

MW_WEEK_Xarxa_walkForward_multivariate-tempmin

December 21, 2019

1 Xarxa neuronal

```
In [1]: import pandas as pd
import numpy as np
from pandas import datetime
from matplotlib import pyplot as plt

import keras
from keras.models import Sequential
from keras.layers import Dense
from keras.layers import LSTM

from keras.optimizers import SGD
from sklearn.model_selection import StratifiedKFold
from scipy.stats import uniform as sp_rand
from scipy.stats import randint
from time import time
from sklearn import preprocessing

import math
from sklearn.metrics import mean_squared_error
```

Using TensorFlow backend.

1.1 Consum setmanal total multivariate one-step

```
In [2]: daily=pd.read_csv('C:/Users/Laura/Desktop/Smart meters London/workspace R/Dades netes/1')
daily.head(5)
```

```
Out[2]:
```

	date	apparentTemperatureMax	apparentTemperatureMin	sunsetTimeHour	\
0	2014-02-08	5.67	2.19	17	
1	2013-12-24	11.93	2.68	15	
2	2012-11-01	11.46	0.85	16	
3	2014-02-05	5.86	1.03	16	
4	2012-04-17	10.01	2.76	19	

	weekday	season	cloudCover	humidity	visibility	month	dewPoint	\
0	6	winter	0.47	0.77	11.20	2	3.99	
1	2	winter	0.40	0.81	10.86	12	5.42	
2	4	autumn	0.44	0.85	12.54	11	5.06	
3	3	winter	0.73	0.77	10.91	2	4.06	
4	2	spring	0.60	0.87	11.86	4	5.74	

	pressure	energy_sum
0	979.25	11.569300
1	979.52	11.981672
2	979.63	10.781689
3	982.20	11.415105
4	982.22	10.617443

```
In [3]: #Ens quedem amb date i energy_sum, ordenem valors per data i resetejem index
daily_dia=daily[['date','energy_sum','apparentTemperatureMax','apparentTemperatureMin']]
daily_dia=daily_dia[['date','energy_sum','apparentTemperatureMax','apparentTemperatureMin']]
daily_dia.head(20)
```

```
Out [3]:
```

	date	energy_sum	apparentTemperatureMax	apparentTemperatureMin
0	2011-11-23	6.952692	10.36	2.18
1	2011-11-24	8.536480	12.93	7.01
2	2011-11-25	9.499781	13.03	4.84
3	2011-11-26	10.267707	12.96	4.69
4	2011-11-27	10.850805	13.54	2.94
5	2011-11-28	9.103382	12.58	1.31
6	2011-11-29	9.274873	13.47	3.39
7	2011-11-30	8.813513	11.87	3.34
8	2011-12-01	9.227707	12.15	5.29
9	2011-12-02	10.145910	5.33	0.46
10	2011-12-03	10.780273	11.42	4.71
11	2011-12-04	12.163127	6.66	1.03
12	2011-12-05	10.609714	3.13	-1.69
13	2011-12-06	11.673417	3.77	-1.61
14	2011-12-07	10.889362	5.14	0.94
15	2011-12-08	11.525150	12.89	0.63
16	2011-12-09	11.759837	3.99	-1.42
17	2011-12-10	12.633801	3.14	-3.42
18	2011-12-11	13.749174	5.72	0.11
19	2011-12-12	11.951958	5.94	-0.64

```
In [4]: #Passem data a datetime
daily_dia["date"] = pd.to_datetime(daily["date"], format='%Y-%m-%d')
```

```
In [5]: import datetime
daily_dia['week']=0
daily_dia['year']=0
for i in range(len(daily_dia)):
```

```

        daily_dia['week'][i]= daily_dia['date'][i].strftime('%W')
        daily_dia['year'][i]= daily_dia['date'][i].strftime('%Y')
daily_dia

```

c:\users\laura\appdata\local\programs\python\python37\lib\site-packages\ipykernel_launcher.py:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: <http://pandas.pydata.org/pandas-docs/stable/indexing.html>

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A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: <http://pandas.pydata.org/pandas-docs/stable/indexing.html>
import sys

```

Out[5]:

```

	date	energy_sum	apparentTemperatureMax	apparentTemperatureMin	\
0	2014-02-08	6.952692	10.36	2.18	
1	2013-12-24	8.536480	12.93	7.01	
2	2012-11-01	9.499781	13.03	4.84	
3	2014-02-05	10.267707	12.96	4.69	
4	2012-04-17	10.850805	13.54	2.94	
5	2012-04-18	9.103382	12.58	1.31	
6	2013-12-25	9.274873	13.47	3.39	
7	2014-02-09	8.813513	11.87	3.34	
8	2014-01-28	9.227707	12.15	5.29	
9	2012-12-14	10.145910	5.33	0.46	
10	2013-12-27	10.780273	11.42	4.71	
11	2011-12-16	12.163127	6.66	1.03	
12	2012-04-24	10.609714	3.13	-1.69	
13	2014-02-15	11.673417	3.77	-1.61	
14	2014-02-07	10.889362	5.14	0.94	
15	2012-09-24	11.525150	12.89	0.63	
16	2012-09-23	11.759837	3.99	-1.42	
17	2014-01-27	12.633801	3.14	-3.42	
18	2014-02-06	13.749174	5.72	0.11	
19	2012-10-31	11.951958	5.94	-0.64	
20	2012-04-09	11.957446	12.08	0.22	
21	2014-02-01	12.392776	2.88	0.78	
22	2011-12-13	12.307079	4.38	1.07	
23	2014-02-14	13.376080	0.99	-2.65	
24	2013-03-17	13.511968	1.72	-3.56	
25	2014-01-16	14.732271	1.98	-4.12	
26	2014-01-17	13.774471	4.02	-3.67	
27	2013-03-18	12.709106	4.98	1.68	
28	2012-11-02	12.148570	12.14	3.84	
29	2012-12-15	11.839403	12.14	5.37	
..	

800	2011-12-26	11.800777	2.53	0.18
801	2012-01-10	11.685169	5.86	0.61
802	2012-03-25	11.857957	5.27	0.29
803	2013-12-02	11.710582	6.86	1.10
804	2013-11-27	12.078164	6.48	3.21
805	2012-03-21	11.280011	4.59	1.96
806	2013-02-27	11.095584	5.63	1.12
807	2012-02-12	11.415105	5.86	1.03
808	2012-03-13	11.445403	7.34	1.96
809	2013-11-28	10.972318	8.44	-0.86
810	2012-03-09	11.569300	5.67	2.19
811	2012-03-20	12.202967	3.91	1.38
812	2012-03-12	11.264175	7.07	0.89
813	2013-01-05	11.452649	4.06	-0.57
814	2012-02-02	11.679099	4.73	-1.20
815	2012-02-04	11.285737	3.42	0.05
816	2012-03-25	11.816914	12.02	0.45
817	2012-03-26	11.490470	5.79	1.77
818	2012-03-10	11.582159	7.88	-1.03
819	2012-05-11	10.979566	10.67	2.84
820	2012-02-11	10.781898	10.13	3.83
821	2012-03-11	10.674624	10.13	2.65
822	2013-01-04	10.573835	12.50	3.95
823	2013-11-25	10.518126	10.15	0.19
824	2012-02-10	10.776242	11.63	1.59
825	2013-11-26	11.480411	11.94	5.53
826	2012-02-03	10.411403	14.23	5.52
827	2012-02-09	10.294997	11.43	3.89
828	2012-02-07	10.202945	11.29	1.67
829	2012-02-08	10.356350	10.31	1.41

	week	year
0	5	2014
1	51	2013
2	44	2012
3	5	2014
4	16	2012
5	16	2012
6	51	2013
7	5	2014
8	4	2014
9	50	2012
10	51	2013
11	50	2011
12	17	2012
13	6	2014
14	5	2014
15	39	2012

16	38	2012
17	4	2014
18	5	2014
19	44	2012
20	15	2012
21	4	2014
22	50	2011
23	6	2014
24	10	2013
25	2	2014
26	2	2014
27	11	2013
28	44	2012
29	50	2012
..
800	52	2011
801	2	2012
802	12	2012
803	48	2013
804	47	2013
805	12	2012
806	8	2013
807	6	2012
808	11	2012
809	47	2013
810	10	2012
811	12	2012
812	11	2012
813	0	2013
814	5	2012
815	5	2012
816	12	2012
817	13	2012
818	10	2012
819	19	2012
820	6	2012
821	10	2012
822	0	2013
823	47	2013
824	6	2012
825	47	2013
826	5	2012
827	6	2012
828	6	2012
829	6	2012

[830 rows x 6 columns]

```
In [9]: daily_week= dailyDia.groupby(by=['year', 'week']).sum()
```

```
In [10]: daily_week
```

```
Out[10]:
```

		energy_sum	apparentTemperatureMax	apparentTemperatureMin
year	week			
2011	47	51.114714	70.67	41.73
	48	65.571115	111.13	63.16
	49	63.016513	117.25	57.62
	50	82.034950	68.42	26.70
	51	75.672988	77.77	23.58
	52	59.108348	78.15	42.57
2012	0	10.675958	7.28	4.53
	1	69.481120	104.06	53.30
	2	81.510830	65.40	14.72
	3	69.813180	97.48	41.30
	4	70.707853	84.95	38.71
	5	76.962281	61.81	24.32
	6	75.172341	66.99	15.38
	7	69.506432	109.90	56.36
	8	73.889743	90.33	35.41
	9	69.289775	88.84	34.64
	10	73.896709	95.91	38.71
	11	74.495490	81.83	28.21
	12	93.630022	53.57	5.47
	13	67.918920	112.48	57.91
	14	77.113029	77.07	23.69
	15	71.793072	106.22	51.59
	16	80.333027	65.84	8.96
	17	77.781531	69.61	28.21
	18	71.854679	90.02	55.94
	19	65.779445	104.08	55.79
	20	67.507820	101.91	51.37
	21	63.278685	123.67	69.41
	22	71.630877	65.12	25.98
	23	81.842540	70.05	17.85
...	
2013	32	65.696722	121.75	66.28
	33	71.339482	93.73	40.54
	34	65.437931	104.52	61.85
	35	69.160818	102.64	53.02
	36	65.619442	121.08	55.72
	37	69.474258	112.72	65.23
	38	72.644275	79.24	48.42
	39	61.162204	138.10	73.43
	40	61.307206	118.27	68.44
	41	68.287755	105.45	48.73
	42	86.817619	38.43	-4.35

