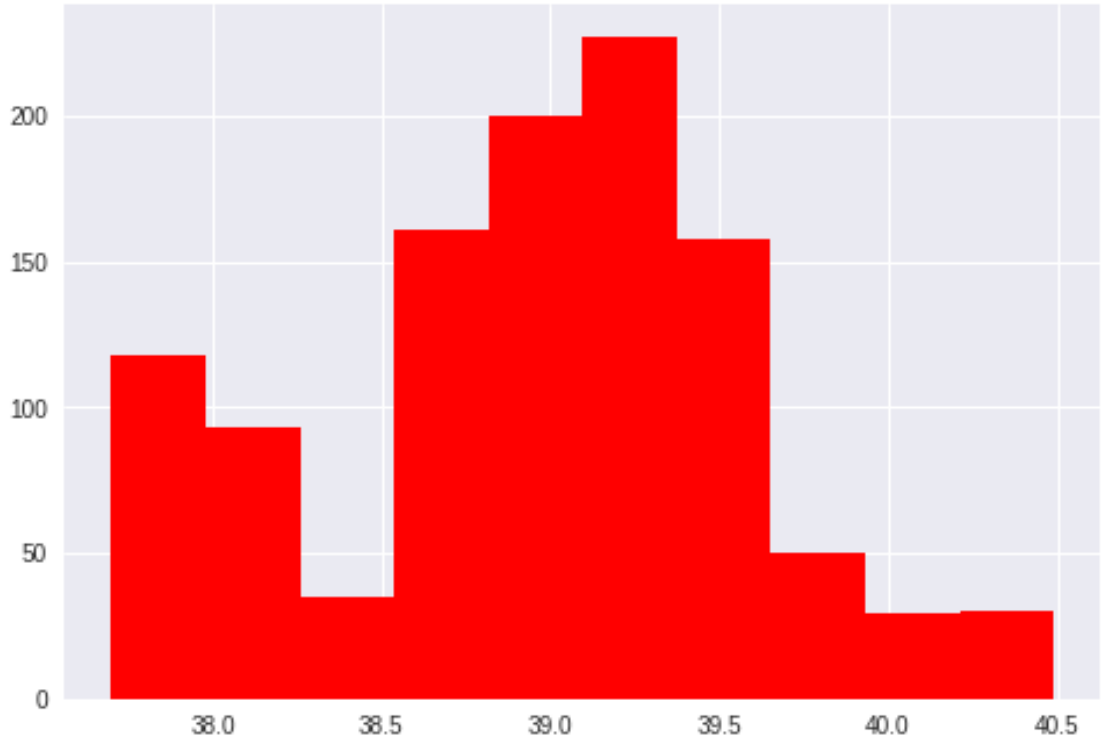


In [293]:
```
plt.subplots(figsize=(20,3))

plt.plot(time, press, 'g') # 'r' is the color red
plt.xlabel('id')
plt.ylabel('Pressure')
plt.title('Pressure Time Series')
plt.show()
```



