M36
_Xarxa_walkforard_normalitzat_multivariate2tempmin_weekday_pres walkforward augment_PCA

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
```

Using TensorFlow backend.

1.1 Consum diari total multivariate one-step

```
In [2]: daily=pd.read_csv('C:/Users/Laura/Desktop/Smart meters London/workspace R/Dades netes/
        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*
```python
daily_dia=daily[['date','energy_sum','apparentTemperatureMax','apparentTemperatureMin'
daily_dia.head(5)
```

Out[3]:   index   date energy_sum apparentTemperatureMax \
```
0    735  2011-11-23    6.952692                    10.36
1    736  2011-11-24    8.536480                    12.93
2    682  2011-11-25    9.499781                    13.03
3    713  2011-11-26   10.267707                    12.96
4    609  2011-11-27   10.850805                    13.54
```

```
   apparentTemperatureMin  humidity  weekday  pressure  sunsetTimeHour  \
0                    2.18      0.93        3   1027.12              16
1                    7.01      0.89        4   1027.22              16
2                    4.84      0.79        5   1024.47              16
3                    4.69      0.81        6   1025.80              16
4                    2.94      0.72        7   1021.11              16
```

```
   cloudCover
0        0.36
1        0.41
2        0.48
3        0.44
4        0.42
```

In [4]: `daily_PCA=daily_dia[['pressure', 'sunsetTimeHour', 'cloudCover']]`

In [5]: *#Escalem dades*
```python
from sklearn.preprocessing import StandardScaler
scaler = StandardScaler()
daily_PCA_scaled=scaler.fit(daily_PCA).transform(daily_PCA)
```

c:\users\laura\appdata\local\programs\python\python37\lib\site-packages\sklearn\preprocessing\
  return self.partial_fit(X, y)

2

```
c:\users\laura\appdata\local\programs\python\python37\lib\site-packages\ipykernel_launcher.py:4
  after removing the cwd from sys.path.


In [6]: from sklearn.decomposition import PCA
        pca_d=PCA(n_components=1)
        daily_PCA_d=pca_d.fit_transform(daily_PCA_scaled)

In [7]: daily_PCA_d

Out[7]: array([[-4.99610280e-01],
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```

In [8]: `daily_dia['presSunCloud']=daily_PCA_d`
`daily_dia.head(5)`

Out[8]:   index   date energy_sum apparentTemperatureMax \
        0   735 2011-11-23   6.952692   10.36
        1   736 2011-11-24   8.536480   12.93
        2   682 2011-11-25   9.499781   13.03
        3   713 2011-11-26   10.267707   12.96
        4   609 2011-11-27   10.850805   13.54

           apparentTemperatureMin humidity weekday pressure sunsetTimeHour \
        0   2.18   0.93   3   1027.12   16
        1   7.01   0.89   4   1027.22   16
        2   4.84   0.79   5   1024.47   16
        3   4.69   0.81   6   1025.80   16
        4   2.94   0.72   7   1021.11   16

           cloudCover presSunCloud
        0   0.36   -0.499610
        1   0.41   -0.349430
        2   0.48   0.004989
        3   0.44   -0.185493
        4   0.42   -0.013602

```
In [ ]:

In [18]: plt.plot(daily_dia.energy_sum )

Out[18]: [<matplotlib.lines.Line2D at 0x1d48d92d710>]
```
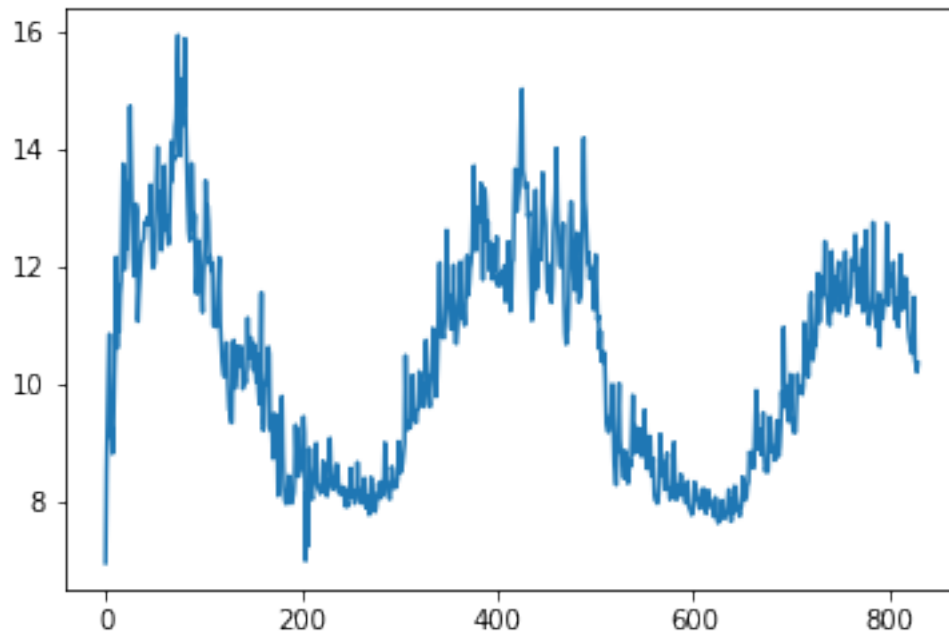


```
In [9]: daily_dia['t-1']=daily_dia['energy_sum'].shift(1)
        daily_dia['t-2']=daily_dia['energy_sum'].shift(2)
        daily_dia['t-3']=daily_dia['energy_sum'].shift(3)
        daily_dia['t-4']=daily_dia['energy_sum'].shift(4)
        daily_dia['t-5']=daily_dia['energy_sum'].shift(5)
        daily_dia['t-6']=daily_dia['energy_sum'].shift(6)
        daily_dia['t-7']=daily_dia['energy_sum'].shift(7)
        daily_dia['t-8']=daily_dia['energy_sum'].shift(8)
        daily_dia['t-9']=daily_dia['energy_sum'].shift(9)
        daily_dia['t-10']=daily_dia['energy_sum'].shift(10)
        daily_dia['t-11']=daily_dia['energy_sum'].shift(11)
        daily_dia['t-12']=daily_dia['energy_sum'].shift(12)
        daily_dia['t-13']=daily_dia['energy_sum'].shift(13)
        daily_dia['t-14']=daily_dia['energy_sum'].shift(14)

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

```python
daily_dia['temp(t-6)']=daily_dia['apparentTemperatureMax'].shift(6)
daily_dia['temp(t-7)']=daily_dia['apparentTemperatureMax'].shift(7)
daily_dia['temp(t-8)']=daily_dia['apparentTemperatureMax'].shift(8)
daily_dia['temp(t-9)']=daily_dia['apparentTemperatureMax'].shift(9)
daily_dia['temp(t-10)']=daily_dia['apparentTemperatureMax'].shift(10)
daily_dia['temp(t-11)']=daily_dia['apparentTemperatureMax'].shift(11)
daily_dia['temp(t-12)']=daily_dia['apparentTemperatureMax'].shift(12)
daily_dia['temp(t-13)']=daily_dia['apparentTemperatureMax'].shift(13)
daily_dia['temp(t-14)']=daily_dia['apparentTemperatureMax'].shift(14)

daily_dia['tempmin(t-1)']=daily_dia['apparentTemperatureMin'].shift(1)
daily_dia['tempmin(t-2)']=daily_dia['apparentTemperatureMin'].shift(2)
daily_dia['tempmin(t-3)']=daily_dia['apparentTemperatureMin'].shift(3)
daily_dia['tempmin(t-4)']=daily_dia['apparentTemperatureMin'].shift(4)
daily_dia['tempmin(t-5)']=daily_dia['apparentTemperatureMin'].shift(5)
daily_dia['tempmin(t-6)']=daily_dia['apparentTemperatureMin'].shift(6)
daily_dia['tempmin(t-7)']=daily_dia['apparentTemperatureMin'].shift(7)
daily_dia['tempmin(t-8)']=daily_dia['apparentTemperatureMin'].shift(8)
daily_dia['tempmin(t-9)']=daily_dia['apparentTemperatureMin'].shift(9)
daily_dia['tempmin(t-10)']=daily_dia['apparentTemperatureMin'].shift(10)
daily_dia['tempmin(t-11)']=daily_dia['apparentTemperatureMin'].shift(11)
daily_dia['tempmin(t-12)']=daily_dia['apparentTemperatureMin'].shift(12)
daily_dia['tempmin(t-13)']=daily_dia['apparentTemperatureMin'].shift(13)
daily_dia['tempmin(t-14)']=daily_dia['apparentTemperatureMin'].shift(14)

daily_dia['humidity(t-1)']=daily_dia['humidity'].shift(1)
daily_dia['humidity(t-2)']=daily_dia['humidity'].shift(2)
daily_dia['humidity(t-3)']=daily_dia['humidity'].shift(3)
daily_dia['humidity(t-4)']=daily_dia['humidity'].shift(4)
daily_dia['humidity(t-5)']=daily_dia['humidity'].shift(5)
daily_dia['humidity(t-6)']=daily_dia['humidity'].shift(6)
daily_dia['humidity(t-7)']=daily_dia['humidity'].shift(7)
daily_dia['humidity(t-8)']=daily_dia['humidity'].shift(8)
daily_dia['humidity(t-9)']=daily_dia['humidity'].shift(9)
daily_dia['humidity(t-10)']=daily_dia['humidity'].shift(10)
daily_dia['humidity(t-11)']=daily_dia['humidity'].shift(11)
daily_dia['humidity(t-12)']=daily_dia['humidity'].shift(12)
daily_dia['humidity(t-13)']=daily_dia['humidity'].shift(13)
daily_dia['humidity(t-14)']=daily_dia['humidity'].shift(14)


daily_dia['weekday(t-1)']=daily_dia['weekday'].shift(1)
daily_dia['weekday(t-2)']=daily_dia['weekday'].shift(2)
daily_dia['weekday(t-3)']=daily_dia['weekday'].shift(3)
daily_dia['weekday(t-4)']=daily_dia['weekday'].shift(4)
daily_dia['weekday(t-5)']=daily_dia['weekday'].shift(5)
daily_dia['weekday(t-6)']=daily_dia['weekday'].shift(6)
daily_dia['weekday(t-7)']=daily_dia['weekday'].shift(7)
```

```
daily_dia['weekday(t-8)']=daily_dia['weekday'].shift(8)
daily_dia['weekday(t-9)']=daily_dia['weekday'].shift(9)
daily_dia['weekday(t-10)']=daily_dia['weekday'].shift(10)
daily_dia['weekday(t-11)']=daily_dia['weekday'].shift(11)
daily_dia['weekday(t-12)']=daily_dia['weekday'].shift(12)
daily_dia['weekday(t-13)']=daily_dia['weekday'].shift(13)
daily_dia['weekday(t-14)']=daily_dia['weekday'].shift(14)


daily_dia['presSunCloud(t-1)']=daily_dia['presSunCloud'].shift(1)
daily_dia['presSunCloud(t-2)']=daily_dia['presSunCloud'].shift(2)
daily_dia['presSunCloud(t-3)']=daily_dia['presSunCloud'].shift(3)
daily_dia['presSunCloud(t-4)']=daily_dia['presSunCloud'].shift(4)
daily_dia['presSunCloud(t-5)']=daily_dia['presSunCloud'].shift(5)
daily_dia['presSunCloud(t-6)']=daily_dia['presSunCloud'].shift(6)
daily_dia['presSunCloud(t-7)']=daily_dia['presSunCloud'].shift(7)
daily_dia['presSunCloud(t-8)']=daily_dia['presSunCloud'].shift(8)
daily_dia['presSunCloud(t-9)']=daily_dia['presSunCloud'].shift(9)
daily_dia['presSunCloud(t-10)']=daily_dia['presSunCloud'].shift(10)
daily_dia['presSunCloud(t-11)']=daily_dia['presSunCloud'].shift(11)
daily_dia['presSunCloud(t-12)']=daily_dia['presSunCloud'].shift(12)
daily_dia['presSunCloud(t-13)']=daily_dia['presSunCloud'].shift(13)
daily_dia['presSunCloud(t-14)']=daily_dia['presSunCloud'].shift(14)


daily_dia
```

```
Out[9]:     index         date  energy_sum  apparentTemperatureMax  \
        0     735   2011-11-23    6.952692                   10.36
        1     736   2011-11-24    8.536480                   12.93
        2     682   2011-11-25    9.499781                   13.03
        3     713   2011-11-26   10.267707                   12.96
        4     609   2011-11-27   10.850805                   13.54
        5     641   2011-11-28    9.103382                   12.58
        6     265   2011-11-29    9.274873                   13.47
        7     571   2011-11-30    8.813513                   11.87
        8     199   2011-12-01    9.227707                   12.15
        9     338   2011-12-02   10.145910                    5.33
        10    131   2011-12-03   10.780273                   11.42
        11    100   2011-12-04   12.163127                    6.66
        12    176   2011-12-05   10.609714                    3.13
        13    203   2011-12-06   11.673417                    3.77
        14    240   2011-12-07   10.889362                    5.14
        15    299   2011-12-08   11.525150                   12.89
        16    294   2011-12-09   11.759837                    3.99
        17    455   2011-12-10   12.633801                    3.14
        18    215   2011-12-11   13.749174                    5.72
        19    115   2011-12-12   11.951958                    5.94
```

20	22	2011-12-13	11.957446	12.08
21	45	2011-12-14	12.392776	2.88
22	59	2011-12-15	12.307079	4.38
23	11	2011-12-16	13.376080	0.99
24	228	2011-12-17	13.511968	1.72
25	478	2011-12-18	14.732271	1.98
26	412	2011-12-19	13.774471	4.02
27	433	2011-12-20	12.709106	4.98
28	524	2011-12-21	12.148570	12.14
29	689	2011-12-22	11.839403	12.14
..	...	...	...	...
800	41	2014-01-29	11.800777	2.53
801	105	2014-01-30	11.685169	5.86
802	80	2014-01-31	11.857957	5.27
803	21	2014-02-01	11.710582	6.86
804	163	2014-02-02	12.078164	6.48
805	135	2014-02-03	11.280011	4.59
806	60	2014-02-04	11.095584	5.63
807	3	2014-02-05	11.415105	5.86
808	18	2014-02-06	11.445403	7.34
809	14	2014-02-07	10.972318	8.44
810	0	2014-02-08	11.569300	5.67
811	7	2014-02-09	12.202967	3.91
812	35	2014-02-10	11.264175	7.07
813	57	2014-02-11	11.452649	4.06
814	44	2014-02-12	11.679099	4.73
815	33	2014-02-13	11.285737	3.42
816	23	2014-02-14	11.816914	12.02
817	13	2014-02-15	11.490470	5.79
818	187	2014-02-16	11.582159	7.88
819	218	2014-02-17	10.979566	10.67
820	235	2014-02-18	10.781898	10.13
821	322	2014-02-19	10.674624	10.13
822	101	2014-02-20	10.573835	12.50
823	129	2014-02-21	10.518126	10.15
824	248	2014-02-22	10.776242	11.63
825	285	2014-02-23	11.480411	11.94
826	158	2014-02-24	10.411403	14.23
827	95	2014-02-25	10.294997	11.43
828	360	2014-02-26	10.202945	11.29
829	197	2014-02-27	10.356350	10.31

	apparentTemperatureMin	humidity	weekday	pressure	sunsetTimeHour \
0	2.18	0.93	3	1027.12	16
1	7.01	0.89	4	1027.22	16
2	4.84	0.79	5	1024.47	16
3	4.69	0.81	6	1025.80	16
4	2.94	0.72	7	1021.11	16

5	1.31	0.86	1	1022.80	15
6	3.39	0.82	2	1009.70	15
7	3.34	0.78	3	1019.43	15
8	5.29	0.82	4	1007.12	15
9	0.46	0.87	5	1012.12	15
10	4.71	0.79	6	1003.55	15
11	1.03	0.82	7	1001.15	15
12	-1.69	0.77	1	1006.01	15
13	-1.61	0.83	2	1007.32	15
14	0.94	0.68	3	1008.76	15
15	0.63	0.81	4	1010.84	15
16	-1.42	0.71	5	1010.60	15
17	-3.42	0.81	6	1015.58	15
18	0.11	0.88	7	1007.71	15
19	-0.64	0.84	1	1002.47	15
20	0.22	0.75	2	990.27	15
21	0.78	0.79	3	994.48	15
22	1.07	0.77	4	996.75	15
23	-2.65	0.88	5	988.10	15
24	-3.56	0.86	6	1008.46	15
25	-4.12	0.84	7	1016.37	15
26	-3.67	0.94	1	1014.39	15
27	1.68	0.81	2	1015.09	15
28	3.84	0.94	3	1017.91	15
29	5.37	0.87	4	1024.71	15
..	...	...	...	...	...
800	0.18	0.90	3	993.99	16
801	0.61	0.91	4	1001.76	16
802	0.29	0.91	5	998.51	16
803	1.10	0.76	6	990.08	16
804	3.21	0.72	7	1005.39	16
805	1.96	0.79	1	1003.89	16
806	1.12	0.75	2	996.87	16
807	1.03	0.77	3	982.20	16
808	1.96	0.82	4	989.90	16
809	-0.86	0.79	5	988.77	17
810	2.19	0.77	6	979.25	17
811	1.38	0.66	7	984.71	17
812	0.89	0.84	1	992.84	17
813	-0.57	0.76	2	996.66	17
814	-1.20	0.75	3	994.27	17
815	0.05	0.68	4	992.43	17
816	0.45	0.81	5	990.31	17
817	1.77	0.69	6	988.63	17
818	-1.03	0.76	7	1006.70	17
819	2.84	0.83	1	1007.80	17
820	3.83	0.87	2	1008.67	17
821	2.65	0.87	3	1011.57	17

822	3.95	0.84	4	1001.54	17
823	0.19	0.72	5	1003.42	17
824	1.59	0.71	6	1009.09	17
825	5.53	0.76	7	1010.37	17
826	5.52	0.74	1	1005.19	17
827	3.89	0.78	2	1000.65	17
828	1.67	0.73	3	1012.73	17
829	1.41	0.74	4	1007.02	17

	cloudCover	...	presSunCloud(t-5)	presSunCloud(t-6)	presSunCloud(t-7) \
0	0.36	...	NaN	NaN	NaN
1	0.41	...	NaN	NaN	NaN
2	0.48	...	NaN	NaN	NaN
3	0.44	...	NaN	NaN	NaN
4	0.42	...	NaN	NaN	NaN
5	0.56	...	-0.499610	NaN	NaN
6	0.60	...	-0.349430	-0.499610	NaN
7	0.31	...	0.004989	-0.349430	-0.499610
8	0.57	...	-0.185493	0.004989	-0.349430
9	0.32	...	-0.013602	-0.185493	0.004989
10	0.54	...	0.693988	-0.013602	-0.185493
11	0.36	...	1.471611	0.693988	-0.013602
12	0.20	...	0.086255	1.471611	0.693988
13	0.34	...	1.507211	0.086255	1.471611
14	0.29	...	0.481945	1.507211	0.086255
15	0.53	...	1.592198	0.481945	1.507211
16	0.15	...	1.153313	1.592198	0.481945
17	0.17	...	0.414334	1.153313	1.592198
18	0.56	...	0.783458	0.414334	1.153313
19	0.38	...	0.556456	0.783458	0.414334
20	0.42	...	1.197506	0.556456	0.783458
21	0.36	...	0.030195	1.197506	0.556456
22	0.42	...	-0.156162	0.030195	1.197506
23	0.70	...	1.446746	-0.156162	0.030195
24	0.37	...	1.149533	1.446746	-0.156162
25	0.22	...	1.882260	1.149533	1.446746
26	0.47	...	1.486043	1.882260	1.149533
27	0.48	...	1.559008	1.486043	1.882260
28	0.67	...	2.859454	1.559008	1.486043
29	0.38	...	0.819691	2.859454	1.559008
..	...	...	...	...	...
800	0.93	...	0.717972	0.111054	1.542647
801	0.81	...	0.479967	0.717972	0.111054
802	0.73	...	0.872636	0.479967	0.717972
803	0.19	...	1.420656	0.872636	0.479967
804	0.22	...	2.360909	1.420656	0.872636
805	0.47	...	2.921989	2.360909	1.420656
806	0.42	...	2.161981	2.921989	2.360909

807	0.73	...	2.075835	2.161981	2.921989
808	0.67	...	0.820539	2.075835	2.161981
809	0.63	...	0.149908	0.820539	2.075835
810	0.47	...	1.000579	0.149908	0.820539
811	0.52	...	1.195600	1.000579	0.149908
812	0.55	...	2.889452	1.195600	1.000579
813	0.41	...	2.319139	2.889452	1.195600
814	0.59	...	1.893951	2.319139	2.889452
815	0.36	...	1.872312	1.893951	2.319139
816	0.67	...	1.755111	1.872312	1.893951
817	0.35	...	1.442651	1.755111	1.872312
818	0.13	...	0.817620	1.442651	1.755111
819	0.56	...	1.495451	0.817620	1.442651
820	0.57	...	0.873462	1.495451	0.817620
821	0.64	...	1.941264	0.873462	1.495451
822	0.61	...	1.031990	1.941264	0.873462
823	0.22	...	-0.552167	1.031990	1.941264
824	0.25	...	0.727412	-0.552167	1.031990
825	0.66	...	0.715046	0.727412	-0.552167
826	0.50	...	0.787618	0.715046	0.727412
827	0.62	...	1.194858	0.787618	0.715046
828	0.26	...	-0.109241	1.194858	0.787618
829	0.32	...	-0.298985	-0.109241	1.194858

	presSunCloud(t-8)	presSunCloud(t-9)	presSunCloud(t-10)	\
0	NaN	NaN	NaN	
1	NaN	NaN	NaN	
2	NaN	NaN	NaN	
3	NaN	NaN	NaN	
4	NaN	NaN	NaN	
5	NaN	NaN	NaN	
6	NaN	NaN	NaN	
7	NaN	NaN	NaN	
8	-0.499610	NaN	NaN	
9	-0.349430	-0.499610	NaN	
10	0.004989	-0.349430	-0.499610	
11	-0.185493	0.004989	-0.349430	
12	-0.013602	-0.185493	0.004989	
13	0.693988	-0.013602	-0.185493	
14	1.471611	0.693988	-0.013602	
15	0.086255	1.471611	0.693988	
16	1.507211	0.086255	1.471611	
17	0.481945	1.507211	0.086255	
18	1.592198	0.481945	1.507211	
19	1.153313	1.592198	0.481945	
20	0.414334	1.153313	1.592198	
21	0.783458	0.414334	1.153313	
22	0.556456	0.783458	0.414334	

23	1.197506	0.556456	0.783458
24	0.030195	1.197506	0.556456
25	-0.156162	0.030195	1.197506
26	1.446746	-0.156162	0.030195
27	1.149533	1.446746	-0.156162
28	1.882260	1.149533	1.446746
29	1.486043	1.882260	1.149533
..	...	...	...
800	0.378962	-0.120993	0.983640
801	1.542647	0.378962	-0.120993
802	0.111054	1.542647	0.378962
803	0.717972	0.111054	1.542647
804	0.479967	0.717972	0.111054
805	0.872636	0.479967	0.717972
806	1.420656	0.872636	0.479967
807	2.360909	1.420656	0.872636
808	2.921989	2.360909	1.420656
809	2.161981	2.921989	2.360909
810	2.075835	2.161981	2.921989
811	0.820539	2.075835	2.161981
812	0.149908	0.820539	2.075835
813	1.000579	0.149908	0.820539
814	1.195600	1.000579	0.149908
815	2.889452	1.195600	1.000579
816	2.319139	2.889452	1.195600
817	1.893951	2.319139	2.889452
818	1.872312	1.893951	2.319139
819	1.755111	1.872312	1.893951
820	1.442651	1.755111	1.872312
821	0.817620	1.442651	1.755111
822	1.495451	0.817620	1.442651
823	0.873462	1.495451	0.817620
824	1.941264	0.873462	1.495451
825	1.031990	1.941264	0.873462
826	-0.552167	1.031990	1.941264
827	0.727412	-0.552167	1.031990
828	0.715046	0.727412	-0.552167
829	0.787618	0.715046	0.727412

	presSunCloud(t-11)	presSunCloud(t-12)	presSunCloud(t-13) \
0	NaN	NaN	NaN
1	NaN	NaN	NaN
2	NaN	NaN	NaN
3	NaN	NaN	NaN
4	NaN	NaN	NaN
5	NaN	NaN	NaN
6	NaN	NaN	NaN
7	NaN	NaN	NaN

8	NaN	NaN	NaN
9	NaN	NaN	NaN
10	NaN	NaN	NaN
11	-0.499610	NaN	NaN
12	-0.349430	-0.499610	NaN
13	0.004989	-0.349430	-0.499610
14	-0.185493	0.004989	-0.349430
15	-0.013602	-0.185493	0.004989
16	0.693988	-0.013602	-0.185493
17	1.471611	0.693988	-0.013602
18	0.086255	1.471611	0.693988
19	1.507211	0.086255	1.471611
20	0.481945	1.507211	0.086255
21	1.592198	0.481945	1.507211
22	1.153313	1.592198	0.481945
23	0.414334	1.153313	1.592198
24	0.783458	0.414334	1.153313
25	0.556456	0.783458	0.414334
26	1.197506	0.556456	0.783458
27	0.030195	1.197506	0.556456
28	-0.156162	0.030195	1.197506
29	1.446746	-0.156162	0.030195
..	...	...	...
800	1.240756	1.653567	2.009904
801	0.983640	1.240756	1.653567
802	-0.120993	0.983640	1.240756
803	0.378962	-0.120993	0.983640
804	1.542647	0.378962	-0.120993
805	0.111054	1.542647	0.378962
806	0.717972	0.111054	1.542647
807	0.479967	0.717972	0.111054
808	0.872636	0.479967	0.717972
809	1.420656	0.872636	0.479967
810	2.360909	1.420656	0.872636
811	2.921989	2.360909	1.420656
812	2.161981	2.921989	2.360909
813	2.075835	2.161981	2.921989
814	0.820539	2.075835	2.161981
815	0.149908	0.820539	2.075835
816	1.000579	0.149908	0.820539
817	1.195600	1.000579	0.149908
818	2.889452	1.195600	1.000579
819	2.319139	2.889452	1.195600
820	1.893951	2.319139	2.889452
821	1.872312	1.893951	2.319139
822	1.755111	1.872312	1.893951
823	1.442651	1.755111	1.872312
824	0.817620	1.442651	1.755111

825	1.495451	0.817620	1.442651
826	0.873462	1.495451	0.817620
827	1.941264	0.873462	1.495451
828	1.031990	1.941264	0.873462
829	-0.552167	1.031990	1.941264

	presSunCloud(t-14)
0	NaN
1	NaN
2	NaN
3	NaN
4	NaN
5	NaN
6	NaN
7	NaN
8	NaN
9	NaN
10	NaN
11	NaN
12	NaN
13	NaN
14	-0.499610
15	-0.349430
16	0.004989
17	-0.185493
18	-0.013602
19	0.693988
20	1.471611
21	0.086255
22	1.507211
23	0.481945
24	1.592198
25	1.153313
26	0.414334
27	0.783458
28	0.556456
29	1.197506
..	...
800	2.196977
801	2.009904
802	1.653567
803	1.240756
804	0.983640
805	-0.120993
806	0.378962
807	1.542647
808	0.111054
809	0.717972

```
810            0.479967
811            0.872636
812            1.420656
813            2.360909
814            2.921989
815            2.161981
816            2.075835
817            0.820539
818            0.149908
819            1.000579
820            1.195600
821            2.889452
822            2.319139
823            1.893951
824            1.872312
825            1.755111
826            1.442651
827            0.817620
828            1.495451
829            0.873462

[830 rows x 95 columns]
```

In [10]: *#Ens quedem amb energies i temperatures*
         #No agafem apparent temperature max ja que quan fem la predicció representa que no ho
         daily_dia=daily_dia.drop(['index','date','apparentTemperatureMax','apparentTemperature
         daily_dia.head(5)

Out[10]:   energy_sum   t-1   t-2   t-3   t-4   t-5 t-6 t-7 t-8 \
         0   6.952692   NaN   NaN   NaN   NaN NaN NaN NaN NaN
         1   8.536480   6.952692   NaN   NaN   NaN NaN NaN NaN NaN
         2   9.499781   8.536480   6.952692   NaN   NaN NaN NaN NaN NaN
         3 10.267707   9.499781   8.536480   6.952692   NaN NaN NaN NaN NaN
         4 10.850805   10.267707   9.499781   8.536480   6.952692 NaN NaN NaN NaN

            t-9 ... presSunCloud(t-5) presSunCloud(t-6) presSunCloud(t-7) \
         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

            presSunCloud(t-8) presSunCloud(t-9) presSunCloud(t-10) \
         0   NaN   NaN   NaN
         1   NaN   NaN   NaN
         2   NaN   NaN   NaN
         3   NaN   NaN   NaN
         4   NaN   NaN   NaN
```

```
     presSunCloud(t-11)  presSunCloud(t-12)  presSunCloud(t-13)  \
0                   NaN                 NaN                 NaN
1                   NaN                 NaN                 NaN
2                   NaN                 NaN                 NaN
3                   NaN                 NaN                 NaN
4                   NaN                 NaN                 NaN

     presSunCloud(t-14)
0                   NaN
1                   NaN
2                   NaN
3                   NaN
4                   NaN

[5 rows x 85 columns]
```

In [11]: *#Eliminem les 14 primeres files ja que contenen NaN (valors buits)*

```
daily_dia=daily_dia.drop([0,1,2,3,4,5,6,7,8,9,10,11,12,13])
daily_dia.head(5)
```

Out[11]:   energy_sum   t-1   t-2   t-3   t-4   t-5 \
        14   10.889362 11.673417 10.609714 12.163127 10.780273 10.145910
        15   11.525150 10.889362 11.673417 10.609714 12.163127 10.780273
        16   11.759837 11.525150 10.889362 11.673417 10.609714 12.163127
        17   12.633801 11.759837 11.525150 10.889362 11.673417 10.609714
        18   13.749174 12.633801 11.759837 11.525150 10.889362 11.673417

              t-6   t-7   t-8   t-9 ... presSunCloud(t-5) \
        14   9.227707   8.813513   9.274873   9.103382 ...   0.481945
        15 10.145910   9.227707   8.813513   9.274873 ...   1.592198
        16 10.780273 10.145910   9.227707   8.813513 ...   1.153313
        17 12.163127 10.780273 10.145910   9.227707 ...   0.414334
        18 10.609714 12.163127 10.780273 10.145910 ...   0.783458

     presSunCloud(t-6) presSunCloud(t-7) presSunCloud(t-8) \
        14   1.507211   0.086255   1.471611
        15   0.481945   1.507211   0.086255
        16   1.592198   0.481945   1.507211
        17   1.153313   1.592198   0.481945
        18   0.414334   1.153313   1.592198

     presSunCloud(t-9) presSunCloud(t-10) presSunCloud(t-11) \
        14   0.693988   -0.013602   -0.185493
        15   1.471611   0.693988   -0.013602
        16   0.086255   1.471611   0.693988
        17   1.507211   0.086255   1.471611
```

```
18                 0.481945              1.507211               0.086255

       presSunCloud(t-12)  presSunCloud(t-13)  presSunCloud(t-14)
14             0.004989           -0.349430            -0.499610
15            -0.185493            0.004989            -0.349430
16            -0.013602           -0.185493             0.004989
17             0.693988           -0.013602            -0.185493
18             1.471611            0.693988            -0.013602

[5 rows x 85 columns]
```

In [13]: `len(daily_dia)`

Out[13]: 816

In [12]:
```python
#normalitzem
scaler=preprocessing.MinMaxScaler(feature_range=(0, 1))
daily_dia_norm=scaler.fit_transform(daily_dia)
```

In [13]:
```python
#Seleccionem dades per test i train
y_daily=daily_dia_norm[:,0]
X_daily=daily_dia_norm[:,1:85]

#y_daily=daily_dia['energy_sum']
#X_daily=daily_dia.drop(['energy_sum'], axis='columns')



#Reshape de [samples,timesteps] a [samples,timesteps,features]

#Enlloc de 14 features en son 7 de una feature i 7 duna altre
X_daily=np.reshape(X_daily, (X_daily.shape[0], 14,6))
```

In [14]:
```python
# definim model
import tensorflow as tf
model =Sequential()
model.add(LSTM(50, activation='relu', input_shape=(14, 6)))
model.add(Dense(1))
model.compile(optimizer='adam', loss='mse', metrics=['accuracy'])
```

```
WARNING:tensorflow:From c:\users\laura\appdata\local\programs\python\python37\lib\site-packages
Instructions for updating:
Colocations handled automatically by placer.
```

In [15]:
```python
import math
from sklearn.metrics import mean_squared_error

#Walk forward per test i train
```

```python
minim=100
n_train=465
lenght=len(daily_dia)

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_daily[minim:i],X_daily[i:i+1]
    y_train,y_test= y_daily[minim:i],y_daily[i:i+1]

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

    #mostrem score
    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
Instructions for updating:
Use tf.cast instead.


```python
In [16]: #Dividim la suma de scores de test entre el nombre de prediccions per obtenir la mitj
         sumScores/(lenght-n_train)
```

Out[16]: 0.03456719525709743

```
In [17]: llista_scores

Out[17]: [0.004309385277514899,
          0.013098823801614978,
          0.027981609337808244,
          0.07103948984708475,
          0.12517217857688312,
          0.06520294575607255,
          0.011685512361909067,
          0.05937173463202239,
          0.10805565529356276,
          0.023853971964522547,
          0.05546670910954532,
          0.03495907673405152,
          0.062344257657203084,
          0.005193765461382283,
          0.019918261526365777,
          0.13085463543817366,
          0.167033054316589,
          0.07299455217068518,
          0.024104571035994837,
          0.025417571744337897,
          0.006876861649556032,
          0.015303629482159353,
          0.14271230001601487,
          0.03007607136137702,
          0.07250852895256998,
          0.11629223598725913,
          0.06102616417748097,
          0.08135550502087208,
          0.10349072515891855,
          0.11954148529655684,
          0.019282359249424008,
          0.18397496284393533,
          0.1128669888057432,
          0.06687961688845911,
          0.033545115592984676,
          0.013897433200950493,
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35

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```
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    0.06451981162329834,
    0.0499475929872879,
    0.037887900819679965,
    0.016704958119073243,
    0.025120153716686522,
    0.024540064592360356]

In [18]: plt.plot(llista_scores)

Out[18]: [<matplotlib.lines.Line2D at 0x280fecffac8>]
```
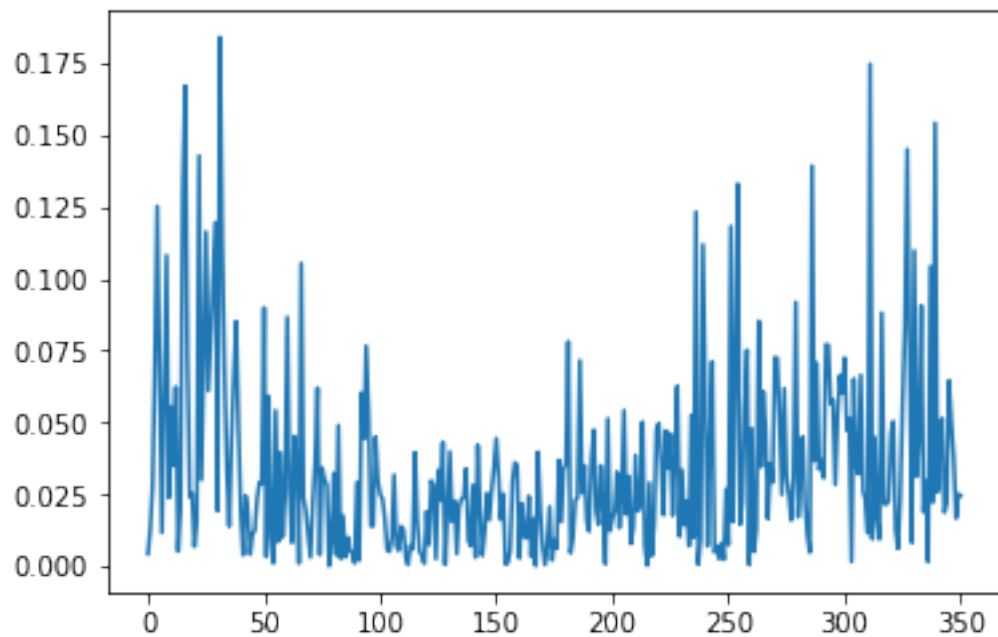


```
In [19]: predis=list()

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

```
        predis.append(predi)

    predis=np.reshape(predis, (351) )

    predis
```

Out[19]: array([0.51837087, 0.59370738, 0.59634483, 0.61031902, 0.61652732,
        0.58734834, 0.51612705, 0.50835323, 0.61140412, 0.7807768 ,
        0.62924898, 0.69713569, 0.67753839, 0.57065982, 0.56572789,
        0.66737801, 0.71928936, 0.47926176, 0.58191389, 0.50321198,
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        0.18984047, 0.20701347, 0.2019061 , 0.16104244, 0.17568001,
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        0.12264842, 0.13298796, 0.24624746, 0.18172416, 0.16519301,
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        0.19100621, 0.14990877, 0.10244668, 0.18019228, 0.15194422,
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```
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             0.48756742, 0.55166912, 0.42017353, 0.38598496, 0.38411564,
             0.40067482])
```

In [20]: ##Mostrem
```python
plt.plot(predis, label="predit")
plt.plot(y_daily[n_train:lenght], label="real")
plt.legend(loc="lower right")
plt.show()
```
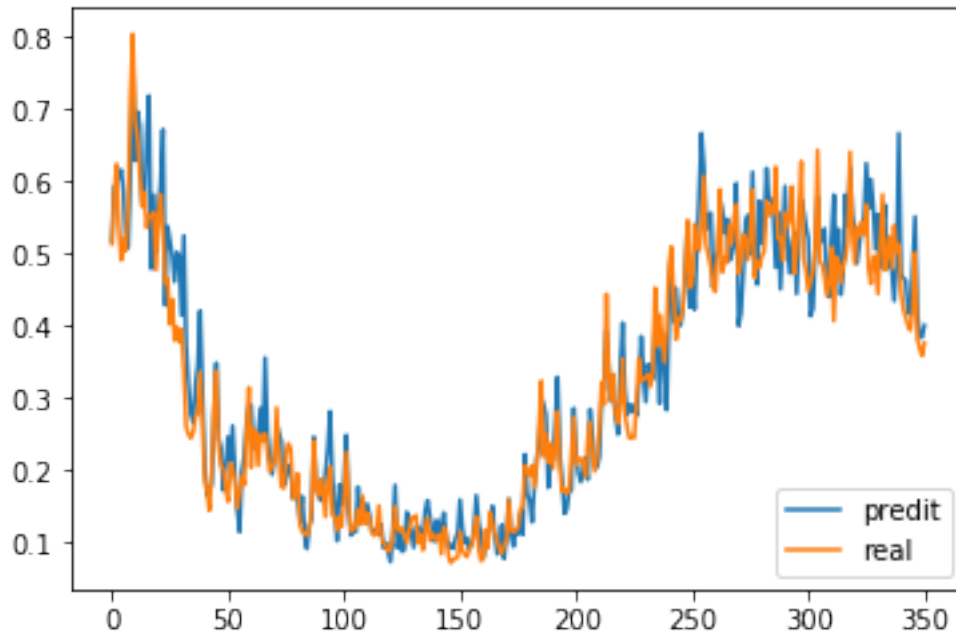
In [23]: `#Creem un dataset amb format (nombre prediccions,17) per tornar les prediccions i els`
`#El necessitem d'questa mida encara que només volguem passar 2 variables ja que al fe`
`#per fer la inversa necessitem 17 variables`
`#Com que només en tenim 2, les ajuntem al dataset inicial i ens quedem amb 15 variabl`
`#Obtenint un dataset amb 15 variables aleatories i les 2 variables que ens interessen`

```python
prova=daily_dia.iloc[n_train:lenght]
prova
#len(predis)
#lenght-n_train
prova['predi']=predis
prova['y']=y_daily[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','t-8','t-9','t-10','t-11
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
  if sys.path[0] == '':
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
  del sys.path[0]
```

```
Out[23]:        predi          y        t-2        t-3        t-4        t-5  \
        479  0.518371  0.514061  12.119938  12.852295  13.106773  12.823073
        480  0.593707  0.580609  11.786082  12.119938  12.852295  13.106773
        481  0.596345  0.624326  11.590859  11.786082  12.119938  12.852295
        482  0.610319  0.539280  12.186487  11.590859  11.786082  12.119938
        483  0.616527  0.491355  12.577783  12.186487  11.590859  11.786082
        484  0.587348  0.522145  11.816573  12.577783  12.186487  11.590859
        485  0.516127  0.504442  11.387627  11.816573  12.577783  12.186487
        486  0.508353  0.567725  11.663214  11.387627  11.816573  12.577783
        487  0.611404  0.719460  11.504756  11.663214  11.387627  11.816573
        488  0.780777  0.804631  12.071173  11.504756  11.663214  11.387627
        489  0.629249  0.684716  13.429271  12.071173  11.504756  11.663214
        490  0.697136  0.662177  14.191591  13.429271  12.071173  11.504756
        491  0.677538  0.615194  13.118295  14.191591  13.429271  12.071173
        492  0.570660  0.565466  12.916559  13.118295  14.191591  13.429271
        493  0.565728  0.585646  12.496044  12.916559  13.118295  14.191591
        494  0.667378  0.536523  12.050954  12.496044  12.916559  13.118295
        495  0.719289  0.552256  12.231576  12.050954  12.496044  12.916559
        496  0.479262  0.552256  11.791904  12.231576  12.050954  12.496044
        497  0.581914  0.557809  11.932721  11.791904  12.231576  12.050954
        498  0.503212  0.477794  11.932721  11.932721  11.791904  12.231576
        499  0.558072  0.551195  11.982423  11.932721  11.932721  11.791904
        500  0.597642  0.582339  11.266252  11.982423  11.932721  11.932721
        501  0.672485  0.529772  11.923226  11.266252  11.982423  11.932721
        502  0.428828  0.458904  12.201972  11.923226  11.266252  11.982423
        503  0.538241  0.465733  11.731479  12.201972  11.923226  11.266252
        504  0.518914  0.402622  11.097177  11.731479  12.201972  11.923226
        505  0.497944  0.436918  11.158295  11.097177  11.731479  12.201972
        506  0.461403  0.380048  10.593420  11.158295  11.097177  11.731479
        507  0.502351  0.398860  10.900388  10.593420  11.158295  11.097177
        508  0.497458  0.377916  10.391372  10.900388  10.593420  11.158295
        ..        ...       ...        ...        ...        ...        ...
        800  0.487136  0.537515  11.753871  12.729659  11.620778  11.409880
        801  0.512193  0.524598  11.344805  11.753871  12.729659  11.620778
        802  0.537751  0.543903  11.800777  11.344805  11.753871  12.729659
        803  0.551815  0.527438  11.685169  11.800777  11.344805  11.753871
        804  0.625477  0.568506  11.857957  11.685169  11.800777  11.344805
        805  0.563004  0.479332  11.710582  11.857957  11.685169  11.800777
        806  0.603664  0.458726  12.078164  11.710582  11.857957  11.685169
        807  0.566252  0.494425  11.280011  12.078164  11.710582  11.857957
        808  0.506047  0.497810  11.095584  11.280011  12.078164  11.710582
```

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```
809   0.554713   0.444954   11.415105   11.095584   11.280011   12.078164
810   0.480424   0.511653   11.445403   11.415105   11.095584   11.280011
811   0.538229   0.582450   10.972318   11.445403   11.415105   11.095584
812   0.568204   0.477562   11.569300   10.972318   11.445403   11.415105
813   0.479746   0.498620   12.202967   11.569300   10.972318   11.445403
814   0.494294   0.523920   11.264175   12.202967   11.569300   10.972318
815   0.478402   0.479971   11.452649   11.264175   12.202967   11.569300
816   0.435089   0.539318   11.679099   11.452649   11.264175   12.202967
817   0.480592   0.502845   11.285737   11.679099   11.452649   11.264175
818   0.667204   0.513089   11.816914   11.285737   11.679099   11.452649
819   0.471562   0.445764   11.490470   11.816914   11.285737   11.679099
820   0.466193   0.423680   11.582159   11.490470   11.816914   11.285737
821   0.463065   0.411694   10.979566   11.582159   11.490470   11.816914
822   0.419163   0.400434   10.781898   10.979566   11.582159   11.490470
823   0.416064   0.394209   10.674624   10.781898   10.979566   11.582159
824   0.487567   0.423048   10.573835   10.674624   10.781898   10.979566
825   0.551669   0.501722   10.518126   10.573835   10.674624   10.781898
826   0.420174   0.382286   10.776242   10.518126   10.573835   10.674624
827   0.385985   0.369280   11.480411   10.776242   10.518126   10.573835
828   0.384116   0.358995   10.411403   11.480411   10.776242   10.518126
829   0.400675   0.376135   10.294997   10.411403   11.480411   10.776242


            t-6         t-7         t-8         t-9   ...   weekday(t-5)  \
479   11.559878   10.930170   10.889469   10.675248   ...            7.0
480   12.823073   11.559878   10.930170   10.889469   ...            1.0
481   13.106773   12.823073   11.559878   10.930170   ...            2.0
482   12.852295   13.106773   12.823073   11.559878   ...            3.0
483   12.119938   12.852295   13.106773   12.823073   ...            4.0
484   11.786082   12.119938   12.852295   13.106773   ...            5.0
485   11.590859   11.786082   12.119938   12.852295   ...            6.0
486   12.186487   11.590859   11.786082   12.119938   ...            7.0
487   12.577783   12.186487   11.590859   11.786082   ...            1.0
488   11.816573   12.577783   12.186487   11.590859   ...            2.0
489   11.387627   11.816573   12.577783   12.186487   ...            3.0
490   11.663214   11.387627   11.816573   12.577783   ...            4.0
491   11.504756   11.663214   11.387627   11.816573   ...            5.0
492   12.071173   11.504756   11.663214   11.387627   ...            6.0
493   13.429271   12.071173   11.504756   11.663214   ...            7.0
494   14.191591   13.429271   12.071173   11.504756   ...            1.0
495   13.118295   14.191591   13.429271   12.071173   ...            2.0
496   12.916559   13.118295   14.191591   13.429271   ...            3.0
497   12.496044   12.916559   13.118295   14.191591   ...            4.0
498   12.050954   12.496044   12.916559   13.118295   ...            5.0
499   12.231576   12.050954   12.496044   12.916559   ...            6.0
500   11.791904   12.231576   12.050954   12.496044   ...            7.0
501   11.932721   11.791904   12.231576   12.050954   ...            7.0
502   11.932721   11.932721   11.791904   12.231576   ...            1.0
503   11.982423   11.932721   11.932721   11.791904   ...            2.0
```

504	11.266252	11.982423	11.932721	11.932721	...	3.0
505	11.923226	11.266252	11.982423	11.932721	...	4.0
506	12.201972	11.923226	11.266252	11.982423	...	5.0
507	11.731479	12.201972	11.923226	11.266252	...	6.0
508	11.097177	11.731479	12.201972	11.923226	...	7.0
..	...	...	...	...	...	...
800	11.300414	11.109560	11.370601	11.430883	...	5.0
801	11.409880	11.300414	11.109560	11.370601	...	6.0
802	11.620778	11.409880	11.300414	11.109560	...	7.0
803	12.729659	11.620778	11.409880	11.300414	...	1.0
804	11.753871	12.729659	11.620778	11.409880	...	2.0
805	11.344805	11.753871	12.729659	11.620778	...	3.0
806	11.800777	11.344805	11.753871	12.729659	...	4.0
807	11.685169	11.800777	11.344805	11.753871	...	5.0
808	11.857957	11.685169	11.800777	11.344805	...	6.0
809	11.710582	11.857957	11.685169	11.800777	...	7.0
810	12.078164	11.710582	11.857957	11.685169	...	1.0
811	11.280011	12.078164	11.710582	11.857957	...	2.0
812	11.095584	11.280011	12.078164	11.710582	...	3.0
813	11.415105	11.095584	11.280011	12.078164	...	4.0
814	11.445403	11.415105	11.095584	11.280011	...	5.0
815	10.972318	11.445403	11.415105	11.095584	...	6.0
816	11.569300	10.972318	11.445403	11.415105	...	7.0
817	12.202967	11.569300	10.972318	11.445403	...	1.0
818	11.264175	12.202967	11.569300	10.972318	...	2.0
819	11.452649	11.264175	12.202967	11.569300	...	3.0
820	11.679099	11.452649	11.264175	12.202967	...	4.0
821	11.285737	11.679099	11.452649	11.264175	...	5.0
822	11.816914	11.285737	11.679099	11.452649	...	6.0
823	11.490470	11.816914	11.285737	11.679099	...	7.0
824	11.582159	11.490470	11.816914	11.285737	...	1.0
825	10.979566	11.582159	11.490470	11.816914	...	2.0
826	10.781898	10.979566	11.582159	11.490470	...	3.0
827	10.674624	10.781898	10.979566	11.582159	...	4.0
828	10.573835	10.674624	10.781898	10.979566	...	5.0
829	10.518126	10.573835	10.674624	10.781898	...	6.0

	weekday(t-6)	weekday(t-7)	weekday(t-8)	weekday(t-9)	weekday(t-10) \
479	6.0	5.0	4.0	3.0	2.0
480	7.0	6.0	5.0	4.0	3.0
481	1.0	7.0	6.0	5.0	4.0
482	2.0	1.0	7.0	6.0	5.0
483	3.0	2.0	1.0	7.0	6.0
484	4.0	3.0	2.0	1.0	7.0
485	5.0	4.0	3.0	2.0	1.0
486	6.0	5.0	4.0	3.0	2.0
487	7.0	6.0	5.0	4.0	3.0
488	1.0	7.0	6.0	5.0	4.0

489	2.0	1.0	7.0	6.0	5.0
490	3.0	2.0	1.0	7.0	6.0
491	4.0	3.0	2.0	1.0	7.0
492	5.0	4.0	3.0	2.0	1.0
493	6.0	5.0	4.0	3.0	2.0
494	7.0	6.0	5.0	4.0	3.0
495	1.0	7.0	6.0	5.0	4.0
496	2.0	1.0	7.0	6.0	5.0
497	3.0	2.0	1.0	7.0	6.0
498	4.0	3.0	2.0	1.0	7.0
499	5.0	4.0	3.0	2.0	1.0
500	6.0	5.0	4.0	3.0	2.0
501	7.0	6.0	5.0	4.0	3.0
502	7.0	7.0	6.0	5.0	4.0
503	1.0	7.0	7.0	6.0	5.0
504	2.0	1.0	7.0	7.0	6.0
505	3.0	2.0	1.0	7.0	7.0
506	4.0	3.0	2.0	1.0	7.0
507	5.0	4.0	3.0	2.0	1.0
508	6.0	5.0	4.0	3.0	2.0
..	...	...	...	...	...
800	4.0	3.0	2.0	1.0	7.0
801	5.0	4.0	3.0	2.0	1.0
802	6.0	5.0	4.0	3.0	2.0
803	7.0	6.0	5.0	4.0	3.0
804	1.0	7.0	6.0	5.0	4.0
805	2.0	1.0	7.0	6.0	5.0
806	3.0	2.0	1.0	7.0	6.0
807	4.0	3.0	2.0	1.0	7.0
808	5.0	4.0	3.0	2.0	1.0
809	6.0	5.0	4.0	3.0	2.0
810	7.0	6.0	5.0	4.0	3.0
811	1.0	7.0	6.0	5.0	4.0
812	2.0	1.0	7.0	6.0	5.0
813	3.0	2.0	1.0	7.0	6.0
814	4.0	3.0	2.0	1.0	7.0
815	5.0	4.0	3.0	2.0	1.0
816	6.0	5.0	4.0	3.0	2.0
817	7.0	6.0	5.0	4.0	3.0
818	1.0	7.0	6.0	5.0	4.0
819	2.0	1.0	7.0	6.0	5.0
820	3.0	2.0	1.0	7.0	6.0
821	4.0	3.0	2.0	1.0	7.0
822	5.0	4.0	3.0	2.0	1.0
823	6.0	5.0	4.0	3.0	2.0
824	7.0	6.0	5.0	4.0	3.0
825	1.0	7.0	6.0	5.0	4.0
826	2.0	1.0	7.0	6.0	5.0

827	3.0	2.0	1.0	7.0	6.0
828	4.0	3.0	2.0	1.0	7.0
829	5.0	4.0	3.0	2.0	1.0

	weekday(t-11)	weekday(t-12)	weekday(t-13)	weekday(t-14)
479	1.0	7.0	6.0	5.0
480	2.0	1.0	7.0	6.0
481	3.0	2.0	1.0	7.0
482	4.0	3.0	2.0	1.0
483	5.0	4.0	3.0	2.0
484	6.0	5.0	4.0	3.0
485	7.0	6.0	5.0	4.0
486	1.0	7.0	6.0	5.0
487	2.0	1.0	7.0	6.0
488	3.0	2.0	1.0	7.0
489	4.0	3.0	2.0	1.0
490	5.0	4.0	3.0	2.0
491	6.0	5.0	4.0	3.0
492	7.0	6.0	5.0	4.0
493	1.0	7.0	6.0	5.0
494	2.0	1.0	7.0	6.0
495	3.0	2.0	1.0	7.0
496	4.0	3.0	2.0	1.0
497	5.0	4.0	3.0	2.0
498	6.0	5.0	4.0	3.0
499	7.0	6.0	5.0	4.0
500	1.0	7.0	6.0	5.0
501	2.0	1.0	7.0	6.0
502	3.0	2.0	1.0	7.0
503	4.0	3.0	2.0	1.0
504	5.0	4.0	3.0	2.0
505	6.0	5.0	4.0	3.0
506	7.0	6.0	5.0	4.0
507	7.0	7.0	6.0	5.0
508	1.0	7.0	7.0	6.0
..	...	...	...	...
800	6.0	5.0	4.0	3.0
801	7.0	6.0	5.0	4.0
802	1.0	7.0	6.0	5.0
803	2.0	1.0	7.0	6.0
804	3.0	2.0	1.0	7.0
805	4.0	3.0	2.0	1.0
806	5.0	4.0	3.0	2.0
807	6.0	5.0	4.0	3.0
808	7.0	6.0	5.0	4.0
809	1.0	7.0	6.0	5.0
810	2.0	1.0	7.0	6.0
811	3.0	2.0	1.0	7.0

```
812          4.0          3.0          2.0          1.0
813          5.0          4.0          3.0          2.0
814          6.0          5.0          4.0          3.0
815          7.0          6.0          5.0          4.0
816          1.0          7.0          6.0          5.0
817          2.0          1.0          7.0          6.0
818          3.0          2.0          1.0          7.0
819          4.0          3.0          2.0          1.0
820          5.0          4.0          3.0          2.0
821          6.0          5.0          4.0          3.0
822          7.0          6.0          5.0          4.0
823          1.0          7.0          6.0          5.0
824          2.0          1.0          7.0          6.0
825          3.0          2.0          1.0          7.0
826          4.0          3.0          2.0          1.0
827          5.0          4.0          3.0          2.0
828          6.0          5.0          4.0          3.0
829          7.0          6.0          5.0          4.0

[351 rows x 85 columns]
```

In [24]: # Convert predictions back to normal values

```python
predi = scaler.inverse_transform(prova)
print(predi)
print(predi[0][0])
print(predi[0][1])

#Les variables en posició 0 i 1 són predicció i y respectivament
```

```
[[ 11.6294302    11.59085917 115.46893021 ...  38.40314883  32.50332814
   26.60350746]
 [ 12.30372756  12.18648691 112.48075791 ...   3.00422472  38.40314883
   32.50332814]
 [ 12.32733395  12.57778255 110.7334244  ...   8.9040454    3.00422472
   38.40314883]
 ...
 [ 10.44451385  10.2949966  109.74485905 ...  20.70368677  14.80386609
    8.9040454 ]
 [ 10.42778255  10.20294532 100.17673598 ...  26.60350746  20.70368677
   14.80386609]
 [ 10.57599506  10.3563499   99.13484299 ...  32.50332814  26.60350746
   20.70368677]]
11.62943020206557
11.590859170709699
```

In [25]: #Fem una llista amb les prediccions i una llista amb y(valor real)

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

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

Out[25]: [11.590859170709699,
 12.186486909458,
 12.5777825527296,
 11.816572589134799,
 11.3876267050719,
 11.6632140210701,
 11.5047561338867,
 12.071172692490801,
 13.4292708131623,
 14.1915913964734,
 13.1182948122023,
 12.916559451200099,
 12.4960441531868,
 12.050954318124699,
 12.231575736212301,
 11.7919036962847,
 11.9327208888355,
 11.9327208888355,
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 11.923225859637402,
 12.2019722473821,
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9.99667631842984,
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8.28206681505197,
8.77842514832838,
9.525847240364241,
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8.79350297401487,
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8.3922208376186,
8.86870556311186,
8.80253695803389,
8.645489666170171,
8.30699609093616,
8.50373096231614,
8.7022052143203,
8.60023035333333,
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9.290409387781711,
9.256266530545721,
8.838438955880711,
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9.05063902911298,
8.43245865167071,
8.47592064981329,
8.73745320429666,
8.11301942072829,
8.01897889462084,
8.0122647113768,
7.96687892296338,
8.05955094284913,

8.26964678339566,
9.14705667833895,
8.57619299859603,
8.458819577203819,
8.666901835294121,
8.54384331740921,
8.20428627614679,
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8.82588218790036,
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8.20618845934807,
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9.008410871902528,
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8.29101761577961,
8.10806280560555,
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8.115509840618559,
8.248033919715139,
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8.17883886064832,
8.22195739049774,
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7.9739420857573995,

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        10.411403084521401,
        10.294996596876901,
        10.202945322371301,
        10.3563498993587]
```

In [26]: ##Mostrem
```python
plt.plot(listpredi, label="predit")
plt.plot(listy, label="real")
plt.legend(loc="lower right")
plt.show()
```
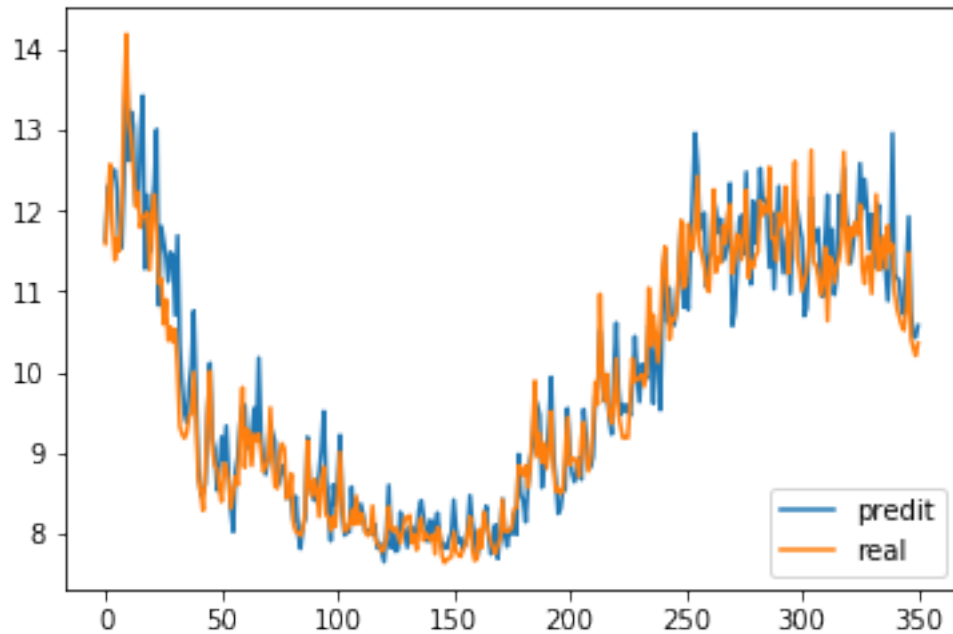
```
In [27]: print(listy[300])
         print(listpredi[300])

         print(listy[300]-listpredi[300])
         (listy[300]-listpredi[300])/listy[300]
```

11.0061509800784
11.654890464106384
-0.648739484027983
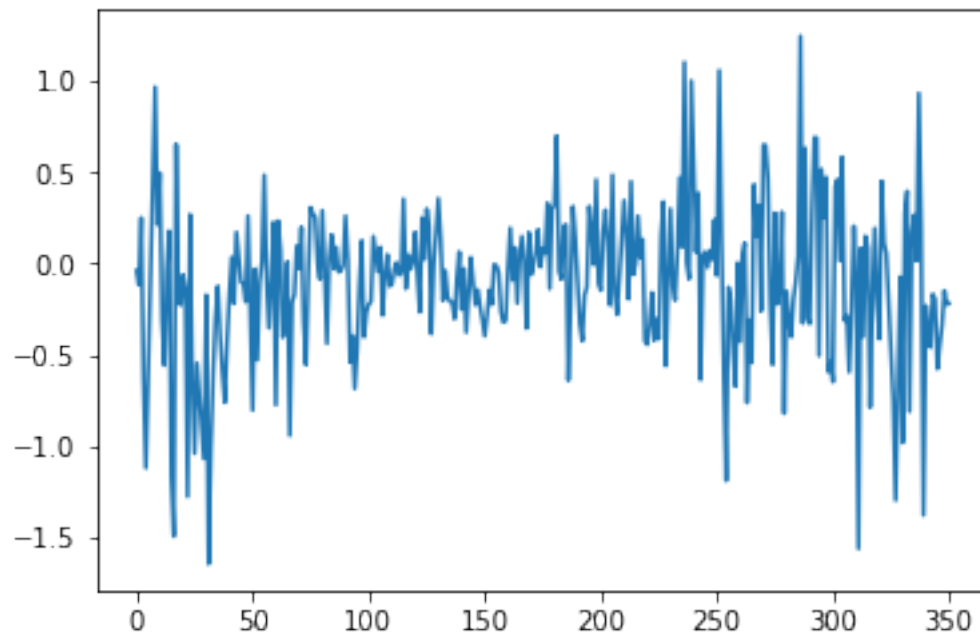

Out[27]: -0.058943356783150526

```
In [29]: llista_errors=list()
         llista_errorsabs=list()
         llista_errorsres=list()


         for i in range(len(listpredi)):
             valor=listy[i]-listpredi[i]
             valorabs=math.fabs(valor)
             valorrespecte=valorabs/listy[i]
             llista_errors.append(valor)
             llista_errorsabs.append(valorabs)
             llista_errorsres.append(valorrespecte)
```
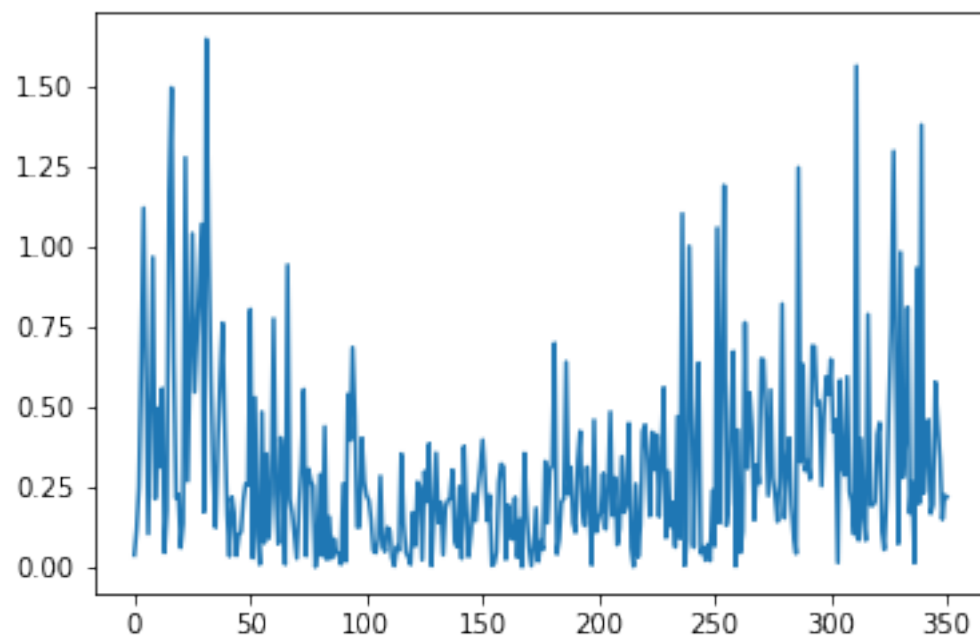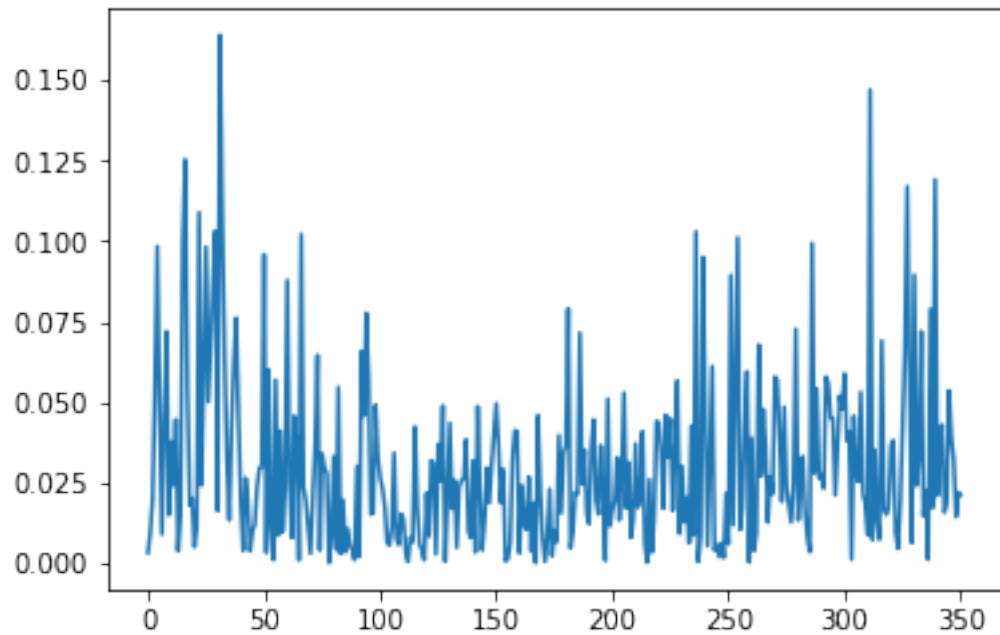
```
In [30]: plt.plot(llista_errors)
```

In [31]: plt.plot(llista_errorsabs)

```
In [32]: plt.plot(llista_errorsres)
```

Out[32]: [<matplotlib.lines.Line2D at 0x280ff05b7f0>]


```
In [33]: sum(llista_errorsres)/(len(llista_errorsres))
```

Out[33]: 0.030484931873431948

```
In [ ]:
```