	43	74.077658	108.12	46.54
	44	78.895956	73.66	27.47
	45	71.739465	88.71	38.36
	46	72.005948	88.04	40.53
	47	80.713782	61.95	22.52
	48	76.877442	68.29	14.59
	49	69.451989	110.00	50.26
	50	70.245566	108.00	63.73
	51	82.914623	50.61	11.13
	52	18.612574	29.51	10.63
2014	0	62.324195	60.50	33.09
	1	75.867974	85.48	26.51
	2	90.607556	49.60	-3.94
	3	71.472853	96.40	52.84
	4	84.648671	50.44	6.50
	5	75.038481	70.13	11.97
	6	81.339806	72.08	23.30
	7	65.270613	131.84	75.08
	8	42.866392	52.60	20.80

[122 rows x 3 columns]

In [11]: *#Passem de mitjana per llar de consum diari a mitjana per llar de consum setmanal*

```
daily_week['apparentTemperatureMax']=daily_week['apparentTemperatureMax']/7
daily_week['apparentTemperatureMin']=daily_week['apparentTemperatureMin']/7
daily_week
```

Out [11]:

		energy_sum	apparentTemperatureMax	apparentTemperatureMin
year	week			
2011	47	51.114714	10.095714	5.961429
	48	65.571115	15.875714	9.022857
	49	63.016513	16.750000	8.231429
	50	82.034950	9.774286	3.814286
	51	75.672988	11.110000	3.368571
	52	59.108348	11.164286	6.081429
2012	0	10.675958	1.040000	0.647143
	1	69.481120	14.865714	7.614286
	2	81.510830	9.342857	2.102857
	3	69.813180	13.925714	5.900000
	4	70.707853	12.135714	5.530000
	5	76.962281	8.830000	3.474286
	6	75.172341	9.570000	2.197143
	7	69.506432	15.700000	8.051429
	8	73.889743	12.904286	5.058571
	9	69.289775	12.691429	4.948571
	10	73.896709	13.701429	5.530000
	11	74.495490	11.690000	4.030000

	12	93.630022	7.652857	0.781429
	13	67.918920	16.068571	8.272857
	14	77.113029	11.010000	3.384286
	15	71.793072	15.174286	7.370000
	16	80.333027	9.405714	1.280000
	17	77.781531	9.944286	4.030000
	18	71.854679	12.860000	7.991429
	19	65.779445	14.868571	7.970000
	20	67.507820	14.558571	7.338571
	21	63.278685	17.667143	9.915714
	22	71.630877	9.302857	3.711429
	23	81.842540	10.007143	2.550000
...
2013	32	65.696722	17.392857	9.468571
	33	71.339482	13.390000	5.791429
	34	65.437931	14.931429	8.835714
	35	69.160818	14.662857	7.574286
	36	65.619442	17.297143	7.960000
	37	69.474258	16.102857	9.318571
	38	72.644275	11.320000	6.917143
	39	61.162204	19.728571	10.490000
	40	61.307206	16.895714	9.777143
	41	68.287755	15.064286	6.961429
	42	86.817619	5.490000	-0.621429
	43	74.077658	15.445714	6.648571
	44	78.895956	10.522857	3.924286
	45	71.739465	12.672857	5.480000
	46	72.005948	12.577143	5.790000
	47	80.713782	8.850000	3.217143
	48	76.877442	9.755714	2.084286
	49	69.451989	15.714286	7.180000
	50	70.245566	15.428571	9.104286
	51	82.914623	7.230000	1.590000
	52	18.612574	4.215714	1.518571
2014	0	62.324195	8.642857	4.727143
	1	75.867974	12.211429	3.787143
	2	90.607556	7.085714	-0.562857
	3	71.472853	13.771429	7.548571
	4	84.648671	7.205714	0.928571
	5	75.038481	10.018571	1.710000
	6	81.339806	10.297143	3.328571
	7	65.270613	18.834286	10.725714
	8	42.866392	7.514286	2.971429

[122 rows x 3 columns]

```
In [12]: daily_week=daily_week.reset_index()
daily_week
```



```

Out[12]:
   year  week  energy_sum  apparentTemperatureMax  apparentTemperatureMin
0  2011    47   51.114714                10.095714                5.961429
1  2011    48   65.571115                15.875714                9.022857
2  2011    49   63.016513                16.750000                8.231429
3  2011    50   82.034950                 9.774286                3.814286
4  2011    51   75.672988                11.110000                3.368571
5  2011    52   59.108348                11.164286                6.081429
6  2012     0   10.675958                 1.040000                0.647143
7  2012     1   69.481120                14.865714                7.614286
8  2012     2   81.510830                 9.342857                2.102857
9  2012     3   69.813180                13.925714                5.900000
10 2012     4   70.707853                12.135714                5.530000
11 2012     5   76.962281                 8.830000                3.474286
12 2012     6   75.172341                 9.570000                2.197143
13 2012     7   69.506432                15.700000                8.051429
14 2012     8   73.889743                12.904286                5.058571
15 2012     9   69.289775                12.691429                4.948571
16 2012    10   73.896709                13.701429                5.530000
17 2012    11   74.495490                11.690000                4.030000
18 2012    12   93.630022                 7.652857                0.781429
19 2012    13   67.918920                16.068571                8.272857
20 2012    14   77.113029                11.010000                3.384286
21 2012    15   71.793072                15.174286                7.370000
22 2012    16   80.333027                 9.405714                1.280000
23 2012    17   77.781531                 9.944286                4.030000
24 2012    18   71.854679                12.860000                7.991429
25 2012    19   65.779445                14.868571                7.970000
26 2012    20   67.507820                14.558571                7.338571
27 2012    21   63.278685                17.667143                9.915714
28 2012    22   71.630877                 9.302857                3.711429
29 2012    23   81.842540                10.007143                2.550000
..   ...   ...   ...   ...
92 2013    32   65.696722                17.392857                9.468571
93 2013    33   71.339482                13.390000                5.791429
94 2013    34   65.437931                14.931429                8.835714
95 2013    35   69.160818                14.662857                7.574286
96 2013    36   65.619442                17.297143                7.960000
97 2013    37   69.474258                16.102857                9.318571
98 2013    38   72.644275                11.320000                6.917143
99 2013    39   61.162204                19.728571               10.490000
100 2013    40   61.307206                16.895714                9.777143
101 2013    41   68.287755                15.064286                6.961429
102 2013    42   86.817619                 5.490000               -0.621429
103 2013    43   74.077658                15.445714                6.648571
104 2013    44   78.895956                10.522857                3.924286
105 2013    45   71.739465                12.672857                5.480000
106 2013    46   72.005948                12.577143                5.790000
107 2013    47   80.713782                 8.850000                3.217143

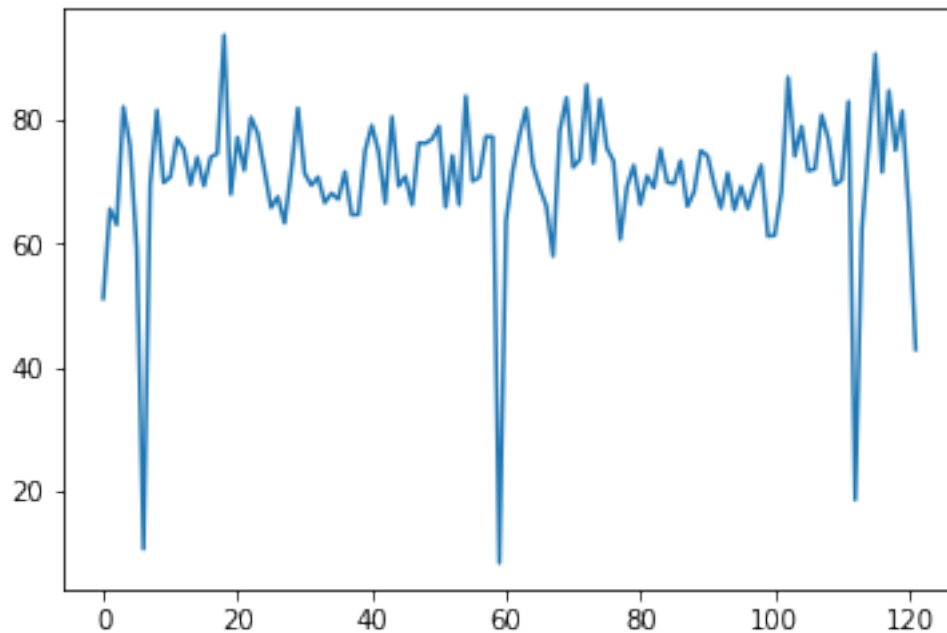
```

108	2013	48	76.877442	9.755714	2.084286
109	2013	49	69.451989	15.714286	7.180000
110	2013	50	70.245566	15.428571	9.104286
111	2013	51	82.914623	7.230000	1.590000
112	2013	52	18.612574	4.215714	1.518571
113	2014	0	62.324195	8.642857	4.727143
114	2014	1	75.867974	12.211429	3.787143
115	2014	2	90.607556	7.085714	-0.562857
116	2014	3	71.472853	13.771429	7.548571
117	2014	4	84.648671	7.205714	0.928571
118	2014	5	75.038481	10.018571	1.710000
119	2014	6	81.339806	10.297143	3.328571
120	2014	7	65.270613	18.834286	10.725714
121	2014	8	42.866392	7.514286	2.971429

[122 rows x 5 columns]

In [13]: plt.plot(daily_week.energy_sum)

Out[13]: [<matplotlib.lines.Line2D at 0x23267cb0d30>]



In [14]: *#Comprovem quines son les setmanes 0*
(daily_week[daily_week.week==0])

Out[14]:	year	week	energy_sum	apparentTemperatureMax	apparentTemperatureMin
6	2012	0	10.675958	1.040000	0.647143

60	2013	0	63.657653	7.481429	2.308571
113	2014	0	62.324195	8.642857	4.727143

```
In [15]: (daily_week[daily_week.week==52])
```

```
Out[15]:
```

	year	week	energy_sum	apparentTemperatureMax	apparentTemperatureMin
5	2011	52	59.108348	11.164286	6.081429
58	2012	52	77.198766	10.284286	3.937143
112	2013	52	18.612574	4.215714	1.518571

```
In [16]: (daily_week[daily_week.week==53])
```

```
Out[16]:
```

	year	week	energy_sum	apparentTemperatureMax	apparentTemperatureMin
59	2012	53	8.405077	2.504286	1.634286

```
In [17]: #Sumem les setmanes 52 i la 0 següent ja que son la mateixa però de diferents anys
```

```
n1_52=daily_week.energy_sum[(daily_week.year==2011) & (daily_week.week==52)]
n1_0= daily_week.energy_sum[(daily_week.year==2012) & (daily_week.week==0)]
nombre1= n1_52.item() + n1_0.item()

n2_52=daily_week.energy_sum[(daily_week.year==2012) & (daily_week.week==53)]
n2_0=daily_week.energy_sum[(daily_week.year==2013) & (daily_week.week==0)]

nombre2=n2_52.item() + n2_0.item()

n3_52=daily_week.energy_sum[(daily_week.year==2013) & (daily_week.week==52)]
n3_0=daily_week.energy_sum[(daily_week.year==2014) & (daily_week.week==0)]
nombre3=n3_52.item() + n3_0.item()

daily_week.energy_sum[(daily_week.year==2011) & (daily_week.week==52)]=nombre1

daily_week.energy_sum[(daily_week.year==2013) & (daily_week.week==0)]=nombre2
daily_week.energy_sum[(daily_week.year==2014) & (daily_week.week==0)]=nombre3

daily_week
```

```
c:\users\laura\appdata\local\programs\python\python37\lib\site-packages\ipykernel_launcher.py:
A value is trying to be set on a copy of a slice from a DataFrame
```

```
See the caveats in the documentation: http://pandas.pydata.org/pandas-docs/stable/indexing.html
app.launch_new_instance()
c:\users\laura\appdata\local\programs\python\python37\lib\site-packages\ipykernel_launcher.py:
A value is trying to be set on a copy of a slice from a DataFrame
```

```
See the caveats in the documentation: http://pandas.pydata.org/pandas-docs/stable/indexing.html
c:\users\laura\appdata\local\programs\python\python37\lib\site-packages\ipykernel_launcher.py:
A value is trying to be set on a copy of a slice from a DataFrame
```

See the caveats in the documentation: <http://pandas.pydata.org/pandas-docs/stable/indexing.html>

```
Out[17]:
```

	year	week	energy_sum	apparentTemperatureMax	apparentTemperatureMin
0	2011	47	51.114714	10.095714	5.961429
1	2011	48	65.571115	15.875714	9.022857
2	2011	49	63.016513	16.750000	8.231429
3	2011	50	82.034950	9.774286	3.814286
4	2011	51	75.672988	11.110000	3.368571
5	2011	52	69.784306	11.164286	6.081429
6	2012	0	10.675958	1.040000	0.647143
7	2012	1	69.481120	14.865714	7.614286
8	2012	2	81.510830	9.342857	2.102857
9	2012	3	69.813180	13.925714	5.900000
10	2012	4	70.707853	12.135714	5.530000
11	2012	5	76.962281	8.830000	3.474286
12	2012	6	75.172341	9.570000	2.197143
13	2012	7	69.506432	15.700000	8.051429
14	2012	8	73.889743	12.904286	5.058571
15	2012	9	69.289775	12.691429	4.948571
16	2012	10	73.896709	13.701429	5.530000
17	2012	11	74.495490	11.690000	4.030000
18	2012	12	93.630022	7.652857	0.781429
19	2012	13	67.918920	16.068571	8.272857
20	2012	14	77.113029	11.010000	3.384286
21	2012	15	71.793072	15.174286	7.370000
22	2012	16	80.333027	9.405714	1.280000
23	2012	17	77.781531	9.944286	4.030000
24	2012	18	71.854679	12.860000	7.991429
25	2012	19	65.779445	14.868571	7.970000
26	2012	20	67.507820	14.558571	7.338571
27	2012	21	63.278685	17.667143	9.915714
28	2012	22	71.630877	9.302857	3.711429
29	2012	23	81.842540	10.007143	2.550000
..
92	2013	32	65.696722	17.392857	9.468571
93	2013	33	71.339482	13.390000	5.791429
94	2013	34	65.437931	14.931429	8.835714
95	2013	35	69.160818	14.662857	7.574286
96	2013	36	65.619442	17.297143	7.960000
97	2013	37	69.474258	16.102857	9.318571
98	2013	38	72.644275	11.320000	6.917143
99	2013	39	61.162204	19.728571	10.490000
100	2013	40	61.307206	16.895714	9.777143
101	2013	41	68.287755	15.064286	6.961429
102	2013	42	86.817619	5.490000	-0.621429
103	2013	43	74.077658	15.445714	6.648571

104	2013	44	78.895956	10.522857	3.924286
105	2013	45	71.739465	12.672857	5.480000
106	2013	46	72.005948	12.577143	5.790000
107	2013	47	80.713782	8.850000	3.217143
108	2013	48	76.877442	9.755714	2.084286
109	2013	49	69.451989	15.714286	7.180000
110	2013	50	70.245566	15.428571	9.104286
111	2013	51	82.914623	7.230000	1.590000
112	2013	52	18.612574	4.215714	1.518571
113	2014	0	80.936769	8.642857	4.727143
114	2014	1	75.867974	12.211429	3.787143
115	2014	2	90.607556	7.085714	-0.562857
116	2014	3	71.472853	13.771429	7.548571
117	2014	4	84.648671	7.205714	0.928571
118	2014	5	75.038481	10.018571	1.710000
119	2014	6	81.339806	10.297143	3.328571
120	2014	7	65.270613	18.834286	10.725714
121	2014	8	42.866392	7.514286	2.971429

[122 rows x 5 columns]

```
In [18]: #Les eliminem (setmana 0 del 2012, setmana 53 del 2012 i setmana 52 del 2013)
daily_week=daily_week.drop([6,59,112])
daily_week
```

```
Out[18]:
```

	year	week	energy_sum	apparentTemperatureMax	apparentTemperatureMin
0	2011	47	51.114714	10.095714	5.961429
1	2011	48	65.571115	15.875714	9.022857
2	2011	49	63.016513	16.750000	8.231429
3	2011	50	82.034950	9.774286	3.814286
4	2011	51	75.672988	11.110000	3.368571
5	2011	52	69.784306	11.164286	6.081429
7	2012	1	69.481120	14.865714	7.614286
8	2012	2	81.510830	9.342857	2.102857
9	2012	3	69.813180	13.925714	5.900000
10	2012	4	70.707853	12.135714	5.530000
11	2012	5	76.962281	8.830000	3.474286
12	2012	6	75.172341	9.570000	2.197143
13	2012	7	69.506432	15.700000	8.051429
14	2012	8	73.889743	12.904286	5.058571
15	2012	9	69.289775	12.691429	4.948571
16	2012	10	73.896709	13.701429	5.530000
17	2012	11	74.495490	11.690000	4.030000
18	2012	12	93.630022	7.652857	0.781429
19	2012	13	67.918920	16.068571	8.272857
20	2012	14	77.113029	11.010000	3.384286
21	2012	15	71.793072	15.174286	7.370000
22	2012	16	80.333027	9.405714	1.280000

23	2012	17	77.781531	9.944286	4.030000
24	2012	18	71.854679	12.860000	7.991429
25	2012	19	65.779445	14.868571	7.970000
26	2012	20	67.507820	14.558571	7.338571
27	2012	21	63.278685	17.667143	9.915714
28	2012	22	71.630877	9.302857	3.711429
29	2012	23	81.842540	10.007143	2.550000
30	2012	24	71.303870	10.495714	5.360000
..
91	2013	31	69.440865	11.535714	3.524286
92	2013	32	65.696722	17.392857	9.468571
93	2013	33	71.339482	13.390000	5.791429
94	2013	34	65.437931	14.931429	8.835714
95	2013	35	69.160818	14.662857	7.574286
96	2013	36	65.619442	17.297143	7.960000
97	2013	37	69.474258	16.102857	9.318571
98	2013	38	72.644275	11.320000	6.917143
99	2013	39	61.162204	19.728571	10.490000
100	2013	40	61.307206	16.895714	9.777143
101	2013	41	68.287755	15.064286	6.961429
102	2013	42	86.817619	5.490000	-0.621429
103	2013	43	74.077658	15.445714	6.648571
104	2013	44	78.895956	10.522857	3.924286
105	2013	45	71.739465	12.672857	5.480000
106	2013	46	72.005948	12.577143	5.790000
107	2013	47	80.713782	8.850000	3.217143
108	2013	48	76.877442	9.755714	2.084286
109	2013	49	69.451989	15.714286	7.180000
110	2013	50	70.245566	15.428571	9.104286
111	2013	51	82.914623	7.230000	1.590000
113	2014	0	80.936769	8.642857	4.727143
114	2014	1	75.867974	12.211429	3.787143
115	2014	2	90.607556	7.085714	-0.562857
116	2014	3	71.472853	13.771429	7.548571
117	2014	4	84.648671	7.205714	0.928571
118	2014	5	75.038481	10.018571	1.710000
119	2014	6	81.339806	10.297143	3.328571
120	2014	7	65.270613	18.834286	10.725714
121	2014	8	42.866392	7.514286	2.971429

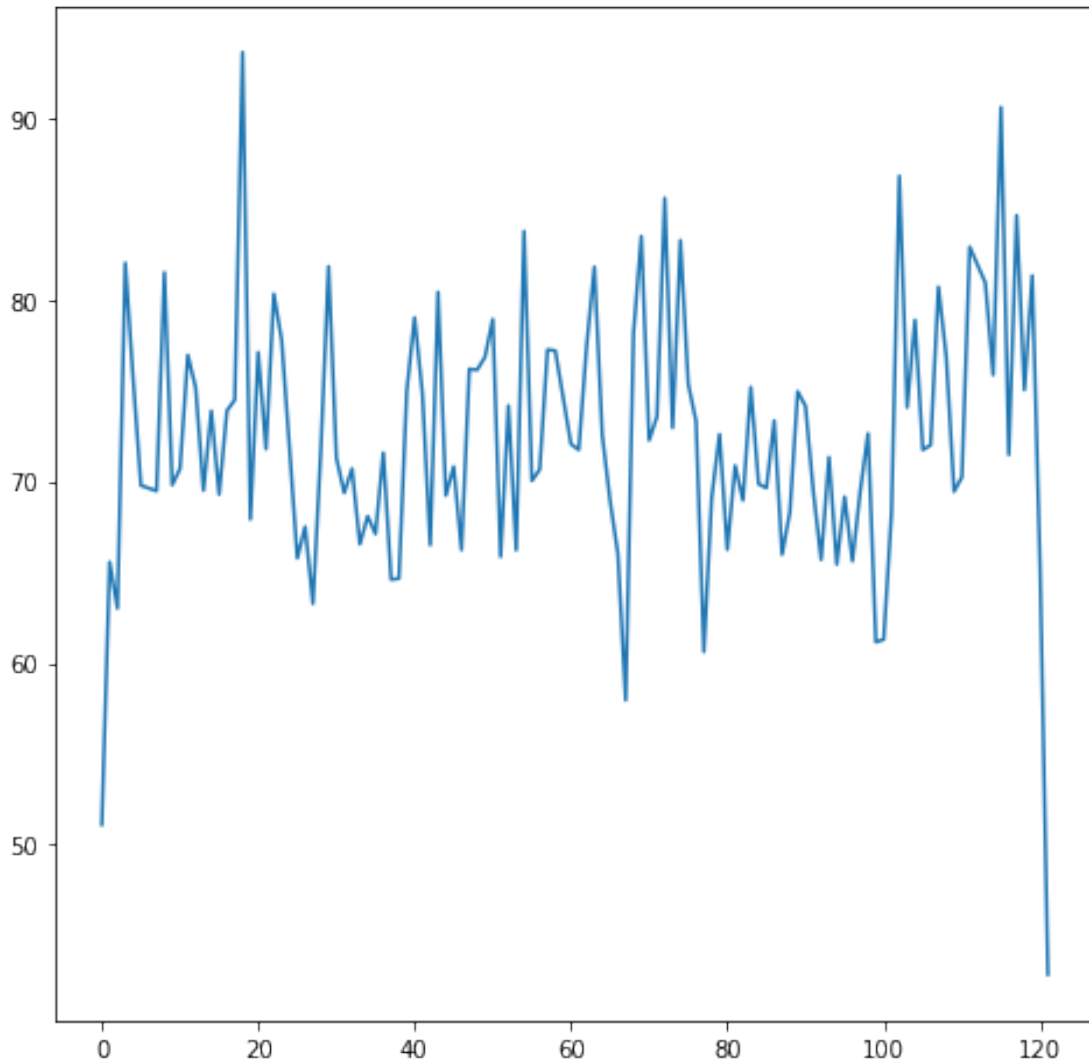
[119 rows x 5 columns]

In []:

In [19]: plt.figure(figsize=(8,8))

plt.plot(daily_week.energy_sum)

Out[19]: [<matplotlib.lines.Line2D at 0x23267d466a0>]



Ja tenim el fitxer preparat.

```
In [20]: daily_week['t-1']=daily_week['energy_sum'].shift(1)
daily_week['t-2']=daily_week['energy_sum'].shift(2)
daily_week['t-3']=daily_week['energy_sum'].shift(3)
daily_week['t-4']=daily_week['energy_sum'].shift(4)
daily_week['t-5']=daily_week['energy_sum'].shift(5)
daily_week['t-6']=daily_week['energy_sum'].shift(6)
daily_week['t-7']=daily_week['energy_sum'].shift(7)

daily_week['temp(t-1)']=daily_week['apparentTemperatureMax'].shift(1)
daily_week['temp(t-2)']=daily_week['apparentTemperatureMax'].shift(2)
daily_week['temp(t-3)']=daily_week['apparentTemperatureMax'].shift(3)
daily_week['temp(t-4)']=daily_week['apparentTemperatureMax'].shift(4)
daily_week['temp(t-5)']=daily_week['apparentTemperatureMax'].shift(5)
```

```

daily_week['temp(t-6)']=daily_week['apparentTemperatureMax'].shift(6)
daily_week['temp(t-7)']=daily_week['apparentTemperatureMax'].shift(7)
daily_week['temp(t-8)']=daily_week['apparentTemperatureMax'].shift(8)

daily_week['tempmin(t-1)']=daily_week['apparentTemperatureMin'].shift(1)
daily_week['tempmin(t-2)']=daily_week['apparentTemperatureMin'].shift(2)
daily_week['tempmin(t-3)']=daily_week['apparentTemperatureMin'].shift(3)
daily_week['tempmin(t-4)']=daily_week['apparentTemperatureMin'].shift(4)
daily_week['tempmin(t-5)']=daily_week['apparentTemperatureMin'].shift(5)
daily_week['tempmin(t-6)']=daily_week['apparentTemperatureMin'].shift(6)
daily_week['tempmin(t-7)']=daily_week['apparentTemperatureMin'].shift(7)
daily_week['tempmin(t-8)']=daily_week['apparentTemperatureMin'].shift(8)

```

```
daily_week
```

```

Out[20]:
   year  week  energy_sum  apparentTemperatureMax  apparentTemperatureMin  \
0  2011    47    51.114714             10.095714             5.961429
1  2011    48    65.571115             15.875714             9.022857
2  2011    49    63.016513             16.750000             8.231429
3  2011    50    82.034950              9.774286             3.814286
4  2011    51    75.672988             11.110000             3.368571
5  2011    52    69.784306             11.164286             6.081429
7  2012     1    69.481120             14.865714             7.614286
8  2012     2    81.510830              9.342857             2.102857
9  2012     3    69.813180             13.925714             5.900000
10 2012     4    70.707853             12.135714             5.530000
11 2012     5    76.962281              8.830000             3.474286
12 2012     6    75.172341              9.570000             2.197143
13 2012     7    69.506432             15.700000             8.051429
14 2012     8    73.889743             12.904286             5.058571
15 2012     9    69.289775             12.691429             4.948571
16 2012    10    73.896709             13.701429             5.530000
17 2012    11    74.495490             11.690000             4.030000
18 2012    12    93.630022              7.652857             0.781429
19 2012    13    67.918920             16.068571             8.272857
20 2012    14    77.113029             11.010000             3.384286
21 2012    15    71.793072             15.174286             7.370000
22 2012    16    80.333027              9.405714             1.280000
23 2012    17    77.781531              9.944286             4.030000
24 2012    18    71.854679             12.860000             7.991429
25 2012    19    65.779445             14.868571             7.970000
26 2012    20    67.507820             14.558571             7.338571
27 2012    21    63.278685             17.667143             9.915714
28 2012    22    71.630877              9.302857             3.711429
29 2012    23    81.842540             10.007143             2.550000
30 2012    24    71.303870             10.495714             5.360000
..    ...    ...          ...          ...          ...

```


91	2013	31	69.440865	11.535714	3.524286
92	2013	32	65.696722	17.392857	9.468571
93	2013	33	71.339482	13.390000	5.791429
94	2013	34	65.437931	14.931429	8.835714
95	2013	35	69.160818	14.662857	7.574286
96	2013	36	65.619442	17.297143	7.960000
97	2013	37	69.474258	16.102857	9.318571
98	2013	38	72.644275	11.320000	6.917143
99	2013	39	61.162204	19.728571	10.490000
100	2013	40	61.307206	16.895714	9.777143
101	2013	41	68.287755	15.064286	6.961429
102	2013	42	86.817619	5.490000	-0.621429
103	2013	43	74.077658	15.445714	6.648571
104	2013	44	78.895956	10.522857	3.924286
105	2013	45	71.739465	12.672857	5.480000
106	2013	46	72.005948	12.577143	5.790000
107	2013	47	80.713782	8.850000	3.217143
108	2013	48	76.877442	9.755714	2.084286
109	2013	49	69.451989	15.714286	7.180000
110	2013	50	70.245566	15.428571	9.104286
111	2013	51	82.914623	7.230000	1.590000
113	2014	0	80.936769	8.642857	4.727143
114	2014	1	75.867974	12.211429	3.787143
115	2014	2	90.607556	7.085714	-0.562857
116	2014	3	71.472853	13.771429	7.548571
117	2014	4	84.648671	7.205714	0.928571
118	2014	5	75.038481	10.018571	1.710000
119	2014	6	81.339806	10.297143	3.328571
120	2014	7	65.270613	18.834286	10.725714
121	2014	8	42.866392	7.514286	2.971429

	t-1	t-2	t-3	t-4	t-5	...	temp(t-7) \
0	NaN	NaN	NaN	NaN	NaN	...	NaN
1	51.114714	NaN	NaN	NaN	NaN	...	NaN
2	65.571115	51.114714	NaN	NaN	NaN	...	NaN
3	63.016513	65.571115	51.114714	NaN	NaN	...	NaN
4	82.034950	63.016513	65.571115	51.114714	NaN	...	NaN
5	75.672988	82.034950	63.016513	65.571115	51.114714	...	NaN
7	69.784306	75.672988	82.034950	63.016513	65.571115	...	NaN
8	69.481120	69.784306	75.672988	82.034950	63.016513	...	10.095714
9	81.510830	69.481120	69.784306	75.672988	82.034950	...	15.875714
10	69.813180	81.510830	69.481120	69.784306	75.672988	...	16.750000
11	70.707853	69.813180	81.510830	69.481120	69.784306	...	9.774286
12	76.962281	70.707853	69.813180	81.510830	69.481120	...	11.110000
13	75.172341	76.962281	70.707853	69.813180	81.510830	...	11.164286
14	69.506432	75.172341	76.962281	70.707853	69.813180	...	14.865714
15	73.889743	69.506432	75.172341	76.962281	70.707853	...	9.342857
16	69.289775	73.889743	69.506432	75.172341	76.962281	...	13.925714

17	73.896709	69.289775	73.889743	69.506432	75.172341	...	12.135714
18	74.495490	73.896709	69.289775	73.889743	69.506432	...	8.830000
19	93.630022	74.495490	73.896709	69.289775	73.889743	...	9.570000
20	67.918920	93.630022	74.495490	73.896709	69.289775	...	15.700000
21	77.113029	67.918920	93.630022	74.495490	73.896709	...	12.904286
22	71.793072	77.113029	67.918920	93.630022	74.495490	...	12.691429
23	80.333027	71.793072	77.113029	67.918920	93.630022	...	13.701429
24	77.781531	80.333027	71.793072	77.113029	67.918920	...	11.690000
25	71.854679	77.781531	80.333027	71.793072	77.113029	...	7.652857
26	65.779445	71.854679	77.781531	80.333027	71.793072	...	16.068571
27	67.507820	65.779445	71.854679	77.781531	80.333027	...	11.010000
28	63.278685	67.507820	65.779445	71.854679	77.781531	...	15.174286
29	71.630877	63.278685	67.507820	65.779445	71.854679	...	9.405714
30	81.842540	71.630877	63.278685	67.507820	65.779445	...	9.944286
..
91	74.145410	74.954583	68.316695	65.981932	73.347557	...	14.254286
92	69.440865	74.145410	74.954583	68.316695	65.981932	...	13.762857
93	65.696722	69.440865	74.145410	74.954583	68.316695	...	11.821429
94	71.339482	65.696722	69.440865	74.145410	74.954583	...	17.635714
95	65.437931	71.339482	65.696722	69.440865	74.145410	...	14.591429
96	69.160818	65.437931	71.339482	65.696722	69.440865	...	12.694286
97	65.619442	69.160818	65.437931	71.339482	65.696722	...	10.715714
98	69.474258	65.619442	69.160818	65.437931	71.339482	...	11.535714
99	72.644275	69.474258	65.619442	69.160818	65.437931	...	17.392857
100	61.162204	72.644275	69.474258	65.619442	69.160818	...	13.390000
101	61.307206	61.162204	72.644275	69.474258	65.619442	...	14.931429
102	68.287755	61.307206	61.162204	72.644275	69.474258	...	14.662857
103	86.817619	68.287755	61.307206	61.162204	72.644275	...	17.297143
104	74.077658	86.817619	68.287755	61.307206	61.162204	...	16.102857
105	78.895956	74.077658	86.817619	68.287755	61.307206	...	11.320000
106	71.739465	78.895956	74.077658	86.817619	68.287755	...	19.728571
107	72.005948	71.739465	78.895956	74.077658	86.817619	...	16.895714
108	80.713782	72.005948	71.739465	78.895956	74.077658	...	15.064286
109	76.877442	80.713782	72.005948	71.739465	78.895956	...	5.490000
110	69.451989	76.877442	80.713782	72.005948	71.739465	...	15.445714
111	70.245566	69.451989	76.877442	80.713782	72.005948	...	10.522857
113	82.914623	70.245566	69.451989	76.877442	80.713782	...	12.672857
114	80.936769	82.914623	70.245566	69.451989	76.877442	...	12.577143
115	75.867974	80.936769	82.914623	70.245566	69.451989	...	8.850000
116	90.607556	75.867974	80.936769	82.914623	70.245566	...	9.755714
117	71.472853	90.607556	75.867974	80.936769	82.914623	...	15.714286
118	84.648671	71.472853	90.607556	75.867974	80.936769	...	15.428571
119	75.038481	84.648671	71.472853	90.607556	75.867974	...	7.230000
120	81.339806	75.038481	84.648671	71.472853	90.607556	...	8.642857
121	65.270613	81.339806	75.038481	84.648671	71.472853	...	12.211429

	temp(t-8)	tempmin(t-1)	tempmin(t-2)	tempmin(t-3)	tempmin(t-4)	\
0	NaN	NaN	NaN	NaN	NaN	

1	NaN	5.961429	NaN	NaN	NaN
2	NaN	9.022857	5.961429	NaN	NaN
3	NaN	8.231429	9.022857	5.961429	NaN
4	NaN	3.814286	8.231429	9.022857	5.961429
5	NaN	3.368571	3.814286	8.231429	9.022857
7	NaN	6.081429	3.368571	3.814286	8.231429
8	NaN	7.614286	6.081429	3.368571	3.814286
9	10.095714	2.102857	7.614286	6.081429	3.368571
10	15.875714	5.900000	2.102857	7.614286	6.081429
11	16.750000	5.530000	5.900000	2.102857	7.614286
12	9.774286	3.474286	5.530000	5.900000	2.102857
13	11.110000	2.197143	3.474286	5.530000	5.900000
14	11.164286	8.051429	2.197143	3.474286	5.530000
15	14.865714	5.058571	8.051429	2.197143	3.474286
16	9.342857	4.948571	5.058571	8.051429	2.197143
17	13.925714	5.530000	4.948571	5.058571	8.051429
18	12.135714	4.030000	5.530000	4.948571	5.058571
19	8.830000	0.781429	4.030000	5.530000	4.948571
20	9.570000	8.272857	0.781429	4.030000	5.530000
21	15.700000	3.384286	8.272857	0.781429	4.030000
22	12.904286	7.370000	3.384286	8.272857	0.781429
23	12.691429	1.280000	7.370000	3.384286	8.272857
24	13.701429	4.030000	1.280000	7.370000	3.384286
25	11.690000	7.991429	4.030000	1.280000	7.370000
26	7.652857	7.970000	7.991429	4.030000	1.280000
27	16.068571	7.338571	7.970000	7.991429	4.030000
28	11.010000	9.915714	7.338571	7.970000	7.991429
29	15.174286	3.711429	9.915714	7.338571	7.970000
30	9.405714	2.550000	3.711429	9.915714	7.338571
..
91	12.220000	4.417143	4.267143	8.422857	9.957143
92	14.254286	3.524286	4.417143	4.267143	8.422857
93	13.762857	9.468571	3.524286	4.417143	4.267143
94	11.821429	5.791429	9.468571	3.524286	4.417143
95	17.635714	8.835714	5.791429	9.468571	3.524286
96	14.591429	7.574286	8.835714	5.791429	9.468571
97	12.694286	7.960000	7.574286	8.835714	5.791429
98	10.715714	9.318571	7.960000	7.574286	8.835714
99	11.535714	6.917143	9.318571	7.960000	7.574286
100	17.392857	10.490000	6.917143	9.318571	7.960000
101	13.390000	9.777143	10.490000	6.917143	9.318571
102	14.931429	6.961429	9.777143	10.490000	6.917143
103	14.662857	-0.621429	6.961429	9.777143	10.490000
104	17.297143	6.648571	-0.621429	6.961429	9.777143
105	16.102857	3.924286	6.648571	-0.621429	6.961429
106	11.320000	5.480000	3.924286	6.648571	-0.621429
107	19.728571	5.790000	5.480000	3.924286	6.648571
108	16.895714	3.217143	5.790000	5.480000	3.924286

109	15.064286	2.084286	3.217143	5.790000	5.480000
110	5.490000	7.180000	2.084286	3.217143	5.790000
111	15.445714	9.104286	7.180000	2.084286	3.217143
113	10.522857	1.590000	9.104286	7.180000	2.084286
114	12.672857	4.727143	1.590000	9.104286	7.180000
115	12.577143	3.787143	4.727143	1.590000	9.104286
116	8.850000	-0.562857	3.787143	4.727143	1.590000
117	9.755714	7.548571	-0.562857	3.787143	4.727143
118	15.714286	0.928571	7.548571	-0.562857	3.787143
119	15.428571	1.710000	0.928571	7.548571	-0.562857
120	7.230000	3.328571	1.710000	0.928571	7.548571
121	8.642857	10.725714	3.328571	1.710000	0.928571

	tempmin(t-5)	tempmin(t-6)	tempmin(t-7)	tempmin(t-8)
0	NaN	NaN	NaN	NaN
1	NaN	NaN	NaN	NaN
2	NaN	NaN	NaN	NaN
3	NaN	NaN	NaN	NaN
4	NaN	NaN	NaN	NaN
5	5.961429	NaN	NaN	NaN
7	9.022857	5.961429	NaN	NaN
8	8.231429	9.022857	5.961429	NaN
9	3.814286	8.231429	9.022857	5.961429
10	3.368571	3.814286	8.231429	9.022857
11	6.081429	3.368571	3.814286	8.231429
12	7.614286	6.081429	3.368571	3.814286
13	2.102857	7.614286	6.081429	3.368571
14	5.900000	2.102857	7.614286	6.081429
15	5.530000	5.900000	2.102857	7.614286
16	3.474286	5.530000	5.900000	2.102857
17	2.197143	3.474286	5.530000	5.900000
18	8.051429	2.197143	3.474286	5.530000
19	5.058571	8.051429	2.197143	3.474286
20	4.948571	5.058571	8.051429	2.197143
21	5.530000	4.948571	5.058571	8.051429
22	4.030000	5.530000	4.948571	5.058571
23	0.781429	4.030000	5.530000	4.948571
24	8.272857	0.781429	4.030000	5.530000
25	3.384286	8.272857	0.781429	4.030000
26	7.370000	3.384286	8.272857	0.781429
27	1.280000	7.370000	3.384286	8.272857
28	4.030000	1.280000	7.370000	3.384286
29	7.991429	4.030000	1.280000	7.370000
30	7.970000	7.991429	4.030000	1.280000
..
91	6.450000	6.275714	9.315714	4.847143
92	9.957143	6.450000	6.275714	9.315714
93	8.422857	9.957143	6.450000	6.275714

94	4.267143	8.422857	9.957143	6.450000
95	4.417143	4.267143	8.422857	9.957143
96	3.524286	4.417143	4.267143	8.422857
97	9.468571	3.524286	4.417143	4.267143
98	5.791429	9.468571	3.524286	4.417143
99	8.835714	5.791429	9.468571	3.524286
100	7.574286	8.835714	5.791429	9.468571
101	7.960000	7.574286	8.835714	5.791429
102	9.318571	7.960000	7.574286	8.835714
103	6.917143	9.318571	7.960000	7.574286
104	10.490000	6.917143	9.318571	7.960000
105	9.777143	10.490000	6.917143	9.318571
106	6.961429	9.777143	10.490000	6.917143
107	-0.621429	6.961429	9.777143	10.490000
108	6.648571	-0.621429	6.961429	9.777143
109	3.924286	6.648571	-0.621429	6.961429
110	5.480000	3.924286	6.648571	-0.621429
111	5.790000	5.480000	3.924286	6.648571
113	3.217143	5.790000	5.480000	3.924286
114	2.084286	3.217143	5.790000	5.480000
115	7.180000	2.084286	3.217143	5.790000
116	9.104286	7.180000	2.084286	3.217143
117	1.590000	9.104286	7.180000	2.084286
118	4.727143	1.590000	9.104286	7.180000
119	3.787143	4.727143	1.590000	9.104286
120	-0.562857	3.787143	4.727143	1.590000
121	7.548571	-0.562857	3.787143	4.727143

[119 rows x 28 columns]

In [21]: *#Ens quedem amb energies i temperatures passades*

```
daily_week=daily_week[['energy_sum','t-1','t-2','t-3','t-4','t-5','t-6','t-7','temp(t-1)']]
daily_week.head(5)
```

```
Out[21]:
```

	energy_sum	t-1	t-2	t-3	t-4	t-5	t-6	t-7	\
0	51.114714	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
1	65.571115	51.114714	NaN	NaN	NaN	NaN	NaN	NaN	
2	63.016513	65.571115	51.114714	NaN	NaN	NaN	NaN	NaN	
3	82.034950	63.016513	65.571115	51.114714	NaN	NaN	NaN	NaN	
4	75.672988	82.034950	63.016513	65.571115	51.114714	NaN	NaN	NaN	

	temp(t-1)	temp(t-2)	...	temp(t-5)	temp(t-6)	temp(t-7)	tempmin(t-1)	\
0	NaN	NaN	...	NaN	NaN	NaN	NaN	
1	10.095714	NaN	...	NaN	NaN	NaN	5.961429	
2	15.875714	10.095714	...	NaN	NaN	NaN	9.022857	
3	16.750000	15.875714	...	NaN	NaN	NaN	8.231429	
4	9.774286	16.750000	...	NaN	NaN	NaN	3.814286	

	tempmin(t-2)	tempmin(t-3)	tempmin(t-4)	tempmin(t-5)	tempmin(t-6)	\
0	NaN	NaN	NaN	NaN	NaN	
1	NaN	NaN	NaN	NaN	NaN	
2	5.961429	NaN	NaN	NaN	NaN	
3	9.022857	5.961429	NaN	NaN	NaN	
4	8.231429	9.022857	5.961429	NaN	NaN	

	tempmin(t-7)
0	NaN
1	NaN
2	NaN
3	NaN
4	NaN

[5 rows x 22 columns]

```
In [22]: daily_week=daily_week.reset_index()
daily_week=daily_week[['energy_sum','t-1','t-2','t-3','t-4','t-5','t-6','t-7','temp(t-1)']]
daily_week.head(5)
```

```
Out [22]:
```

	energy_sum	t-1	t-2	t-3	t-4	t-5	t-6	t-7	\
0	51.114714	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
1	65.571115	51.114714	NaN	NaN	NaN	NaN	NaN	NaN	
2	63.016513	65.571115	51.114714	NaN	NaN	NaN	NaN	NaN	
3	82.034950	63.016513	65.571115	51.114714	NaN	NaN	NaN	NaN	
4	75.672988	82.034950	63.016513	65.571115	51.114714	NaN	NaN	NaN	

	temp(t-1)	temp(t-2)	...	temp(t-5)	temp(t-6)	temp(t-7)	tempmin(t-1)	\
0	NaN	NaN	...	NaN	NaN	NaN	NaN	
1	10.095714	NaN	...	NaN	NaN	NaN	5.961429	
2	15.875714	10.095714	...	NaN	NaN	NaN	9.022857	
3	16.750000	15.875714	...	NaN	NaN	NaN	8.231429	
4	9.774286	16.750000	...	NaN	NaN	NaN	3.814286	

	tempmin(t-2)	tempmin(t-3)	tempmin(t-4)	tempmin(t-5)	tempmin(t-6)	\
0	NaN	NaN	NaN	NaN	NaN	
1	NaN	NaN	NaN	NaN	NaN	
2	5.961429	NaN	NaN	NaN	NaN	
3	9.022857	5.961429	NaN	NaN	NaN	
4	8.231429	9.022857	5.961429	NaN	NaN	

	tempmin(t-7)
0	NaN
1	NaN
2	NaN
3	NaN
4	NaN

[5 rows x 22 columns]

```
In [23]: #Eliminem les 7 primeres files ja que contenen NaN (valors buits)
daily_week=daily_week.drop([0,1,2,3,4,5,6])
daily_week.head(5)
```

```
Out [23]:
```

	energy_sum	t-1	t-2	t-3	t-4	t-5	\
7	81.510830	69.481120	69.784306	75.672988	82.034950	63.016513	
8	69.813180	81.510830	69.481120	69.784306	75.672988	82.034950	
9	70.707853	69.813180	81.510830	69.481120	69.784306	75.672988	
10	76.962281	70.707853	69.813180	81.510830	69.481120	69.784306	
11	75.172341	76.962281	70.707853	69.813180	81.510830	69.481120	

	t-6	t-7	temp(t-1)	temp(t-2)	...	temp(t-5)	temp(t-6)	\
7	65.571115	51.114714	14.865714	11.164286	...	16.750000	15.875714	
8	63.016513	65.571115	9.342857	14.865714	...	9.774286	16.750000	
9	82.034950	63.016513	13.925714	9.342857	...	11.110000	9.774286	
10	75.672988	82.034950	12.135714	13.925714	...	11.164286	11.110000	
11	69.784306	75.672988	8.830000	12.135714	...	14.865714	11.164286	

	temp(t-7)	tempmin(t-1)	tempmin(t-2)	tempmin(t-3)	tempmin(t-4)	\
7	10.095714	7.614286	6.081429	3.368571	3.814286	
8	15.875714	2.102857	7.614286	6.081429	3.368571	
9	16.750000	5.900000	2.102857	7.614286	6.081429	
10	9.774286	5.530000	5.900000	2.102857	7.614286	
11	11.110000	3.474286	5.530000	5.900000	2.102857	

	tempmin(t-5)	tempmin(t-6)	tempmin(t-7)
7	8.231429	9.022857	5.961429
8	3.814286	8.231429	9.022857
9	3.368571	3.814286	8.231429
10	6.081429	3.368571	3.814286
11	7.614286	6.081429	3.368571

[5 rows x 22 columns]

```
In [124]: len(daily_week)
```

```
Out [124]: 112
```

```
In [15]:
```

WARNING:tensorflow:From c:\users\laura\appdata\local\programs\python\python37\lib\site-packages\nn\collocation.py:100: tf.nn.nn_located_interpolate is deprecated and will be removed in a future version. Instructions for updating:
Colocations handled automatically by placer.

```
In [24]: #normalitzem
scaler=preprocessing.MinMaxScaler(feature_range=(0, 1))
daily_week_norm=scaler.fit_transform(daily_week)
```

```

In [25]: #Partim en X i y(valor a predir)

#Selecccionem dades per y i X
y_week=daily_week_norm[:,0]
X_week=daily_week_norm[:,1:29]

#Reshape de [samples,timesteps] a [samples,timesteps,features]
#X_daily_list=X_daily.values#.tolist()
X_week=np.reshape(X_week, (X_week.shape[0],7,3))

In [18]: len(X_week)

Out[18]: 112

In [27]: # definim model
import tensorflow as tf
model =Sequential()
model.add(LSTM(50, activation='relu', input_shape=(7, 3)))
model.add(Dense(1))
model.compile(optimizer='adam', loss='mse')

#Walk forward per test i train
minim=2
n_train=55
lenght=len(daily_week)-1

llista_evaluate=list()
llista_prediccions=list()
llista_preditrain=list()
llista_scores=list()
llista_scoretrain=list()
sumScores=0

for i in range(n_train,lenght):
    minim=minim+1
    X_train,X_test= X_week[minim:i],X_week[i:i+1]
    y_train,y_test= y_week[minim:i],y_week[i:i+1]

    #fem fit al model
    model.fit(X_train, y_train, epochs=50, verbose=0)

    #mostrem score per cada model
    score=model.evaluate(X_test,y_test,verbose=0)
    llista_evaluate.append(score)

    #Predim per cadascun
    preditest=model.predict(X_test)

```



```

llista_prediccions.append(preditest)

preditrain=model.predict(X_train)
llista_preditrain.append(preditrain)

trainScore = math.sqrt(mean_squared_error(y_train, preditrain))
llista_scoretrain.append(trainScore )

testScore = math.sqrt(mean_squared_error(y_test, preditest))
llista_scores.append(testScore)

sumScores=sumScores+testScore

```

WARNING:tensorflow:From c:\users\laura\appdata\local\programs\python\python37\lib\site-packages\tensorflow\python\ops\math_ops.py:306: div (tf.nn.div) will be auto-casted from float to half. Instructions for updating:
Use tf.cast instead.

```

In [28]: #Dividim la suma de scores de test entre el nombre de prediccions per obtenir la mitjana
        sumScores/(lenght-n_train)

```

```

Out[28]: 0.18526804429420407

```

```

In [29]: predis=list()

        for i in range(len(llista_prediccions)):
            predi=llista_prediccions[i].tolist()
            predis.append(predi)

        predis=np.reshape(predis, (56))

        predis

```

```

Out[29]: array([0.54526418, 0.52887022, 0.53626031, 0.56864125, 0.58610916,
                0.6268611 , 0.68082237, 0.61409605, 0.80668217, 0.51266319,
                0.53236502, 0.7358551 , 1.12101007, 0.69285834, 0.69615304,
                0.68232453, 0.77212977, 0.80255598, 0.56524223, 0.63820714,
                0.4962166 , 0.4652991 , 0.46541533, 0.56714219, 0.4897694 ,
                0.46476638, 0.6424107 , 0.56692916, 0.45989737, 0.51178348,
                0.66953462, 0.49274987, 0.47173658, 0.56253278, 0.53315634,
                0.57204646, 0.61961538, 0.67534482, 0.94406712, 0.44516098,
                0.29154176, 0.94113815, 0.67404467, 0.32466027, 0.79000705,
                0.6981163 , 0.46185476, 0.38694209, 0.47651404, 0.31708619,
                0.40995732, 0.77893984, 0.13033997, 1.04714549, 0.41361097,
                0.99083596])

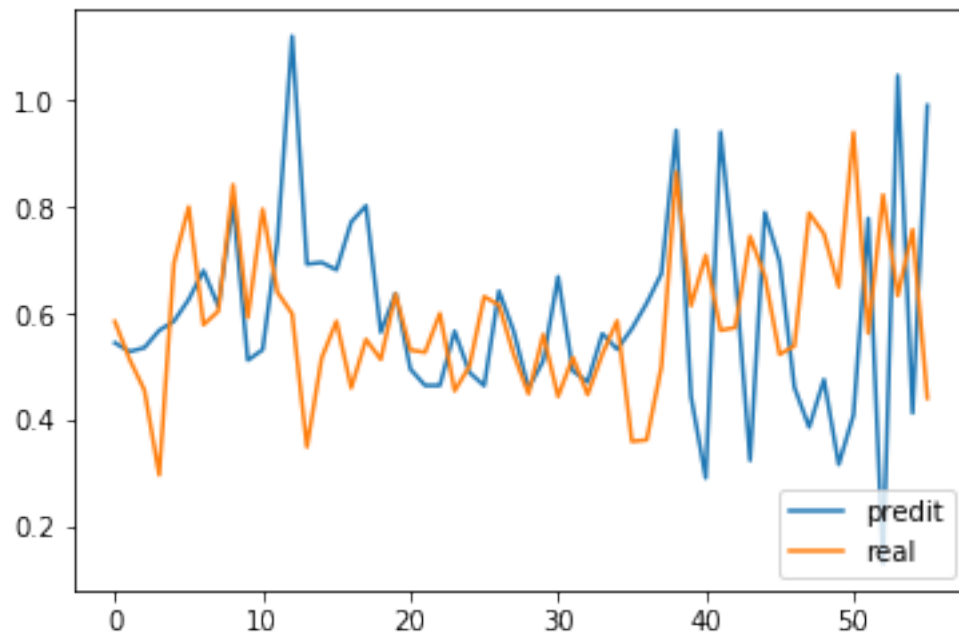
```

```

In [30]: ##Mostrem
        plt.plot(predis, label="predict")

```

```
plt.plot(y_week[n_train:lenght], label="real")
plt.legend(loc="lower right")
plt.show()
```



```
In [32]: prova=daily_week.iloc[n_train:lenght]
prova
#len(predis)
#lenght-n_train
prova['predi']=predis
prova['y']=y_week[n_train:lenght]
prova=prova.drop(['energy_sum','t-1'], axis=1)
prova

prova=prova[['predi','y','t-2','t-3','t-4','t-5','t-6','t-7','temp(t-1)','temp(t-2)'],
prova
```

c:\users\laura\appdata\local\programs\python\python37\lib\site-packages\ipykernel_launcher.py:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: <http://pandas.pydata.org/pandas-docs/stable/indexing.html>

c:\users\laura\appdata\local\programs\python\python37\lib\site-packages\ipykernel_launcher.py:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: <http://pandas.pydata.org/pandas-docs/stable/indexing.html>

```
import sys
```

```
Out[32]:
```

	predi	y	t-2	t-3	t-4	t-5	\
62	0.545264	0.585234	77.437620	71.744692	72.062731	77.198766	
63	0.528870	0.513990	81.810558	77.437620	71.744692	72.062731	
64	0.536260	0.456374	72.574976	81.810558	77.437620	71.744692	
65	0.568641	0.297209	68.958373	72.574976	81.810558	77.437620	
66	0.586109	0.695217	66.033571	68.958373	72.574976	81.810558	
67	0.626861	0.800479	57.953783	66.033571	68.958373	72.574976	
68	0.680822	0.579275	78.158107	57.953783	66.033571	68.958373	
69	0.614096	0.604790	83.501617	78.158107	57.953783	66.033571	
70	0.806682	0.841917	72.272519	83.501617	78.158107	57.953783	
71	0.512663	0.592762	73.567716	72.272519	83.501617	78.158107	
72	0.532365	0.796123	85.605174	73.567716	72.272519	83.501617	
73	0.735855	0.640497	72.957145	85.605174	73.567716	72.272519	
74	1.121010	0.599801	83.280488	72.957145	85.605174	73.567716	
75	0.692858	0.349847	75.380342	83.280488	72.957145	85.605174	
76	0.696153	0.516987	73.314447	75.380342	83.280488	72.957145	
77	0.682325	0.585745	60.625875	73.314447	75.380342	83.280488	
78	0.772130	0.460769	69.110532	60.625875	73.314447	75.380342	
79	0.802556	0.551698	72.600922	69.110532	60.625875	73.314447	
80	0.565242	0.514140	66.256717	72.600922	69.110532	60.625875	
81	0.638207	0.636863	70.872598	66.256717	72.600922	69.110532	
82	0.496217	0.531834	68.965995	70.872598	66.256717	72.600922	
83	0.465299	0.527565	75.195854	68.965995	70.872598	66.256717	
84	0.465415	0.600453	69.864196	75.195854	68.965995	70.872598	
85	0.567142	0.455356	69.647524	69.864196	75.195854	68.965995	
86	0.489769	0.501349	73.347557	69.647524	69.864196	75.195854	
87	0.464766	0.632110	65.981932	73.347557	69.647524	69.864196	
88	0.642411	0.616170	68.316695	65.981932	73.347557	69.647524	
89	0.566929	0.523494	74.954583	68.316695	65.981932	73.347557	
90	0.459897	0.449738	74.145410	74.954583	68.316695	65.981932	
91	0.511783	0.560895	69.440865	74.145410	74.954583	68.316695	
92	0.669535	0.444640	65.696722	69.440865	74.145410	74.954583	
93	0.492750	0.517978	71.339482	65.696722	69.440865	74.145410	
94	0.471737	0.448216	65.437931	71.339482	65.696722	69.440865	
95	0.562533	0.524152	69.160818	65.437931	71.339482	65.696722	
96	0.533156	0.586599	65.619442	69.160818	65.437931	71.339482	
97	0.572046	0.360412	69.474258	65.619442	69.160818	65.437931	
98	0.619615	0.363268	72.644275	69.474258	65.619442	69.160818	
99	0.675345	0.500779	61.162204	72.644275	69.474258	65.619442	
100	0.944067	0.865802	61.307206	61.162204	72.644275	69.474258	
101	0.445161	0.614835	68.287755	61.307206	61.162204	72.644275	
102	0.291542	0.709752	86.817619	68.287755	61.307206	61.162204	
103	0.941138	0.568775	74.077658	86.817619	68.287755	61.307206	
104	0.674045	0.574024	78.895956	74.077658	86.817619	68.287755	

105	0.324660	0.745561	71.739465	78.895956	74.077658	86.817619
106	0.790007	0.669989	72.005948	71.739465	78.895956	74.077658
107	0.698116	0.523713	80.713782	72.005948	71.739465	78.895956
108	0.461855	0.539346	76.877442	80.713782	72.005948	71.739465
109	0.386942	0.788916	69.451989	76.877442	80.713782	72.005948
110	0.476514	0.749954	70.245566	69.451989	76.877442	80.713782
111	0.317086	0.650103	82.914623	70.245566	69.451989	76.877442
112	0.409957	0.940460	80.936769	82.914623	70.245566	69.451989
113	0.778940	0.563523	75.867974	80.936769	82.914623	70.245566
114	0.130340	0.823075	90.607556	75.867974	80.936769	82.914623
115	1.047145	0.633763	71.472853	90.607556	75.867974	80.936769
116	0.413611	0.757893	84.648671	71.472853	90.607556	75.867974
117	0.990836	0.441344	75.038481	84.648671	71.472853	90.607556

	t-6	t-7	temp(t-1)	temp(t-2)	...	temp(t-5)	temp(t-6)	\
62	77.260768	70.664219	10.950000	12.012857	...	10.284286	11.920000	
63	77.198766	77.260768	10.742857	10.950000	...	7.481429	10.284286	
64	72.062731	77.198766	15.165714	10.742857	...	11.415714	7.481429	
65	71.744692	72.062731	16.284286	15.165714	...	12.012857	11.415714	
66	77.437620	71.744692	23.265714	16.284286	...	10.950000	12.012857	
67	81.810558	77.437620	10.168571	23.265714	...	10.742857	10.950000	
68	72.574976	81.810558	8.278571	10.168571	...	15.165714	10.742857	
69	68.958373	72.574976	12.042857	8.278571	...	16.284286	15.165714	
70	66.033571	68.958373	14.291429	12.042857	...	23.265714	16.284286	
71	57.953783	66.033571	12.585714	14.291429	...	10.168571	23.265714	
72	78.158107	57.953783	12.380000	12.585714	...	8.278571	10.168571	
73	83.501617	78.158107	5.622857	12.380000	...	12.042857	8.278571	
74	72.272519	83.501617	10.575714	5.622857	...	14.291429	12.042857	
75	73.567716	72.272519	12.288571	10.575714	...	12.585714	14.291429	
76	85.605174	73.567716	20.107143	12.288571	...	12.380000	12.585714	
77	72.957145	85.605174	12.655714	20.107143	...	5.622857	12.380000	
78	83.280488	72.957145	12.462857	12.655714	...	10.575714	5.622857	
79	75.380342	83.280488	15.947143	12.462857	...	12.288571	10.575714	
80	73.314447	75.380342	13.524286	15.947143	...	20.107143	12.288571	
81	60.625875	73.314447	14.741429	13.524286	...	12.655714	20.107143	
82	69.110532	60.625875	12.220000	14.741429	...	12.462857	12.655714	
83	72.600922	69.110532	14.254286	12.220000	...	15.947143	12.462857	
84	66.256717	72.600922	13.762857	14.254286	...	13.524286	15.947143	
85	70.872598	66.256717	11.821429	13.762857	...	14.741429	13.524286	
86	68.965995	70.872598	17.635714	11.821429	...	12.220000	14.741429	
87	75.195854	68.965995	14.591429	17.635714	...	14.254286	12.220000	
88	69.864196	75.195854	12.694286	14.591429	...	13.762857	14.254286	
89	69.647524	69.864196	10.715714	12.694286	...	11.821429	13.762857	
90	73.347557	69.647524	11.535714	10.715714	...	17.635714	11.821429	
91	65.981932	73.347557	17.392857	11.535714	...	14.591429	17.635714	
92	68.316695	65.981932	13.390000	17.392857	...	12.694286	14.591429	
93	74.954583	68.316695	14.931429	13.390000	...	10.715714	12.694286	
94	74.145410	74.954583	14.662857	14.931429	...	11.535714	10.715714	

95	69.440865	74.145410	17.297143	14.662857	...	17.392857	11.535714
96	65.696722	69.440865	16.102857	17.297143	...	13.390000	17.392857
97	71.339482	65.696722	11.320000	16.102857	...	14.931429	13.390000
98	65.437931	71.339482	19.728571	11.320000	...	14.662857	14.931429
99	69.160818	65.437931	16.895714	19.728571	...	17.297143	14.662857
100	65.619442	69.160818	15.064286	16.895714	...	16.102857	17.297143
101	69.474258	65.619442	5.490000	15.064286	...	11.320000	16.102857
102	72.644275	69.474258	15.445714	5.490000	...	19.728571	11.320000
103	61.162204	72.644275	10.522857	15.445714	...	16.895714	19.728571
104	61.307206	61.162204	12.672857	10.522857	...	15.064286	16.895714
105	68.287755	61.307206	12.577143	12.672857	...	5.490000	15.064286
106	86.817619	68.287755	8.850000	12.577143	...	15.445714	5.490000
107	74.077658	86.817619	9.755714	8.850000	...	10.522857	15.445714
108	78.895956	74.077658	15.714286	9.755714	...	12.672857	10.522857
109	71.739465	78.895956	15.428571	15.714286	...	12.577143	12.672857
110	72.005948	71.739465	7.230000	15.428571	...	8.850000	12.577143
111	80.713782	72.005948	8.642857	7.230000	...	9.755714	8.850000
112	76.877442	80.713782	12.211429	8.642857	...	15.714286	9.755714
113	69.451989	76.877442	7.085714	12.211429	...	15.428571	15.714286
114	70.245566	69.451989	13.771429	7.085714	...	7.230000	15.428571
115	82.914623	70.245566	7.205714	13.771429	...	8.642857	7.230000
116	80.936769	82.914623	10.018571	7.205714	...	12.211429	8.642857
117	75.867974	80.936769	10.297143	10.018571	...	7.085714	12.211429

	temp(t-7)	tempmin(t-1)	tempmin(t-2)	tempmin(t-3)	tempmin(t-4)	\
62	14.197143	4.078571	4.364286	5.054286	2.308571	
63	11.920000	3.617143	4.078571	4.364286	5.054286	
64	10.284286	6.892857	3.617143	4.078571	4.364286	
65	7.481429	8.255714	6.892857	3.617143	4.078571	
66	11.415714	13.784286	8.255714	6.892857	3.617143	
67	12.012857	2.300000	13.784286	8.255714	6.892857	
68	10.950000	0.571429	2.300000	13.784286	8.255714	
69	10.742857	5.510000	0.571429	2.300000	13.784286	
70	15.165714	8.212857	5.510000	0.571429	2.300000	
71	16.284286	3.828571	8.212857	5.510000	0.571429	
72	23.265714	5.085714	3.828571	8.212857	5.510000	
73	10.168571	0.192857	5.085714	3.828571	8.212857	
74	8.278571	3.547143	0.192857	5.085714	3.828571	
75	12.042857	4.511429	3.547143	0.192857	5.085714	
76	14.291429	10.581429	4.511429	3.547143	0.192857	
77	12.585714	6.118571	10.581429	4.511429	3.547143	
78	12.380000	5.967143	6.118571	10.581429	4.511429	
79	5.622857	7.852857	5.967143	6.118571	10.581429	
80	10.575714	5.730000	7.852857	5.967143	6.118571	
81	12.288571	8.095714	5.730000	7.852857	5.967143	
82	20.107143	4.847143	8.095714	5.730000	7.852857	
83	12.655714	9.315714	4.847143	8.095714	5.730000	
84	12.462857	6.275714	9.315714	4.847143	8.095714	

85	15.947143	6.450000	6.275714	9.315714	4.847143
86	13.524286	9.957143	6.450000	6.275714	9.315714
87	14.741429	8.422857	9.957143	6.450000	6.275714
88	12.220000	4.267143	8.422857	9.957143	6.450000
89	14.254286	4.417143	4.267143	8.422857	9.957143
90	13.762857	3.524286	4.417143	4.267143	8.422857
91	11.821429	9.468571	3.524286	4.417143	4.267143
92	17.635714	5.791429	9.468571	3.524286	4.417143
93	14.591429	8.835714	5.791429	9.468571	3.524286
94	12.694286	7.574286	8.835714	5.791429	9.468571
95	10.715714	7.960000	7.574286	8.835714	5.791429
96	11.535714	9.318571	7.960000	7.574286	8.835714
97	17.392857	6.917143	9.318571	7.960000	7.574286
98	13.390000	10.490000	6.917143	9.318571	7.960000
99	14.931429	9.777143	10.490000	6.917143	9.318571
100	14.662857	6.961429	9.777143	10.490000	6.917143
101	17.297143	-0.621429	6.961429	9.777143	10.490000
102	16.102857	6.648571	-0.621429	6.961429	9.777143
103	11.320000	3.924286	6.648571	-0.621429	6.961429
104	19.728571	5.480000	3.924286	6.648571	-0.621429
105	16.895714	5.790000	5.480000	3.924286	6.648571
106	15.064286	3.217143	5.790000	5.480000	3.924286
107	5.490000	2.084286	3.217143	5.790000	5.480000
108	15.445714	7.180000	2.084286	3.217143	5.790000
109	10.522857	9.104286	7.180000	2.084286	3.217143
110	12.672857	1.590000	9.104286	7.180000	2.084286
111	12.577143	4.727143	1.590000	9.104286	7.180000
112	8.850000	3.787143	4.727143	1.590000	9.104286
113	9.755714	-0.562857	3.787143	4.727143	1.590000
114	15.714286	7.548571	-0.562857	3.787143	4.727143
115	15.428571	0.928571	7.548571	-0.562857	3.787143
116	7.230000	1.710000	0.928571	7.548571	-0.562857
117	8.642857	3.328571	1.710000	0.928571	7.548571

	tempmin(t-5)	tempmin(t-6)	tempmin(t-7)
62	3.937143	4.064286	6.544286
63	2.308571	3.937143	4.064286
64	5.054286	2.308571	3.937143
65	4.364286	5.054286	2.308571
66	4.078571	4.364286	5.054286
67	3.617143	4.078571	4.364286
68	6.892857	3.617143	4.078571
69	8.255714	6.892857	3.617143
70	13.784286	8.255714	6.892857
71	2.300000	13.784286	8.255714
72	0.571429	2.300000	13.784286
73	5.510000	0.571429	2.300000
74	8.212857	5.510000	0.571429

75	3.828571	8.212857	5.510000
76	5.085714	3.828571	8.212857
77	0.192857	5.085714	3.828571
78	3.547143	0.192857	5.085714
79	4.511429	3.547143	0.192857
80	10.581429	4.511429	3.547143
81	6.118571	10.581429	4.511429
82	5.967143	6.118571	10.581429
83	7.852857	5.967143	6.118571
84	5.730000	7.852857	5.967143
85	8.095714	5.730000	7.852857
86	4.847143	8.095714	5.730000
87	9.315714	4.847143	8.095714
88	6.275714	9.315714	4.847143
89	6.450000	6.275714	9.315714
90	9.957143	6.450000	6.275714
91	8.422857	9.957143	6.450000
92	4.267143	8.422857	9.957143
93	4.417143	4.267143	8.422857
94	3.524286	4.417143	4.267143
95	9.468571	3.524286	4.417143
96	5.791429	9.468571	3.524286
97	8.835714	5.791429	9.468571
98	7.574286	8.835714	5.791429
99	7.960000	7.574286	8.835714
100	9.318571	7.960000	7.574286
101	6.917143	9.318571	7.960000
102	10.490000	6.917143	9.318571
103	9.777143	10.490000	6.917143
104	6.961429	9.777143	10.490000
105	-0.621429	6.961429	9.777143
106	6.648571	-0.621429	6.961429
107	3.924286	6.648571	-0.621429
108	5.480000	3.924286	6.648571
109	5.790000	5.480000	3.924286
110	3.217143	5.790000	5.480000
111	2.084286	3.217143	5.790000
112	7.180000	2.084286	3.217143
113	9.104286	7.180000	2.084286
114	1.590000	9.104286	7.180000
115	4.727143	1.590000	9.104286
116	3.787143	4.727143	1.590000
117	-0.562857	3.787143	4.727143

[56 rows x 22 columns]

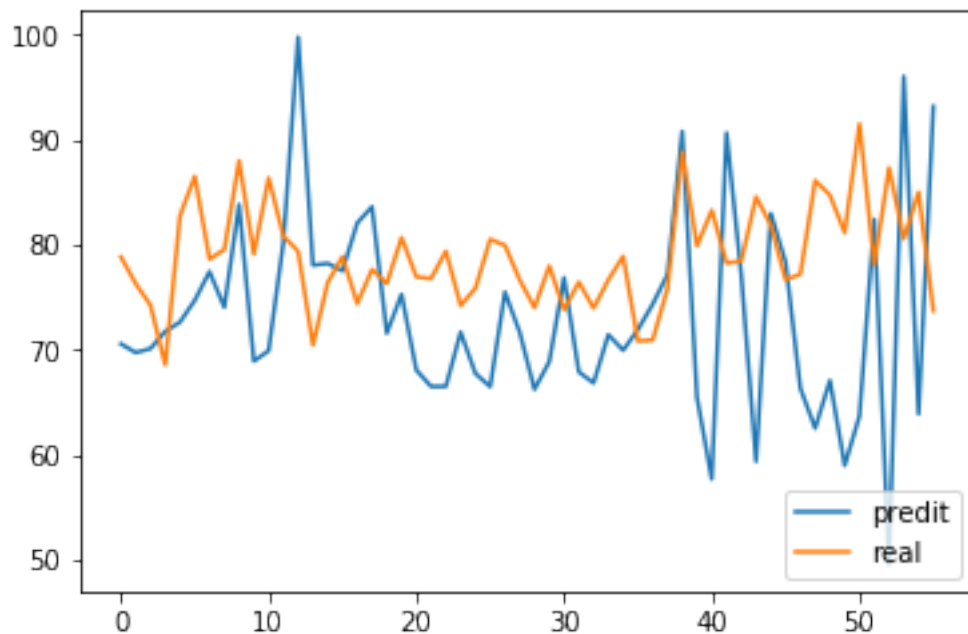
In [33]: `predi = scaler.inverse_transform(prova)`

In [34]: *#Fem una llista amb les prediccions i una llista amb y(valor real)*

```
listpredi=list()
for i in range(len(predi)):
    listpredi.append(predi[i][0])
```

```
listy=list()
for i in range(len(predi)):
    listy.append(predi[i][1])
```

```
In [35]: ##Mostrem
plt.plot(listpredi, label="predit")
plt.plot(listy, label="real")
plt.legend(loc="lower right")
plt.show()
```



```
In [36]: llista_errors=list()
         llista_errorsabs=list()
         llista_errorsres=list()

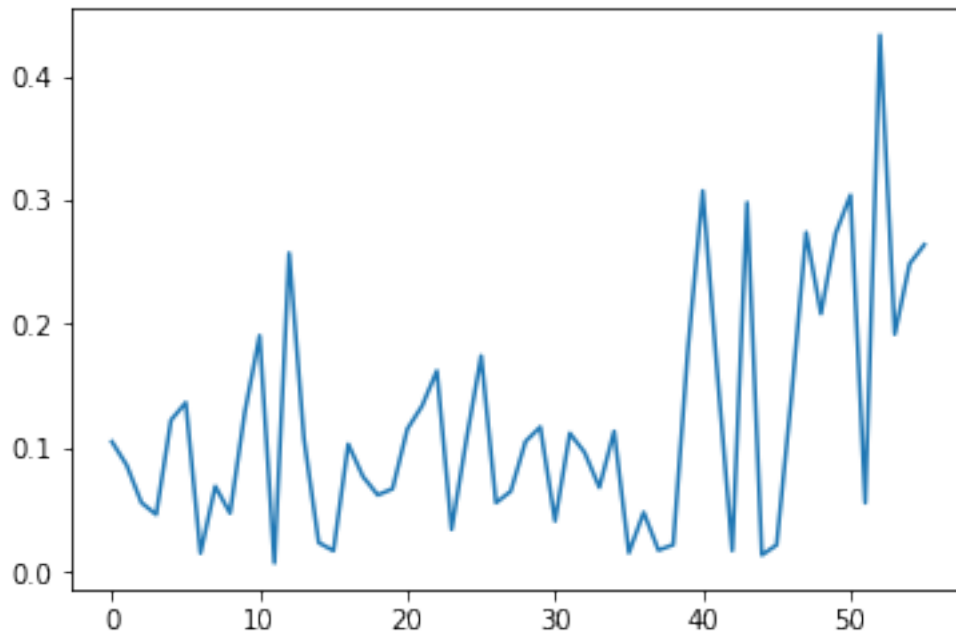
         for i in range(len(listpredi)):
             valor=listy[i]-listpredi[i]
             valorabs=math.fabs(valor)
             valorrespete=valorabs/listy[i]
             llista_errors.append(valor)
```



```
llista_errorsabs.append(valorabs)
llista_errorsres.append(valorrespete)
```

```
In [37]: plt.plot(llista_errorsres)
```

```
Out[37]: [<matplotlib.lines.Line2D at 0x2326bdbb6d8>]
```



```
In [38]: sum(llista_errorsres)/(len(llista_errorsres))
```

```
Out[38]: 0.12004697727169544
```

```
In [ ]:
```