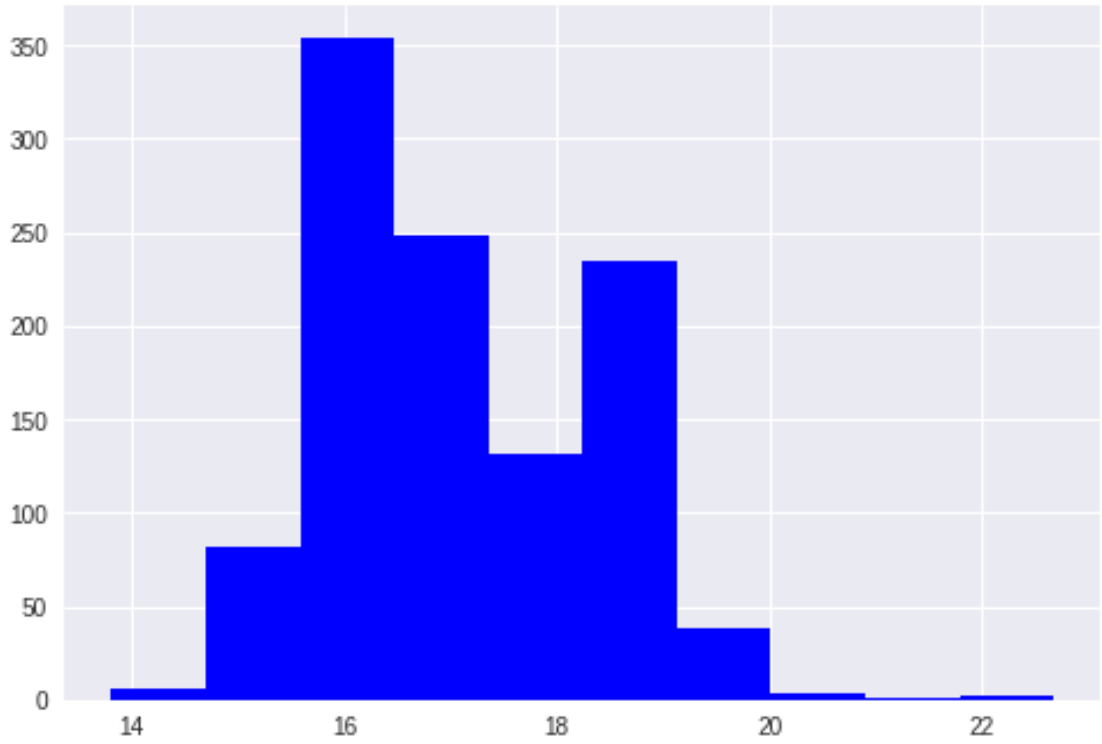
In [294]:
```
plt.hist(temp, color='r')
```

```
Out[294]: (array([ 118.,   93.,   35.,  161.,  200.,  227.,  158.,   50.,   29.,   30.]),
           array([ 37.7  ,  37.979,  38.258,  38.537,  38.816,  39.095,  39.374,
                   39.653,  39.932,  40.211,  40.49 ]),
           <a list of 10 Patch objects>)
```

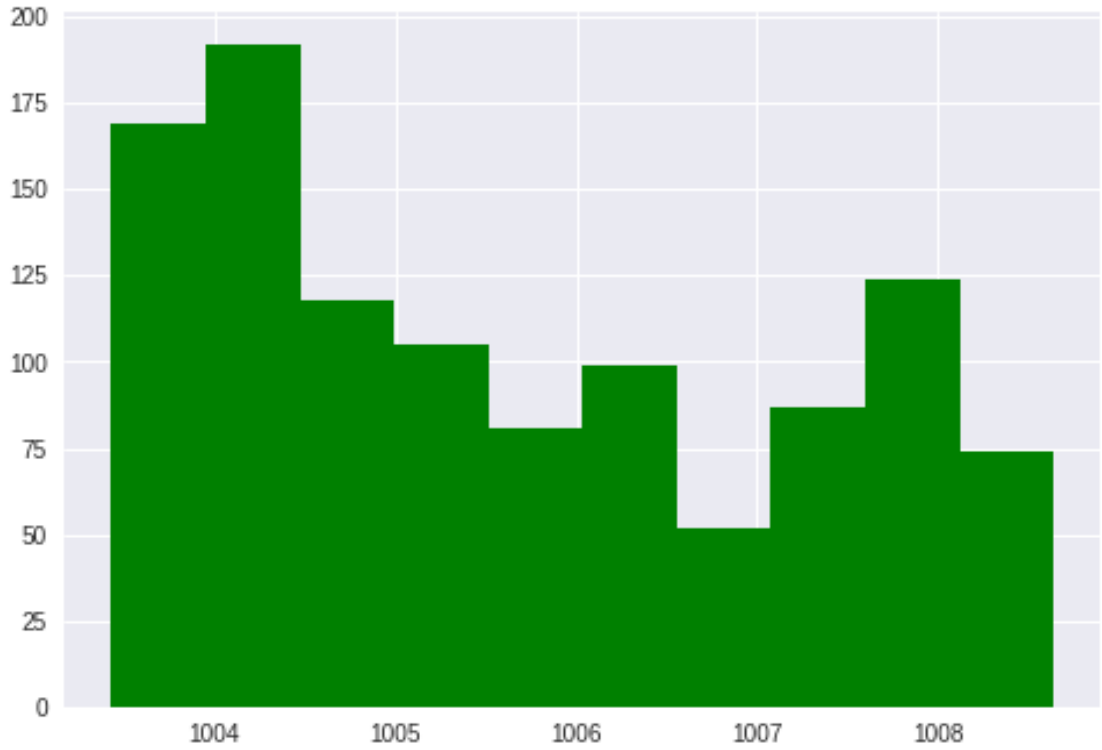



```
In [295]: plt.hist(hum, color='b')
```

