M29
_Xarxa_walkforard_normalitzat_multivariate2tempmin_presioweekda
walkforward
augment

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/l
        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.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  pressure  weekday
0                     2.18      0.93   1027.12        3
1                     7.01      0.89   1027.22        4
2                     4.84      0.79   1024.47        5
3                     4.69      0.81   1025.80        6
4                     2.94      0.72   1021.11        7
```

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

Out[18]: [<matplotlib.lines.Line2D at 0x1d48d92d710>]
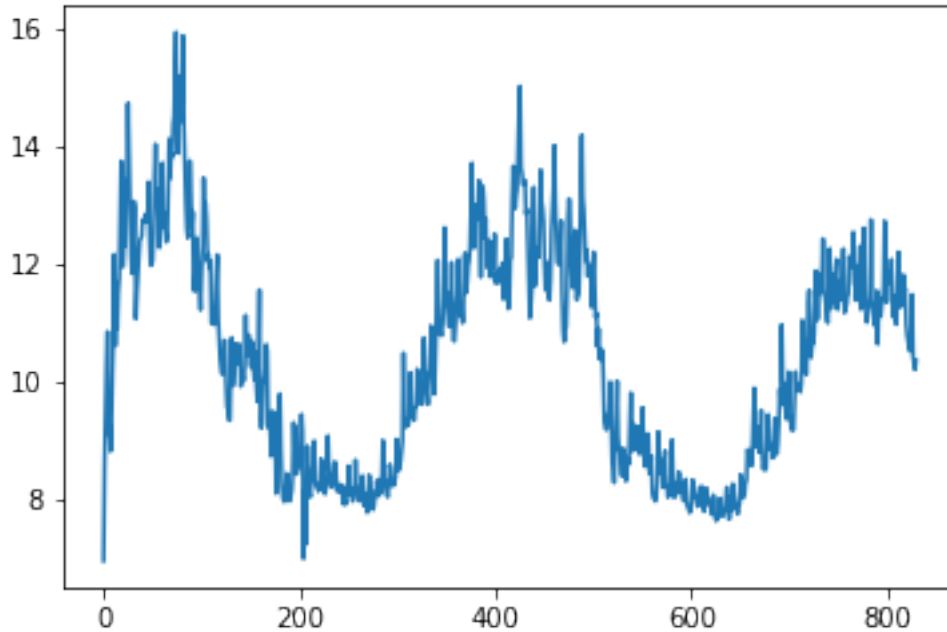
```
In [4]: daily_dia['t-1']=daily_dia['energy_sum'].shift(1)
        daily_dia['t-2']=daily_dia['energy_sum'].shift(2)
        daily_dia['t-3']=daily_dia['energy_sum'].shift(3)
        daily_dia['t-4']=daily_dia['energy_sum'].shift(4)
        daily_dia['t-5']=daily_dia['energy_sum'].shift(5)
        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)
        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)
```

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

```
Out[4]:      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	pressure	weekday	t-1 \
0	2.18	0.93	1027.12	3	NaN
1	7.01	0.89	1027.22	4	6.952692
2	4.84	0.79	1024.47	5	8.536480
3	4.69	0.81	1025.80	6	9.499781
4	2.94	0.72	1021.11	7	10.267707
5	1.31	0.86	1022.80	1	10.850805
6	3.39	0.82	1009.70	2	9.103382
7	3.34	0.78	1019.43	3	9.274873
8	5.29	0.82	1007.12	4	8.813513
9	0.46	0.87	1012.12	5	9.227707
10	4.71	0.79	1003.55	6	10.145910
11	1.03	0.82	1001.15	7	10.780273