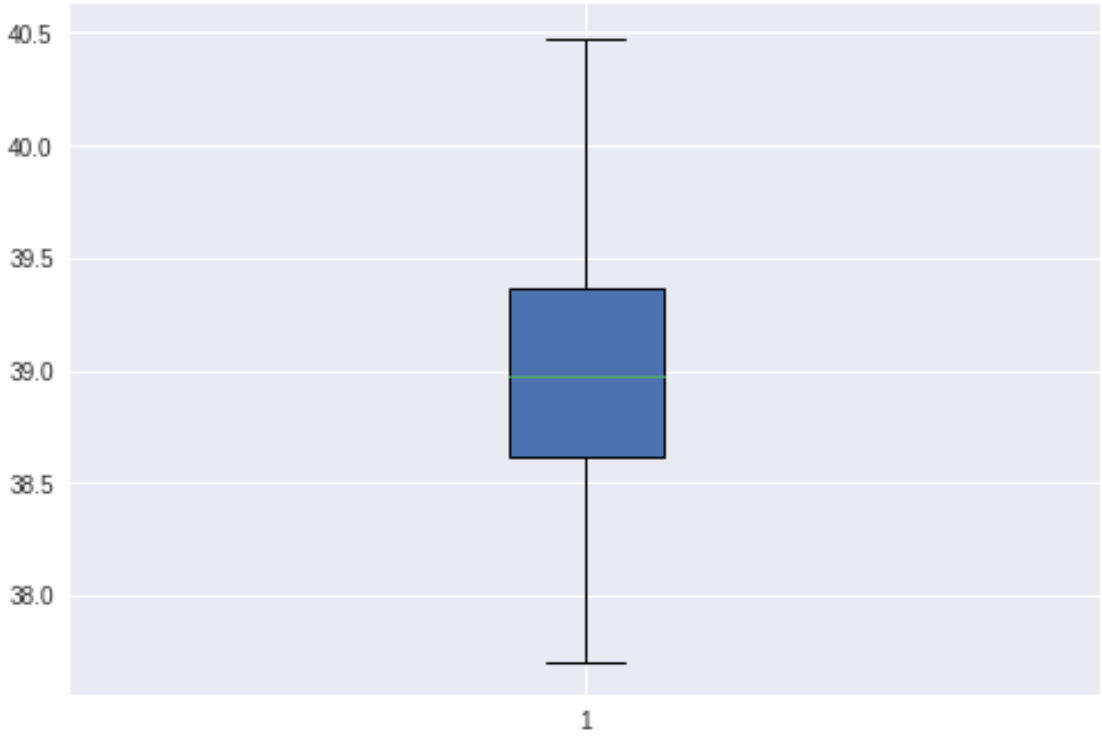
```
Out[295]: (array([   6.,   82.,  354.,  249.,  131.,  235.,   38.,    3.,    1.,    2.]),
           array([ 13.81 ,  14.697,  15.584,  16.471,  17.358,  18.245,  19.132,
                   20.019,  20.906,  21.793,  22.68 ]),
           <a list of 10 Patch objects>)
```



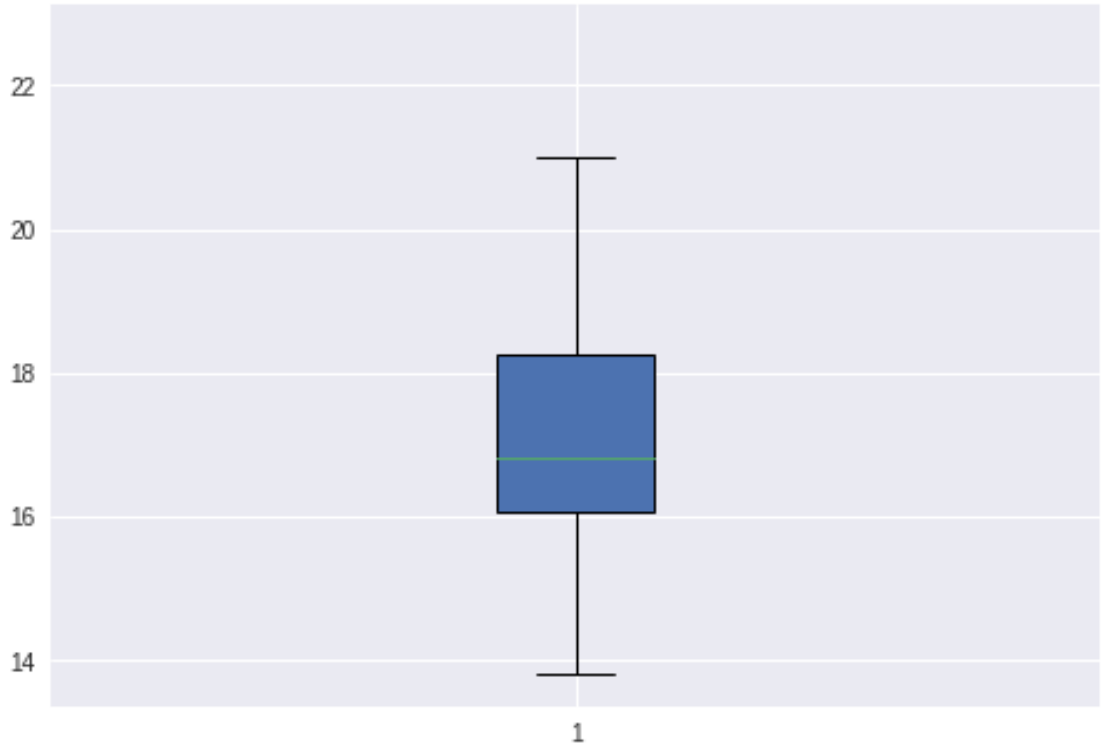

```
In [296]: plt.hist(press, color='g')

Out[296]: (array([ 169.,  192.,  118.,  105.,   81.,   99.,   52.,   87.,  124.,   74.]),
           array([ 1003.43 ,  1003.951,  1004.472,  1004.993,  1005.514,  1006.035,
                   1006.556,  1007.077,  1007.598,  1008.119,  1008.64 ]),
           <a list of 10 Patch objects>)
```



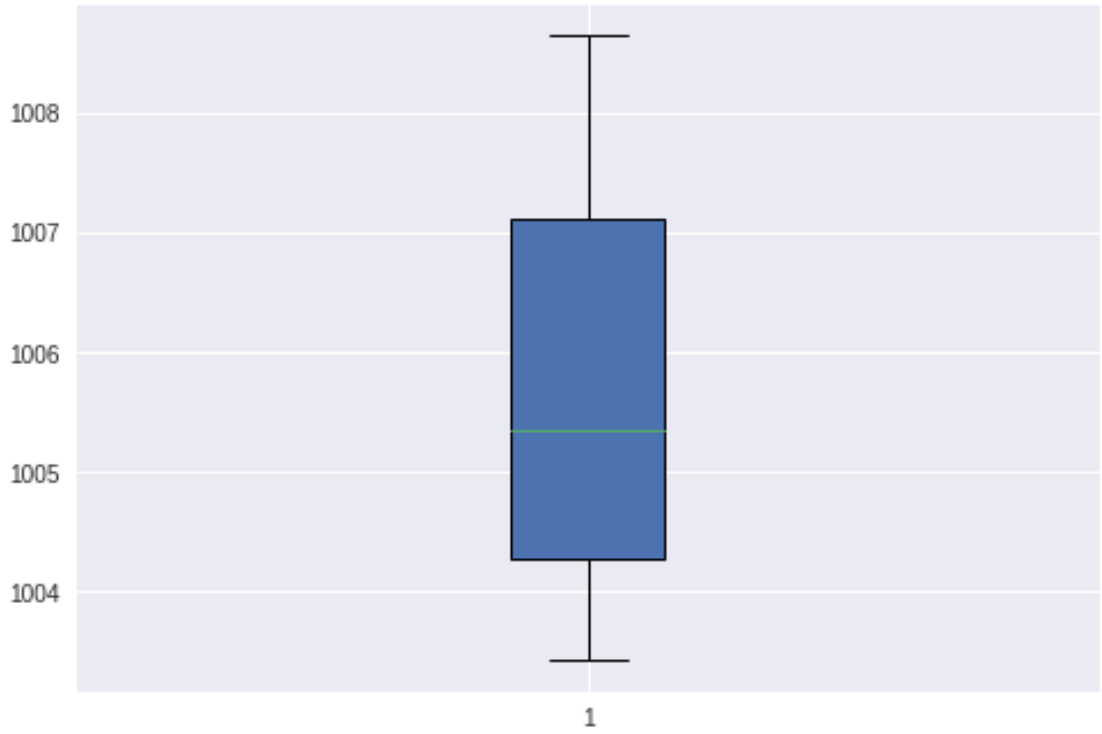
In [297]: `plt.boxplot([temp],vert=True,patch_artist=True);`