12	−1.69	0.77	1006.01	1	12.163127
13	−1.61	0.83	1007.32	2	10.609714
14	0.94	0.68	1008.76	3	11.673417
15	0.63	0.81	1010.84	4	10.889362
16	−1.42	0.71	1010.60	5	11.525150
17	−3.42	0.81	1015.58	6	11.759837
18	0.11	0.88	1007.71	7	12.633801
19	−0.64	0.84	1002.47	1	13.749174
20	0.22	0.75	990.27	2	11.951958
21	0.78	0.79	994.48	3	11.957446
22	1.07	0.77	996.75	4	12.392776
23	−2.65	0.88	988.10	5	12.307079
24	−3.56	0.86	1008.46	6	13.376080
25	−4.12	0.84	1016.37	7	13.511968
26	−3.67	0.94	1014.39	1	14.732271
27	1.68	0.81	1015.09	2	13.774471
28	3.84	0.94	1017.91	3	12.709106
29	5.37	0.87	1024.71	4	12.148570
..	...	...	...	...	...
800	0.18	0.90	993.99	3	11.344805
801	0.61	0.91	1001.76	4	11.800777
802	0.29	0.91	998.51	5	11.685169
803	1.10	0.76	990.08	6	11.857957
804	3.21	0.72	1005.39	7	11.710582
805	1.96	0.79	1003.89	1	12.078164
806	1.12	0.75	996.87	2	11.280011
807	1.03	0.77	982.20	3	11.095584
808	1.96	0.82	989.90	4	11.415105
809	−0.86	0.79	988.77	5	11.445403
810	2.19	0.77	979.25	6	10.972318
811	1.38	0.66	984.71	7	11.569300
812	0.89	0.84	992.84	1	12.202967
813	−0.57	0.76	996.66	2	11.264175
814	−1.20	0.75	994.27	3	11.452649
815	0.05	0.68	992.43	4	11.679099
816	0.45	0.81	990.31	5	11.285737
817	1.77	0.69	988.63	6	11.816914
818	−1.03	0.76	1006.70	7	11.490470
819	2.84	0.83	1007.80	1	11.582159
820	3.83	0.87	1008.67	2	10.979566
821	2.65	0.87	1011.57	3	10.781898
822	3.95	0.84	1001.54	4	10.674624
823	0.19	0.72	1003.42	5	10.573835
824	1.59	0.71	1009.09	6	10.518126
825	5.53	0.76	1010.37	7	10.776242
826	5.52	0.74	1005.19	1	11.480411
827	3.89	0.78	1000.65	2	10.411403
828	1.67	0.73	1012.73	3	10.294997

```
829                1.41    0.74   1007.02     4   10.202945

          t-2  ...  weekday(t-5)  weekday(t-6)  weekday(t-7)  weekday(t-8)  \
0         NaN  ...           NaN           NaN           NaN           NaN
1         NaN  ...           NaN           NaN           NaN           NaN
2    6.952692  ...           NaN           NaN           NaN           NaN
3    8.536480  ...           NaN           NaN           NaN           NaN
4    9.499781  ...           NaN           NaN           NaN           NaN
5   10.267707  ...           3.0           NaN           NaN           NaN
6   10.850805  ...           4.0           3.0           NaN           NaN
7    9.103382  ...           5.0           4.0           3.0           NaN
8    9.274873  ...           6.0           5.0           4.0           3.0
9    8.813513  ...           7.0           6.0           5.0           4.0
10   9.227707  ...           1.0           7.0           6.0           5.0
11  10.145910  ...           2.0           1.0           7.0           6.0
12  10.780273  ...           3.0           2.0           1.0           7.0
13  12.163127  ...           4.0           3.0           2.0           1.0
14  10.609714  ...           5.0           4.0           3.0           2.0
15  11.673417  ...           6.0           5.0           4.0           3.0
16  10.889362  ...           7.0           6.0           5.0           4.0
17  11.525150  ...           1.0           7.0           6.0           5.0
18  11.759837  ...           2.0           1.0           7.0           6.0
19  12.633801  ...           3.0           2.0           1.0           7.0
20  13.749174  ...           4.0           3.0           2.0           1.0
21  11.951958  ...           5.0           4.0           3.0           2.0
22  11.957446  ...           6.0           5.0           4.0           3.0
23  12.392776  ...           7.0           6.0           5.0           4.0
24  12.307079  ...           1.0           7.0           6.0           5.0
25  13.376080  ...           2.0           1.0           7.0           6.0
26  13.511968  ...           3.0           2.0           1.0           7.0
27  14.732271  ...           4.0           3.0           2.0           1.0
28  13.774471  ...           5.0           4.0           3.0           2.0
29  12.709106  ...           6.0           5.0           4.0           3.0
..        ...  ...           ...           ...           ...           ...
800 11.753871  ...           5.0           4.0           3.0           2.0
801 11.344805  ...           6.0           5.0           4.0           3.0
802 11.800777  ...           7.0           6.0           5.0           4.0
803 11.685169  ...           1.0           7.0           6.0           5.0
804 11.857957  ...           2.0           1.0           7.0           6.0
805 11.710582  ...           3.0           2.0           1.0           7.0
806 12.078164  ...           4.0           3.0           2.0           1.0
807 11.280011  ...           5.0           4.0           3.0           2.0
808 11.095584  ...           6.0           5.0           4.0           3.0
809 11.415105  ...           7.0           6.0           5.0           4.0
810 11.445403  ...           1.0           7.0           6.0           5.0
811 10.972318  ...           2.0           1.0           7.0           6.0
812 11.569300  ...           3.0           2.0           1.0           7.0
813 12.202967  ...           4.0           3.0           2.0           1.0
```

			5.0	4.0	3.0	2.0
814	11.264175	...	5.0	4.0	3.0	2.0
815	11.452649	...	6.0	5.0	4.0	3.0
816	11.679099	...	7.0	6.0	5.0	4.0
817	11.285737	...	1.0	7.0	6.0	5.0
818	11.816914	...	2.0	1.0	7.0	6.0
819	11.490470	...	3.0	2.0	1.0	7.0
820	11.582159	...	4.0	3.0	2.0	1.0
821	10.979566	...	5.0	4.0	3.0	2.0
822	10.781898	...	6.0	5.0	4.0	3.0
823	10.674624	...	7.0	6.0	5.0	4.0
824	10.573835	...	1.0	7.0	6.0	5.0
825	10.518126	...	2.0	1.0	7.0	6.0
826	10.776242	...	3.0	2.0	1.0	7.0
827	11.480411	...	4.0	3.0	2.0	1.0
828	10.411403	...	5.0	4.0	3.0	2.0
829	10.294997	...	6.0	5.0	4.0	3.0

	weekday(t-9)	weekday(t-10)	weekday(t-11)	weekday(t-12)	weekday(t-13)	\
0	NaN	NaN	NaN	NaN	NaN
1	NaN	NaN	NaN	NaN	NaN
2	NaN	NaN	NaN	NaN	NaN
3	NaN	NaN	NaN	NaN	NaN
4	NaN	NaN	NaN	NaN	NaN
5	NaN	NaN	NaN	NaN	NaN
6	NaN	NaN	NaN	NaN	NaN
7	NaN	NaN	NaN	NaN	NaN
8	NaN	NaN	NaN	NaN	NaN
9	3.0	NaN	NaN	NaN	NaN
10	4.0	3.0	NaN	NaN	NaN
11	5.0	4.0	3.0	NaN	NaN
12	6.0	5.0	4.0	3.0	NaN
13	7.0	6.0	5.0	4.0	3.0
14	1.0	7.0	6.0	5.0	4.0
15	2.0	1.0	7.0	6.0	5.0
16	3.0	2.0	1.0	7.0	6.0
17	4.0	3.0	2.0	1.0	7.0
18	5.0	4.0	3.0	2.0	1.0
19	6.0	5.0	4.0	3.0	2.0
20	7.0	6.0	5.0	4.0	3.0
21	1.0	7.0	6.0	5.0	4.0
22	2.0	1.0	7.0	6.0	5.0
23	3.0	2.0	1.0	7.0	6.0
24	4.0	3.0	2.0	1.0	7.0
25	5.0	4.0	3.0	2.0	1.0
26	6.0	5.0	4.0	3.0	2.0
27	7.0	6.0	5.0	4.0	3.0
28	1.0	7.0	6.0	5.0	4.0
29	2.0	1.0	7.0	6.0	5.0

..	...	...	...	...	...
800	1.0	7.0	6.0	5.0	4.0
801	2.0	1.0	7.0	6.0	5.0
802	3.0	2.0	1.0	7.0	6.0
803	4.0	3.0	2.0	1.0	7.0
804	5.0	4.0	3.0	2.0	1.0
805	6.0	5.0	4.0	3.0	2.0
806	7.0	6.0	5.0	4.0	3.0
807	1.0	7.0	6.0	5.0	4.0
808	2.0	1.0	7.0	6.0	5.0
809	3.0	2.0	1.0	7.0	6.0
810	4.0	3.0	2.0	1.0	7.0
811	5.0	4.0	3.0	2.0	1.0
812	6.0	5.0	4.0	3.0	2.0
813	7.0	6.0	5.0	4.0	3.0
814	1.0	7.0	6.0	5.0	4.0
815	2.0	1.0	7.0	6.0	5.0
816	3.0	2.0	1.0	7.0	6.0
817	4.0	3.0	2.0	1.0	7.0
818	5.0	4.0	3.0	2.0	1.0
819	6.0	5.0	4.0	3.0	2.0
820	7.0	6.0	5.0	4.0	3.0
821	1.0	7.0	6.0	5.0	4.0
822	2.0	1.0	7.0	6.0	5.0
823	3.0	2.0	1.0	7.0	6.0
824	4.0	3.0	2.0	1.0	7.0
825	5.0	4.0	3.0	2.0	1.0
826	6.0	5.0	4.0	3.0	2.0
827	7.0	6.0	5.0	4.0	3.0
828	1.0	7.0	6.0	5.0	4.0
829	2.0	1.0	7.0	6.0	5.0

	weekday(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	3.0

```
15              4.0
16              5.0
17              6.0
18              7.0
19              1.0
20              2.0
21              3.0
22              4.0
23              5.0
24              6.0
25              7.0
26              1.0
27              2.0
28              3.0
29              4.0
..              ...
800             3.0
801             4.0
802             5.0
803             6.0
804             7.0
805             1.0
806             2.0
807             3.0
808             4.0
809             5.0
810             6.0
811             7.0
812             1.0
813             2.0
814             3.0
815             4.0
816             5.0
817             6.0
818             7.0
819             1.0
820             2.0
821             3.0
822             4.0
823             5.0
824             6.0
825             7.0
826             1.0
827             2.0
828             3.0
829             4.0

[830 rows x 92 columns]
```

```
In [6]: #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','apparentTemperatureM
        daily_dia.head(5)

Out[6]:    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  ...  weekday(t-5)  weekday(t-6)  weekday(t-7)  weekday(t-8)  \
        0   NaN  ...           NaN           NaN           NaN           NaN
        1   NaN  ...           NaN           NaN           NaN           NaN
        2   NaN  ...           NaN           NaN           NaN           NaN
        3   NaN  ...           NaN           NaN           NaN           NaN
        4   NaN  ...           NaN           NaN           NaN           NaN

            weekday(t-9)  weekday(t-10)  weekday(t-11)  weekday(t-12)  weekday(t-13)  \
        0            NaN            NaN            NaN            NaN            NaN
        1            NaN            NaN            NaN            NaN            NaN
        2            NaN            NaN            NaN            NaN            NaN
        3            NaN            NaN            NaN            NaN            NaN
        4            NaN            NaN            NaN            NaN            NaN

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

        [5 rows x 85 columns]

In [7]: #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[7]:    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  ...  weekday(t-5)  \
```

```
14    9.227707    8.813513    9.274873    9.103382    ...              5.0
15   10.145910    9.227707    8.813513    9.274873    ...              6.0
16   10.780273   10.145910    9.227707    8.813513    ...              7.0
17   12.163127   10.780273   10.145910    9.227707    ...              1.0
18   10.609714   12.163127   10.780273   10.145910    ...              2.0

     weekday(t-6)  weekday(t-7)  weekday(t-8)  weekday(t-9)  weekday(t-10)  \
14            4.0           3.0           2.0           1.0            7.0
15            5.0           4.0           3.0           2.0            1.0
16            6.0           5.0           4.0           3.0            2.0
17            7.0           6.0           5.0           4.0            3.0
18            1.0           7.0           6.0           5.0            4.0

     weekday(t-11)  weekday(t-12)  weekday(t-13)  weekday(t-14)
14             6.0            5.0            4.0            3.0
15             7.0            6.0            5.0            4.0
16             1.0            7.0            6.0            5.0
17             2.0            1.0            7.0            6.0
18             3.0            2.0            1.0            7.0

[5 rows x 85 columns]
```

In [7]: `len(daily_dia)`

Out[7]: 816

In [8]:
```python
#normalitzem
scaler=preprocessing.MinMaxScaler(feature_range=(0, 1))
daily_dia_norm=scaler.fit_transform(daily_dia)
```

In [10]:
```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 [11]:
```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 [12]: import math
         from sklearn.metrics import mean_squared_error

         #Walk forward per test i train
         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 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
```

```
Instructions for updating:
Use tf.cast instead.
```

In [13]: *#Dividim la suma de scores de test entre el nombre de prediccions per obtenir la mitj*
sumScores/(lenght-n_train)

Out[13]: 0.032832669361170505

In [14]: llista_scores

Out[14]: [0.03493338897060827,
 0.06651074908580568,
 0.06082198046970522,
 0.019685514825919403,
 0.0396970914110506,
 0.0959576127060704,
 0.09555134982070812,
 0.0563717732558322,
 0.10782915764341627,
 0.10480125189463729,
 0.11401325223088321,
 0.017065523953900152,
 0.04543877107349337,
 0.04528164416545333,
 0.0031742439253525934,
 0.08959606190606917,
 0.0778764266615597,
 0.10025762728398169,
 0.07979851395736759,
 0.03245390006007276,
 0.0047803874788712175,
 0.11763147727214363,
 0.06914633016434402,
 0.03710381712548516,
 0.07815597939017294,
 0.04921993388421653,
 0.017197064277108876,
 0.12194155934597584,
 0.07343880832122629,
 0.0513212275374626,
 0.04729445613129046,
 0.13660288990883096,
 0.12365572753331278,
 0.12462748757212916,
 0.03449831307223272,
 0.004455552181129585,
 0.04569985995752068,
 0.005821549819166716,

```
0.04075344056115404,
0.02867931940267532,
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0.058576572195559895,
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0.0445119951983044,
0.031513505641254325,
0.01145588949085008,
0.03278695617711391,
0.0013347167313506603,
0.04891606291543282,
0.0002159641664866152,
0.001898343070904529,
0.04173605795095592,
0.0071600965842950615,
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0.011852364307986196,
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0.04799406256648586,
0.0486081145330437,
0.002457756394897981,
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0.009139107876024122,
0.01594653584734007,
0.03025773952851074,
0.001961450577351198,
0.06405949152188761,
0.04656592936840842,
0.06128815989132985,
0.08948388618260572,
0.020472879967448288,
0.02438705259295837,
0.04286279062262599,
0.041204344564145234,
0.01997039875154072,
0.022100862499931817,
0.05182526265405041,
0.03854605980215875,
0.0030393747054601183,
0.003892021355616837,
0.0030806097318213377,
0.026396860744248518,
```

0.038100505554797715,
0.003157007469879458,
0.02341716627898316,
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0.03195052790631259,
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0.031836831569230784,
0.0008653735135518703,
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0.005804209594940657,
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0.0238766839749901,
0.005149458027706499,
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0.010485847485750655,
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0.030181739865230317,
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0.0014927695876969516,
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9.681075423340069e-05,
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0.00643792784140973,
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0.002062497347550485,
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0.0755615402367209,
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0.0013688090932448826,
0.01615843469901712,
0.01561485037087107,
0.06637959692959972,
0.005981503179393055,
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0.05468202581568926,
0.025987915719789312,
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```
    0.025020306137039316,
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    0.02392198264333878,
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    0.037266017057747014,
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    0.07759323083733616,
    0.11971844520677632,
    0.032439931425201296,
    0.06625643232380818,
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    0.046759470911579726,
    0.060535509340964966,
    0.03311464525626984,
    0.05289444302549051,
    0.00895394738706079,
    0.05839012532580212,
    0.018959758539198734]
```

In [15]: plt.plot(llista_scores)

Out[15]: [<matplotlib.lines.Line2D at 0x29e7cbf2160>]
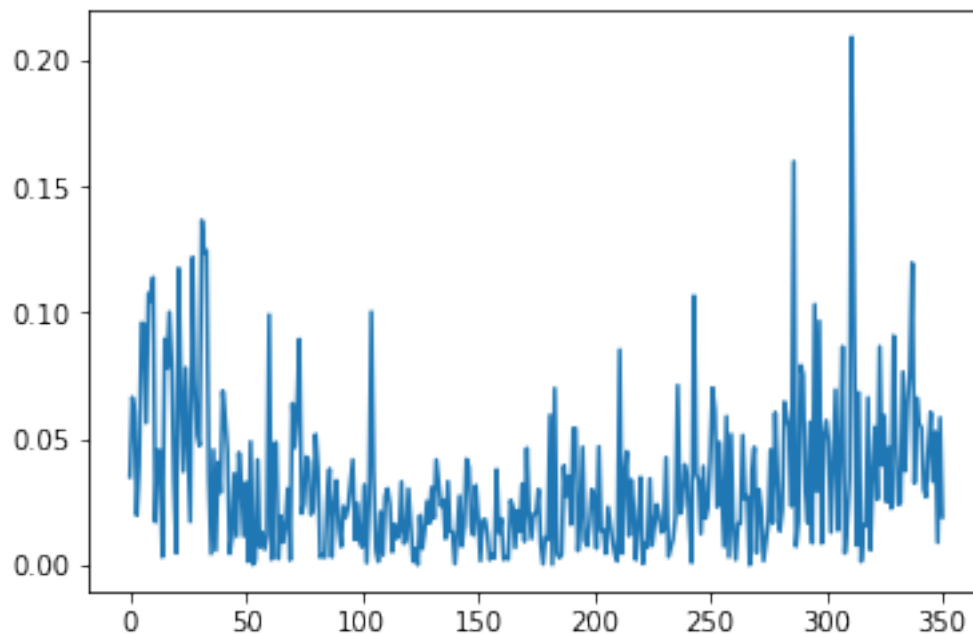
```
In [16]: predis=list()

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

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

         predis

Out[16]: array([0.47912809, 0.51409781, 0.56350446, 0.51959401, 0.53105223,
                0.42618778, 0.40889019, 0.51135319, 0.61163062, 0.69982952,
                0.57070243, 0.67924213, 0.66063291, 0.61074769, 0.58247191,
                0.62611943, 0.63013273, 0.45199868, 0.4780108 , 0.5102483 ,
                0.55597585, 0.4647072 , 0.46062607, 0.49600819, 0.38757688,
                0.45184162, 0.41972086, 0.50198919, 0.47229871, 0.42923725,
                0.44301113, 0.47786871, 0.38396692, 0.37490594, 0.27912289,
                0.2481012 , 0.32046145, 0.28468212, 0.37670332, 0.24189378,
                0.25616959, 0.11083713, 0.1897779 , 0.19528764, 0.27212107,
                0.30120724, 0.24306102, 0.25171623, 0.17001069, 0.16368796,
                0.18947752, 0.21126099, 0.25144958, 0.1847713 , 0.14906709,
                0.12741308, 0.19848396, 0.19296864, 0.26164028, 0.30305639,
                0.30299801, 0.25921473, 0.20523283, 0.25515282, 0.24741141,
                0.26091179, 0.25984764, 0.21077855, 0.16801479, 0.20302939,
                0.27779323, 0.24032483, 0.27657238, 0.26770356, 0.19553539,
                0.19970267, 0.19428411, 0.18904862, 0.14121577, 0.18814287,
                0.24708724, 0.16404258, 0.11195038, 0.11813162, 0.10608822,
                0.14591956, 0.10489535, 0.23786831, 0.15382786, 0.19762962,
                0.17268094, 0.16639313, 0.15893099, 0.20463361, 0.22810547,
                0.16990487, 0.17764717, 0.12646884, 0.11077589, 0.13169533,
                0.15190271, 0.25737181, 0.15891315, 0.09132395, 0.01653426,
                0.16035086, 0.13957933, 0.1263196 , 0.14343247, 0.12188079,
                0.11329468, 0.16492821, 0.1383462 , 0.10439932, 0.12882431,
                0.14036262, 0.12217734, 0.06479393, 0.10435022, 0.09683509,
                0.12248626, 0.09003247, 0.15122929, 0.12680817, 0.11539005,
                0.10133778, 0.11932097, 0.08517089, 0.08911458, 0.15102714,
                0.10209725, 0.11914217, 0.05775131, 0.0773302 , 0.06615269,
                0.0952825 , 0.12388484, 0.13566428, 0.12614647, 0.12140971,
                0.10363151, 0.09831253, 0.11137851, 0.12844105, 0.12849411,
                0.12286773, 0.11071586, 0.09079286, 0.09050411, 0.11132187,
                0.13384402, 0.09021603, 0.10114191, 0.09867968, 0.07824236,
                0.09467901, 0.1091923 , 0.13278651, 0.12942833, 0.08763012,
                0.05879195, 0.1155715 , 0.09570316, 0.13998611, 0.1516787 ,
                0.09000986, 0.10737136, 0.11333527, 0.09793878, 0.12884134,
                0.11377598, 0.11341641, 0.0953799 , 0.10483059, 0.09588036,
```

```
        0.10028866, 0.11653127, 0.13955835, 0.20638365, 0.18996173,
        0.18314299, 0.1471779 , 0.17625226, 0.13545755, 0.26185781,
        0.3268615 , 0.22330138, 0.21232742, 0.18361077, 0.20262185,
        0.18629277, 0.17549768, 0.22780553, 0.19865882, 0.1522685 ,
        0.12846552, 0.17790708, 0.17930532, 0.24064295, 0.30383909,
        0.23429734, 0.22215439, 0.16978312, 0.22477791, 0.17756595,
        0.24619576, 0.2896871 , 0.23486495, 0.207701  , 0.21390519,
        0.25912029, 0.23687047, 0.28665721, 0.40919593, 0.38475549,
        0.30792186, 0.29949653, 0.29971364, 0.26280224, 0.31067216,
        0.3896628 , 0.27687559, 0.26835364, 0.25146002, 0.28136134,
        0.25268197, 0.30883628, 0.33100852, 0.34244895, 0.31384659,
        0.31457895, 0.29039419, 0.31969836, 0.34055811, 0.44259787,
        0.39124405, 0.34444749, 0.36946672, 0.32611379, 0.35585928,
        0.44682002, 0.49300283, 0.44985259, 0.48827374, 0.37499636,
        0.44203642, 0.41196397, 0.44194448, 0.52804387, 0.47575527,
        0.41672474, 0.47101855, 0.45751879, 0.52809024, 0.5828594 ,
        0.57922333, 0.51880735, 0.43866295, 0.48474294, 0.50586659,
        0.46202457, 0.50515574, 0.5726999 , 0.4582808 , 0.4428826 ,
        0.51389498, 0.51194668, 0.51564705, 0.58904612, 0.61542934,
        0.46826777, 0.46051931, 0.50501603, 0.51808912, 0.50103551,
        0.5137952 , 0.54281539, 0.45044333, 0.42898694, 0.51593375,
        0.51114833, 0.52427346, 0.50897723, 0.61203539, 0.51049292,
        0.58101225, 0.46047375, 0.52870291, 0.50483507, 0.56956297,
        0.6323843 , 0.50990689, 0.53346092, 0.53690112, 0.48170671,
        0.39939675, 0.5301311 , 0.53133368, 0.50231498, 0.42750207,
        0.50601047, 0.41277125, 0.46270466, 0.54863852, 0.57434756,
        0.50248611, 0.43744236, 0.55530918, 0.44717509, 0.44718984,
        0.54361963, 0.61662227, 0.3966848 , 0.49734437, 0.52869487,
        0.48298001, 0.50999987, 0.53301907, 0.57491535, 0.53825563,
        0.52096969, 0.48283267, 0.49861041, 0.45733616, 0.56693906,
        0.50925094, 0.50435203, 0.5052436 , 0.516846  , 0.40691614,
        0.49502808, 0.48773083, 0.55793631, 0.55412143, 0.53588587,
        0.58810496, 0.55756462, 0.41959926, 0.53528529, 0.57934588,
        0.50164014, 0.36928126, 0.44165751, 0.42743528, 0.44096887,
        0.48358312, 0.53483617, 0.43518007, 0.36032605, 0.41738561,
        0.39509451])
```

```python
In [17]: ##Mostrem
         plt.plot(predis, label="predit")
         plt.plot(y_daily[n_train:lenght], label="real")
         plt.legend(loc="lower right")
         plt.show()
```
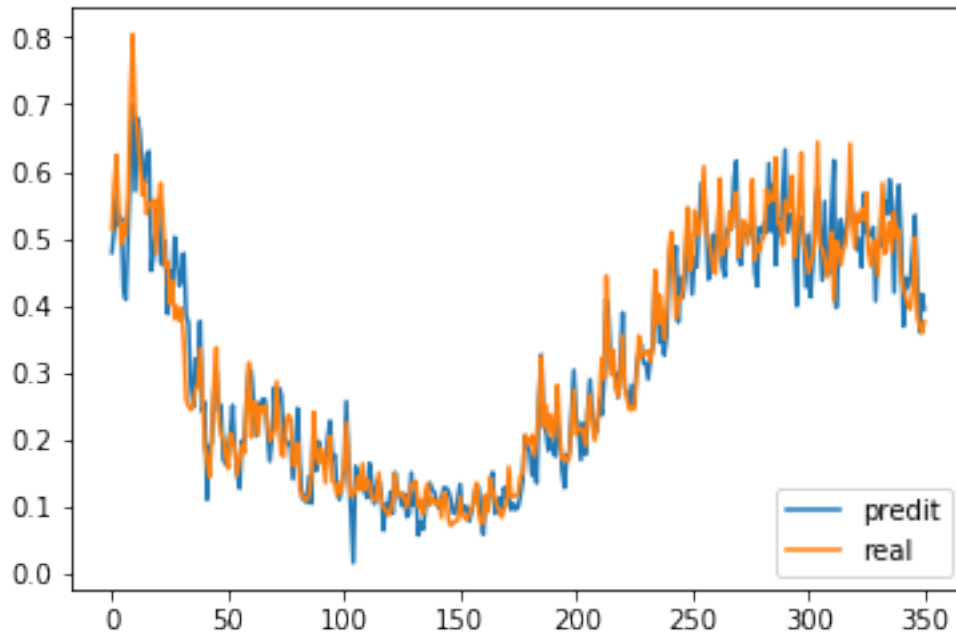
In [19]: #Creem un dataset amb format (nombre prediccions,17) per tornar les prediccions i els
#El necessitem d'questa mida encara que només volguem passar 2 variables ja que al fe
#per fer la inversa necessitem 17 variables
#Com que només en tenim 2, les ajuntem al dataset inicial i ens quedem amb 15 variabl
#Obtenint un dataset amb 15 variables aleatories i les 2 variables que ens interessen

```
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:

25

```
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[19]:        predi         y        t-2        t-3        t-4        t-5  \
        479  0.479128  0.514061  12.119938  12.852295  13.106773  12.823073
        480  0.514098  0.580609  11.786082  12.119938  12.852295  13.106773
        481  0.563504  0.624326  11.590859  11.786082  12.119938  12.852295
        482  0.519594  0.539280  12.186487  11.590859  11.786082  12.119938
        483  0.531052  0.491355  12.577783  12.186487  11.590859  11.786082
        484  0.426188  0.522145  11.816573  12.577783  12.186487  11.590859
        485  0.408890  0.504442  11.387627  11.816573  12.577783  12.186487
        486  0.511353  0.567725  11.663214  11.387627  11.816573  12.577783
        487  0.611631  0.719460  11.504756  11.663214  11.387627  11.816573
        488  0.699830  0.804631  12.071173  11.504756  11.663214  11.387627
        489  0.570702  0.684716  13.429271  12.071173  11.504756  11.663214
        490  0.679242  0.662177  14.191591  13.429271  12.071173  11.504756
        491  0.660633  0.615194  13.118295  14.191591  13.429271  12.071173
        492  0.610748  0.565466  12.916559  13.118295  14.191591  13.429271
        493  0.582472  0.585646  12.496044  12.916559  13.118295  14.191591
        494  0.626119  0.536523  12.050954  12.496044  12.916559  13.118295
        495  0.630133  0.552256  12.231576  12.050954  12.496044  12.916559
        496  0.451999  0.552256  11.791904  12.231576  12.050954  12.496044
        497  0.478011  0.557809  11.932721  11.791904  12.231576  12.050954
        498  0.510248  0.477794  11.932721  11.932721  11.791904  12.231576
        499  0.555976  0.551195  11.982423  11.932721  11.932721  11.791904
        500  0.464707  0.582339  11.266252  11.982423  11.932721  11.932721
        501  0.460626  0.529772  11.923226  11.266252  11.982423  11.932721
        502  0.496008  0.458904  12.201972  11.923226  11.266252  11.982423
        503  0.387577  0.465733  11.731479  12.201972  11.923226  11.266252
        504  0.451842  0.402622  11.097177  11.731479  12.201972  11.923226
        505  0.419721  0.436918  11.158295  11.097177  11.731479  12.201972
        506  0.501989  0.380048  10.593420  11.158295  11.097177  11.731479
        507  0.472299  0.398860  10.900388  10.593420  11.158295  11.097177
        508  0.429237  0.377916  10.391372  10.900388  10.593420  11.158295
        ..       ...       ...        ...        ...        ...        ...
        800  0.482833  0.537515  11.753871  12.729659  11.620778  11.409880
        801  0.498610  0.524598  11.344805  11.753871  12.729659  11.620778
        802  0.457336  0.543903  11.800777  11.344805  11.753871  12.729659
        803  0.566939  0.527438  11.685169  11.800777  11.344805  11.753871
        804  0.509251  0.568506  11.857957  11.685169  11.800777  11.344805
        805  0.504352  0.479332  11.710582  11.857957  11.685169  11.800777
        806  0.505244  0.458726  12.078164  11.710582  11.857957  11.685169
        807  0.516846  0.494425  11.280011  12.078164  11.710582  11.857957
        808  0.406916  0.497810  11.095584  11.280011  12.078164  11.710582
```

```
809  0.495028  0.444954  11.415105  11.095584  11.280011  12.078164
810  0.487731  0.511653  11.445403  11.415105  11.095584  11.280011
811  0.557936  0.582450  10.972318  11.445403  11.415105  11.095584
812  0.554121  0.477562  11.569300  10.972318  11.445403  11.415105
813  0.535886  0.498620  12.202967  11.569300  10.972318  11.445403
814  0.588105  0.523920  11.264175  12.202967  11.569300  10.972318
815  0.557565  0.479971  11.452649  11.264175  12.202967  11.569300
816  0.419599  0.539318  11.679099  11.452649  11.264175  12.202967
817  0.535285  0.502845  11.285737  11.679099  11.452649  11.264175
818  0.579346  0.513089  11.816914  11.285737  11.679099  11.452649
819  0.501640  0.445764  11.490470  11.816914  11.285737  11.679099
820  0.369281  0.423680  11.582159  11.490470  11.816914  11.285737
821  0.441658  0.411694  10.979566  11.582159  11.490470  11.816914
822  0.427435  0.400434  10.781898  10.979566  11.582159  11.490470
823  0.440969  0.394209  10.674624  10.781898  10.979566  11.582159
824  0.483583  0.423048  10.573835  10.674624  10.781898  10.979566
825  0.534836  0.501722  10.518126  10.573835  10.674624  10.781898
826  0.435180  0.382286  10.776242  10.518126  10.573835  10.674624
827  0.360326  0.369280  11.480411  10.776242  10.518126  10.573835
828  0.417386  0.358995  10.411403  11.480411  10.776242  10.518126
829  0.395095  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 [20]: # 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
```

```
[[ 11.27818886  11.59085917 115.46893021 ...  43.          37.
   31.        ]
 [ 11.59118433  12.18648691 112.48075791 ...   7.          43.
   37.        ]
 [ 12.03339713  12.57778255 110.7334244  ...  13.           7.
   43.        ]
 ...
 [ 10.21485454  10.2949966  109.74485905 ...  25.          19.
   13.        ]
 [ 10.72556449  10.20294532 100.17673598 ...  31.          25.
   19.        ]
 [ 10.52604868  10.3563499   99.13484299 ...  37.          31.
   25.        ]]
11.278188858221599
11.590859170709699
```

In [21]: #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[21]: [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,
 11.9824229419611,
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 11.923225859637402,
 12.2019722473821,
 11.7314792668086,
 11.097177003906697,
 11.158295184648098,
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 10.531617352131999,
 10.0442564420545,
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 9.17927174876646,
 9.25026850964928,
 9.44901226100687,
 9.48570009257196,

```

9.99667631842984,
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8.79350297401487,
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10.950307543020301,
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11.3706013415024,
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11.409880228867399,
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11.3448047011651,
11.800776505725603,
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```
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       11.4151045424321,
       11.445403332361696,
       10.972318254623001,
       11.5693004562016,
       12.202967430864,
       11.264175173604801,
       11.4526493140274,
       11.679099381932001,
       11.285736726983497,
       11.8169143320215,
       11.490469615202198,
       11.5821590267637,
       10.979565988197802,
       10.781897981553199,
       10.6746236023562,
       10.573835396803801,
       10.5181264982014,
       10.7762421096284,
       11.480410763265299,
       10.411403084521401,
       10.294996596876901,
       10.202945322371301,
       10.3563498993587]

In [22]: ##Mostrem
         plt.plot(listpredi, label="predit")
         plt.plot(listy, label="real")
         plt.legend(loc="lower right")
         plt.show()
```

```
In [26]: print(listy[300])
         print(listpredi[300])
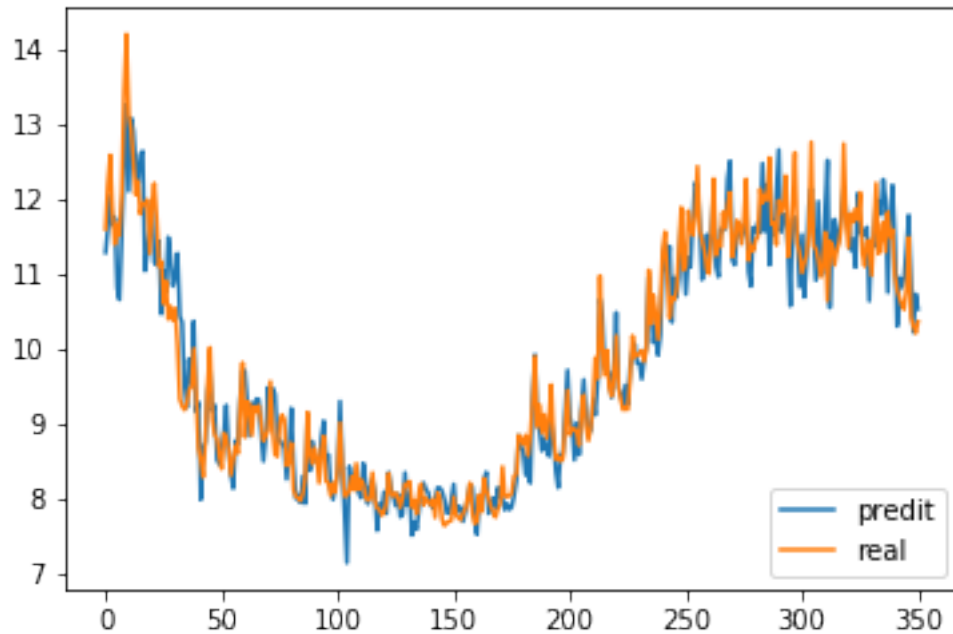
         print(listy[300]-listpredi[300])
         (listy[300]-listpredi[300])/listy[300]
```

```
11.0061509800784
11.392040093066475
-0.3858891129880746
```

```
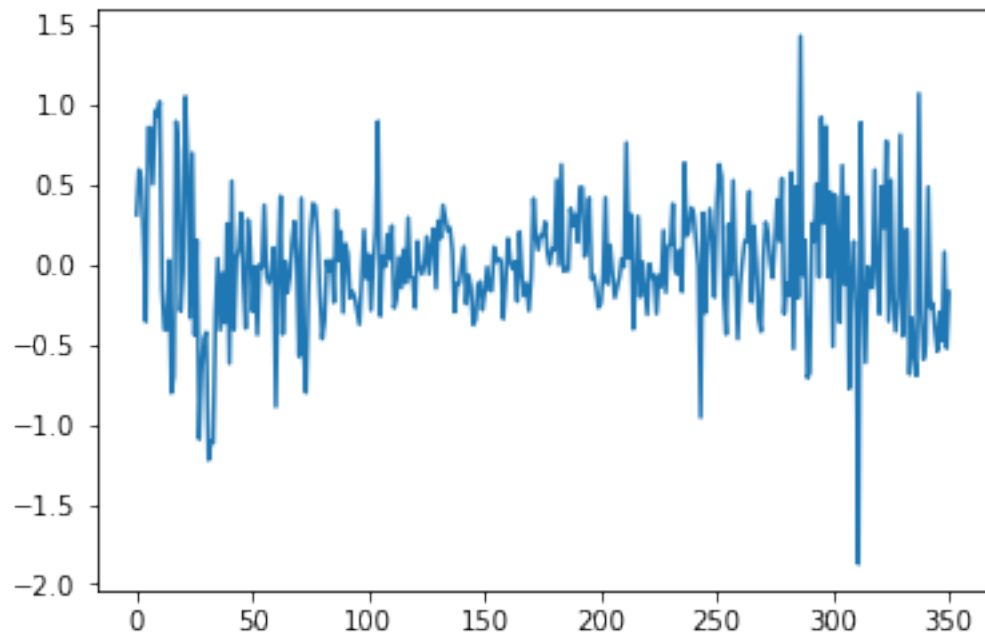Out[26]: -0.035061222918579826
```

```
In [23]: 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)
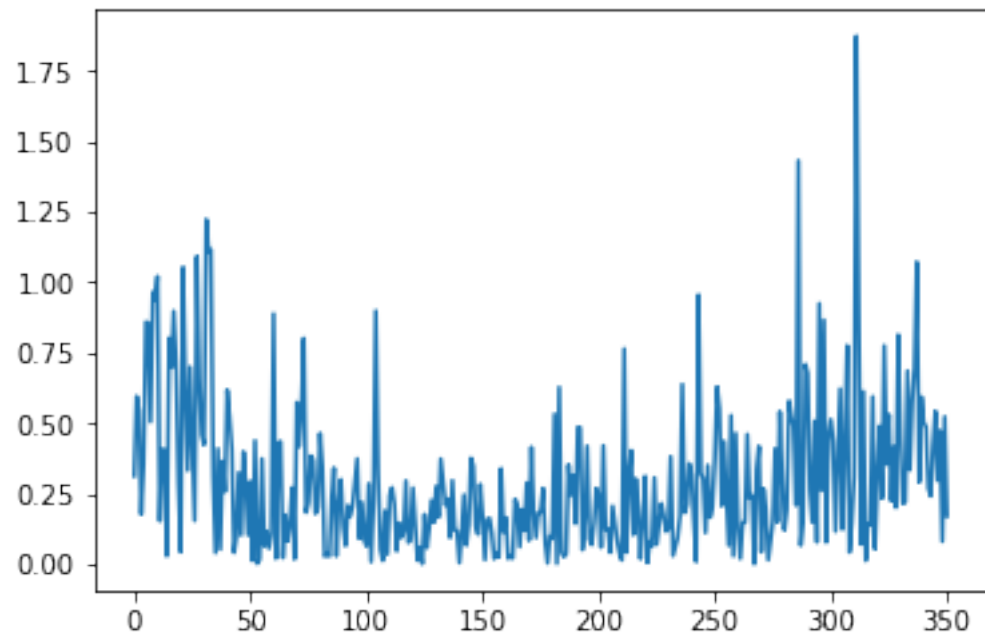             llista_errorsres.append(valorrespecte)
```

```
In [24]: plt.plot(llista_errors)
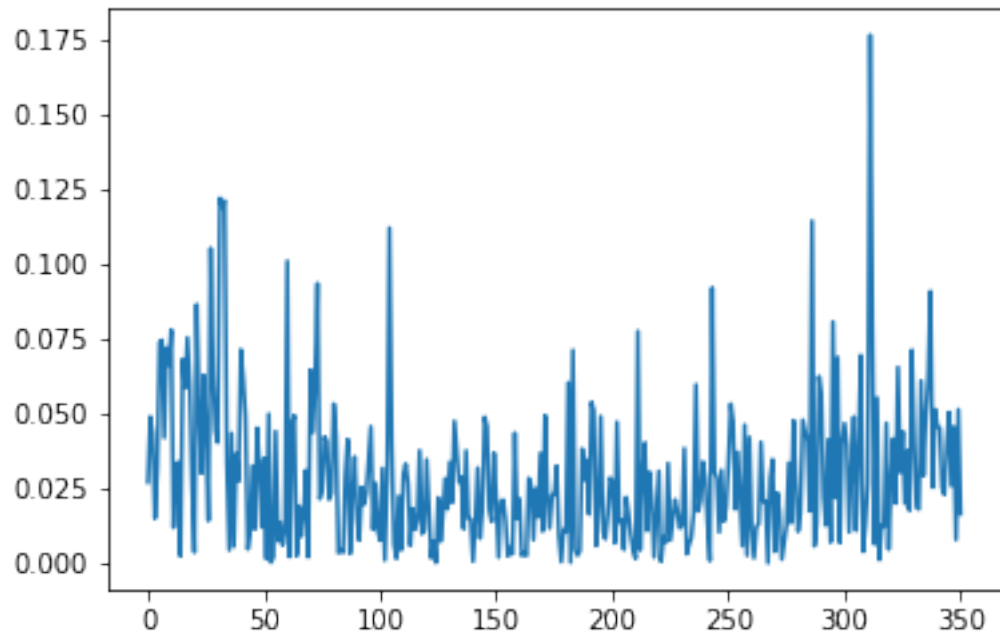```

In [25]: plt.plot(llista_errorsabs)

```
In [28]: plt.plot(llista_errorsres)
```

Out[28]: [<matplotlib.lines.Line2D at 0x29e7cef43c8>]


```
In [29]: sum(llista_errorsres)/(len(llista_errorsres))
```

Out[29]: 0.028931752570169708

```
In [ ]:
```