In [298]:
```
plt.boxplot([hum],vert=True,patch_artist=True);
```



In [299]:
```
plt.boxplot([press],vert=True,patch_artist=True);
```

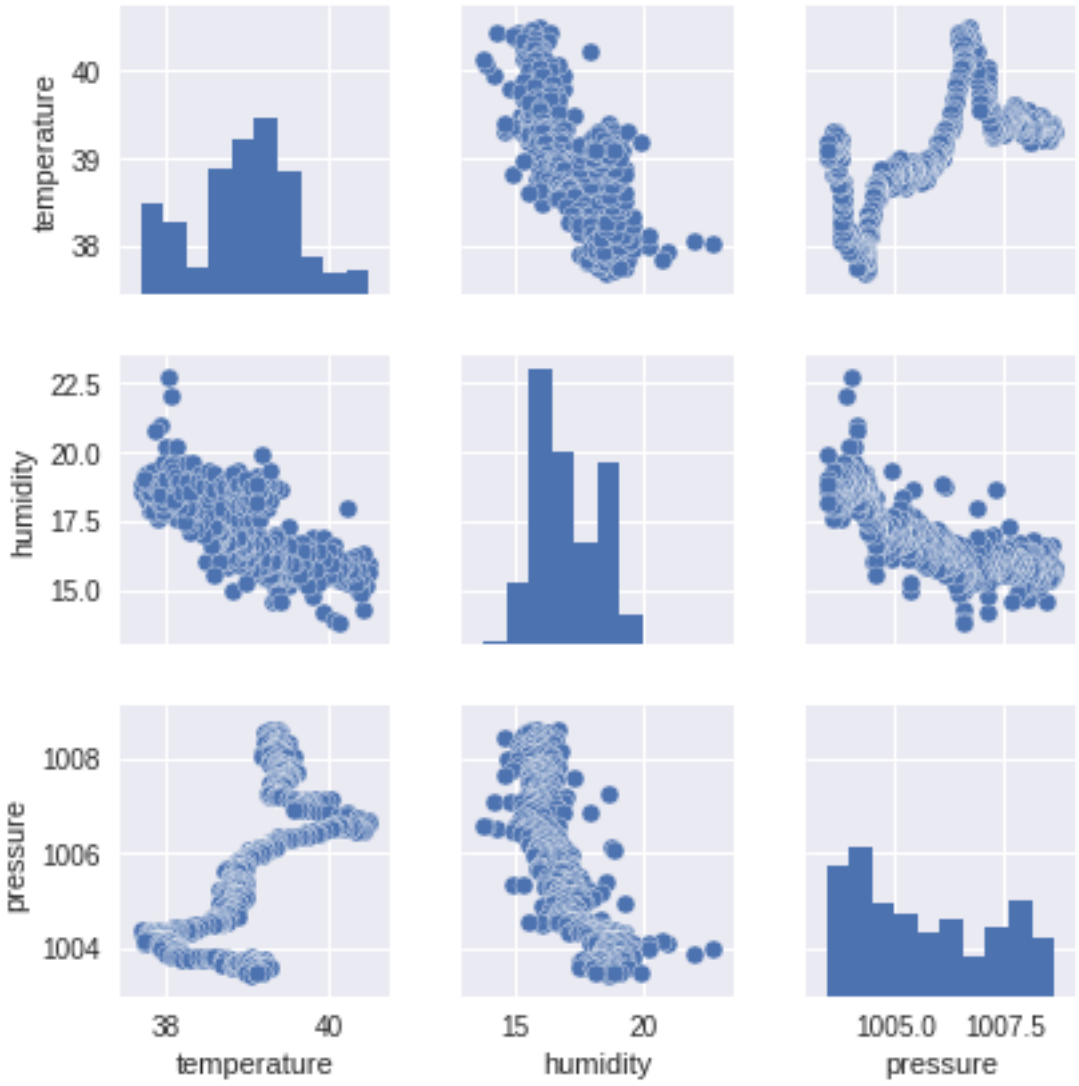


In [300]:
```
# Time Series for RaspberryPi
tempSeries = pd.Series(temp, index=time)
humSeries = pd.Series(hum, index=time)
pressSeries = pd.Series(press, index=time)
```

In [301]:
```
# Time Series for OpenWeather
temp2Series = pd.Series(temp2, index=time2)
```

In [302]:
```
seaborn.pairplot(df1, size=2.0)
```

Out[302]:
```
<seaborn.axisgrid.PairGrid at 0x7f84be65dc18>
```


temperature
40
39
38
humidity
22.5
20.0
17.5
15.0
pressure
1008
1006
1004
38
40
temperature
15
20
humidity
1005.0
1007.5
pressure

In [ ]: