

M37

_Xarxa_walkforard_normalitzat_multivariate2tempmin_weekdaypresi 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 [4]: daily=pd.read_csv('C:/Users/Laura/Desktop/Smart meters London/workspace R/Dades netes/1
daily.head(5)
```

```
Out [4]:
```

	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
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	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 [5]: #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 [5]:
```

	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 [6]: daily_PCA=daily_dia[['weekday','pressure','sunsetTimeHour','cloudCover']]
```

```
In [7]: #Escalem dades
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)
```

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

```
In [8]: from sklearn.decomposition import PCA  
        pca_d=PCA(n_components=1)  
        daily_PCA_d=pca_d.fit_transform(daily_PCA_scaled)
```

```
In [9]: daily_PCA_d
```

```
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```

```

In [10]: daily_dia['weekPresSunCloud']=daily_PCA_d
         daily_dia.head(5)

```

```

Out [10]:   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

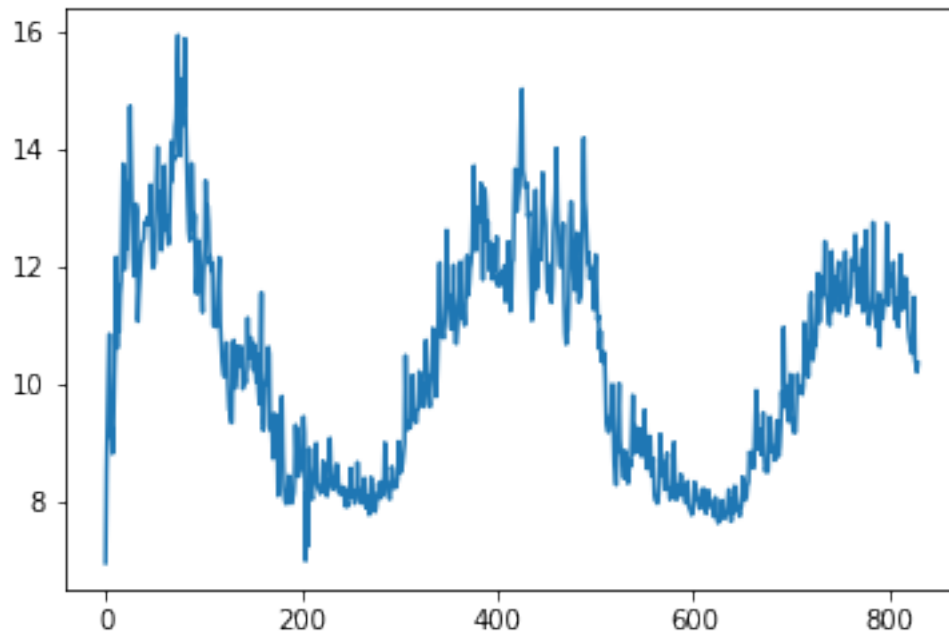
      cloudCover  weekPresSunCloud
0           0.36           0.425475
1           0.41           0.362353
2           0.48           0.096166
3           0.44           0.372564
4           0.42           0.288895

```

```
In [ ]:
```

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

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



```
In [11]: 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)
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['presSunCloud(t-1)']=daily_dia['weekPresSunCloud'].shift(1)
daily_dia['presSunCloud(t-2)']=daily_dia['weekPresSunCloud'].shift(2)
daily_dia['presSunCloud(t-3)']=daily_dia['weekPresSunCloud'].shift(3)
daily_dia['presSunCloud(t-4)']=daily_dia['weekPresSunCloud'].shift(4)
daily_dia['presSunCloud(t-5)']=daily_dia['weekPresSunCloud'].shift(5)
daily_dia['presSunCloud(t-6)']=daily_dia['weekPresSunCloud'].shift(6)
daily_dia['presSunCloud(t-7)']=daily_dia['weekPresSunCloud'].shift(7)
daily_dia['presSunCloud(t-8)']=daily_dia['weekPresSunCloud'].shift(8)

```

```

daily_dia['presSunCloud(t-9)']=daily_dia['weekPresSunCloud'].shift(9)
daily_dia['presSunCloud(t-10)']=daily_dia['weekPresSunCloud'].shift(10)
daily_dia['presSunCloud(t-11)']=daily_dia['weekPresSunCloud'].shift(11)
daily_dia['presSunCloud(t-12)']=daily_dia['weekPresSunCloud'].shift(12)
daily_dia['presSunCloud(t-13)']=daily_dia['weekPresSunCloud'].shift(13)
daily_dia['presSunCloud(t-14)']=daily_dia['weekPresSunCloud'].shift(14)

```

daily_dia

```

Out[11]:

```

	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	...	0.425475	NaN	NaN	
6	0.60	...	0.362353	0.425475	NaN	

7	0.31	...	0.096166	0.362353	0.425475
8	0.57	...	0.372564	0.096166	0.362353
9	0.32	...	0.288895	0.372564	0.096166
10	0.54	...	-0.925650	0.288895	0.372564
11	0.36	...	-1.611579	-0.925650	0.288895
12	0.20	...	-0.145258	-1.611579	-0.925650
13	0.34	...	-1.473086	-0.145258	-1.611579
14	0.29	...	-0.364853	-1.473086	-0.145258
15	0.53	...	-1.383625	-0.364853	-1.473086
16	0.15	...	-0.858585	-1.383625	-0.364853
17	0.17	...	-0.642811	-0.858585	-1.383625
18	0.56	...	-0.924606	-0.642811	-0.858585
19	0.38	...	-0.611805	-0.924606	-0.642811
20	0.42	...	-1.165021	-0.611805	-0.924606
21	0.36	...	0.086113	-1.165021	-0.611805
22	0.42	...	0.357551	0.086113	-1.165021
23	0.70	...	-1.152799	0.357551	0.086113
24	0.37	...	-1.375341	-1.152799	0.357551
25	0.22	...	-2.016695	-1.375341	-1.152799
26	0.47	...	-1.535747	-2.016695	-1.375341
27	0.48	...	-1.522350	-1.535747	-2.016695
28	0.67	...	-2.730819	-1.522350	-1.535747
29	0.38	...	-0.614198	-2.730819	-1.522350
..
800	0.93	...	-0.612579	-0.093538	-1.606919
801	0.81	...	-0.288133	-0.612579	-0.093538
802	0.73	...	-0.590711	-0.288133	-0.612579
803	0.19	...	-1.654741	-0.590711	-0.288133
804	0.22	...	-2.504874	-1.654741	-0.590711
805	0.47	...	-2.979845	-2.504874	-1.654741
806	0.42	...	-2.136845	-2.979845	-2.504874
807	0.73	...	-1.963460	-2.136845	-2.979845
808	0.67	...	-0.622665	-1.963460	-2.136845
809	0.63	...	0.129437	-0.622665	-1.963460
810	0.47	...	-1.238968	0.129437	-0.622665
811	0.52	...	-1.345168	-1.238968	0.129437
812	0.55	...	-2.944660	-1.345168	-1.238968
813	0.41	...	-2.290861	-2.944660	-1.345168
814	0.59	...	-1.791655	-2.290861	-2.944660
815	0.36	...	-1.681162	-1.791655	-2.290861
816	0.67	...	-1.478817	-1.681162	-1.791655
817	0.35	...	-1.689246	-1.478817	-1.681162
818	0.13	...	-0.979968	-1.689246	-1.478817
819	0.56	...	-1.568838	-0.979968	-1.689246
820	0.57	...	-0.861284	-1.568838	-0.979968
821	0.64	...	-1.839205	-0.861284	-1.568838
822	0.61	...	-0.845125	-1.839205	-0.861284
823	0.22	...	0.817565	-0.845125	-1.839205

824	0.25	...	-0.979271	0.817565	-0.845125
825	0.66	...	-0.880435	-0.979271	0.817565
826	0.50	...	-0.866791	-0.880435	-0.979271
827	0.62	...	-1.183981	-0.866791	-0.880435
828	0.26	...	0.203107	-1.183981	-0.866791
829	0.32	...	0.477764	0.203107	-1.183981

	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	0.425475	NaN	NaN	
9	0.362353	0.425475	NaN	
10	0.096166	0.362353	0.425475	
11	0.372564	0.096166	0.362353	
12	0.288895	0.372564	0.096166	
13	-0.925650	0.288895	0.372564	
14	-1.611579	-0.925650	0.288895	
15	-0.145258	-1.611579	-0.925650	
16	-1.473086	-0.145258	-1.611579	
17	-0.364853	-1.473086	-0.145258	
18	-1.383625	-0.364853	-1.473086	
19	-0.858585	-1.383625	-0.364853	
20	-0.642811	-0.858585	-1.383625	
21	-0.924606	-0.642811	-0.858585	
22	-0.611805	-0.924606	-0.642811	
23	-1.165021	-0.611805	-0.924606	
24	0.086113	-1.165021	-0.611805	
25	0.357551	0.086113	-1.165021	
26	-1.152799	0.357551	0.086113	
27	-1.375341	-1.152799	0.357551	
28	-2.016695	-1.375341	-1.152799	
29	-1.535747	-2.016695	-1.375341	
..	
800	-0.533656	-0.121102	-0.699912	
801	-1.606919	-0.533656	-0.121102	
802	-0.093538	-1.606919	-0.533656	
803	-0.612579	-0.093538	-1.606919	
804	-0.288133	-0.612579	-0.093538	
805	-0.590711	-0.288133	-0.612579	
806	-1.654741	-0.590711	-0.288133	
807	-2.504874	-1.654741	-0.590711	
808	-2.979845	-2.504874	-1.654741	

809	-2.136845	-2.979845	-2.504874
810	-1.963460	-2.136845	-2.979845
811	-0.622665	-1.963460	-2.136845
812	0.129437	-0.622665	-1.963460
813	-1.238968	0.129437	-0.622665
814	-1.345168	-1.238968	0.129437
815	-2.944660	-1.345168	-1.238968
816	-2.290861	-2.944660	-1.345168
817	-1.791655	-2.290861	-2.944660
818	-1.681162	-1.791655	-2.290861
819	-1.478817	-1.681162	-1.791655
820	-1.689246	-1.478817	-1.681162
821	-0.979968	-1.689246	-1.478817
822	-1.568838	-0.979968	-1.689246
823	-0.861284	-1.568838	-0.979968
824	-1.839205	-0.861284	-1.568838
825	-0.845125	-1.839205	-0.861284
826	0.817565	-0.845125	-1.839205
827	-0.979271	0.817565	-0.845125
828	-0.880435	-0.979271	0.817565
829	-0.866791	-0.880435	-0.979271

	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	0.425475	NaN	NaN
12	0.362353	0.425475	NaN
13	0.096166	0.362353	0.425475
14	0.372564	0.096166	0.362353
15	0.288895	0.372564	0.096166
16	-0.925650	0.288895	0.372564
17	-1.611579	-0.925650	0.288895
18	-0.145258	-1.611579	-0.925650
19	-1.473086	-0.145258	-1.611579
20	-0.364853	-1.473086	-0.145258
21	-1.383625	-0.364853	-1.473086
22	-0.858585	-1.383625	-0.364853
23	-0.642811	-0.858585	-1.383625
24	-0.924606	-0.642811	-0.858585

25	-0.611805	-0.924606	-0.642811
26	-1.165021	-0.611805	-0.924606
27	0.086113	-1.165021	-0.611805
28	0.357551	0.086113	-1.165021
29	-1.152799	0.357551	0.086113
..
800	-1.042179	-1.540468	-1.982543
801	-0.699912	-1.042179	-1.540468
802	-0.121102	-0.699912	-1.042179
803	-0.533656	-0.121102	-0.699912
804	-1.606919	-0.533656	-0.121102
805	-0.093538	-1.606919	-0.533656
806	-0.612579	-0.093538	-1.606919
807	-0.288133	-0.612579	-0.093538
808	-0.590711	-0.288133	-0.612579
809	-1.654741	-0.590711	-0.288133
810	-2.504874	-1.654741	-0.590711
811	-2.979845	-2.504874	-1.654741
812	-2.136845	-2.979845	-2.504874
813	-1.963460	-2.136845	-2.979845
814	-0.622665	-1.963460	-2.136845
815	0.129437	-0.622665	-1.963460
816	-1.238968	0.129437	-0.622665
817	-1.345168	-1.238968	0.129437
818	-2.944660	-1.345168	-1.238968
819	-2.290861	-2.944660	-1.345168
820	-1.791655	-2.290861	-2.944660
821	-1.681162	-1.791655	-2.290861
822	-1.478817	-1.681162	-1.791655
823	-1.689246	-1.478817	-1.681162
824	-0.979968	-1.689246	-1.478817
825	-1.568838	-0.979968	-1.689246
826	-0.861284	-1.568838	-0.979968
827	-1.839205	-0.861284	-1.568838
828	-0.845125	-1.839205	-0.861284
829	0.817565	-0.845125	-1.839205

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	0.425475
15	0.362353
16	0.096166
17	0.372564
18	0.288895
19	-0.925650
20	-1.611579
21	-0.145258
22	-1.473086
23	-0.364853
24	-1.383625
25	-0.858585
26	-0.642811
27	-0.924606
28	-0.611805
29	-1.165021
..	...
800	-2.257718
801	-1.982543
802	-1.540468
803	-1.042179
804	-0.699912
805	-0.121102
806	-0.533656
807	-1.606919
808	-0.093538
809	-0.612579
810	-0.288133
811	-0.590711
812	-1.654741
813	-2.504874
814	-2.979845
815	-2.136845
816	-1.963460
817	-0.622665
818	0.129437
819	-1.238968
820	-1.345168
821	-2.944660
822	-2.290861
823	-1.791655
824	-1.681162
825	-1.478817
826	-1.689246

```
827          -0.979968
828          -1.568838
829          -0.861284
```

```
[830 rows x 81 columns]
```

```
In [12]: #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','apparentTemperatureMax2'])
daily_dia.head(5)
```

```
Out[12]:
```

	energy_sum	weekday	t-1	t-2	t-3	t-4	t-5	t-6	\
0	6.952692	3	NaN	NaN	NaN	NaN	NaN	NaN	
1	8.536480	4	6.952692	NaN	NaN	NaN	NaN	NaN	
2	9.499781	5	8.536480	6.952692	NaN	NaN	NaN	NaN	
3	10.267707	6	9.499781	8.536480	6.952692	NaN	NaN	NaN	
4	10.850805	7	10.267707	9.499781	8.536480	6.952692	NaN	NaN	

	t-7	t-8	...	presSunCloud(t-5)	presSunCloud(t-6)	presSunCloud(t-7)	\
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	

	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 72 columns]
```

```
In [13]: #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 [13]:
```

	energy_sum	weekday	t-1	t-2	t-3	t-4	\
14	10.889362	3	11.673417	10.609714	12.163127	10.780273	
15	11.525150	4	10.889362	11.673417	10.609714	12.163127	
16	11.759837	5	11.525150	10.889362	11.673417	10.609714	
17	12.633801	6	11.759837	11.525150	10.889362	11.673417	
18	13.749174	7	12.633801	11.759837	11.525150	10.889362	

	t-5	t-6	t-7	t-8	...	presSunCloud(t-5)	\
14	10.145910	9.227707	8.813513	9.274873	...	-0.364853	
15	10.780273	10.145910	9.227707	8.813513	...	-1.383625	
16	12.163127	10.780273	10.145910	9.227707	...	-0.858585	
17	10.609714	12.163127	10.780273	10.145910	...	-0.642811	
18	11.673417	10.609714	12.163127	10.780273	...	-0.924606	

	presSunCloud(t-6)	presSunCloud(t-7)	presSunCloud(t-8)	\
14	-1.473086	-0.145258	-1.611579	
15	-0.364853	-1.473086	-0.145258	
16	-1.383625	-0.364853	-1.473086	
17	-0.858585	-1.383625	-0.364853	
18	-0.642811	-0.858585	-1.383625	

	presSunCloud(t-9)	presSunCloud(t-10)	presSunCloud(t-11)	\
14	-0.925650	0.288895	0.372564	
15	-1.611579	-0.925650	0.288895	
16	-0.145258	-1.611579	-0.925650	
17	-1.473086	-0.145258	-1.611579	
18	-0.364853	-1.473086	-0.145258	

	presSunCloud(t-12)	presSunCloud(t-13)	presSunCloud(t-14)
14	0.096166	0.362353	0.425475
15	0.372564	0.096166	0.362353
16	0.288895	0.372564	0.096166
17	-0.925650	0.288895	0.372564
18	-1.611579	-0.925650	0.288895

[5 rows x 72 columns]

```
In [16]: #Ens hem descuidat d'eliminar weekday
```

```
daily_dia=daily_dia.drop(['weekday'], axis=1)
daily_dia.head(5)
```

```
Out [16]:
```

	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	...	-0.364853
15	10.145910	9.227707	8.813513	9.274873	...	-1.383625
16	10.780273	10.145910	9.227707	8.813513	...	-0.858585
17	12.163127	10.780273	10.145910	9.227707	...	-0.642811
18	10.609714	12.163127	10.780273	10.145910	...	-0.924606

	presSunCloud(t-6)	presSunCloud(t-7)	presSunCloud(t-8) \
14	-1.473086	-0.145258	-1.611579
15	-0.364853	-1.473086	-0.145258
16	-1.383625	-0.364853	-1.473086
17	-0.858585	-1.383625	-0.364853
18	-0.642811	-0.858585	-1.383625

	presSunCloud(t-9)	presSunCloud(t-10)	presSunCloud(t-11) \
14	-0.925650	0.288895	0.372564
15	-1.611579	-0.925650	0.288895
16	-0.145258	-1.611579	-0.925650
17	-1.473086	-0.145258	-1.611579
18	-0.364853	-1.473086	-0.145258

	presSunCloud(t-12)	presSunCloud(t-13)	presSunCloud(t-14)
14	0.096166	0.362353	0.425475
15	0.372564	0.096166	0.362353
16	0.288895	0.372564	0.096166
17	-0.925650	0.288895	0.372564
18	-1.611579	-0.925650	0.288895

[5 rows x 71 columns]

In [13]: `len(daily_dia)`

Out[13]: 816

In [17]: `#normalitzem`

```
scaler=preprocessing.MinMaxScaler(feature_range=(0, 1))
daily_dia_norm=scaler.fit_transform(daily_dia)
```

In [18]: `#Seleccionem dades per test i train`

```
y_daily=daily_dia_norm[:,0]
X_daily=daily_dia_norm[:,1:71]
```

```
#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], 14,5))
```

```
In [19]: # definim model  
import tensorflow as tf  
model =Sequential()  
model.add(LSTM(50, activation='relu', input_shape=(14, 5)))  
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 [20]: 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  
    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, predictrain))
llista_scoretrain.append(trainScore )

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

sumScores=sumScores+testScore

```

WARNING:tensorflow:From c:\users\laura\appdata\local\programs\python\python37\lib\site-packages\tensorflow\python\ops\gen_ops.py:170: *tf.nn.conv2d* is deprecated and will be removed in a future version. Instructions for updating:
Use tf.nn.conv2d instead.

In [21]: *#Dividim la suma de scores de test entre el nombre de prediccions per obtenir la mitjana*
sumScores/(length-n_train)

Out[21]: 0.03682280616769471

In [22]: llista_scores

Out[22]: [0.0471011109573789,
0.061566663010976574,
0.10064569138813173,
0.028645984273812042,
0.04487852318137531,
0.06936288447464034,
0.0651883104423534,
0.03748997546530486,
0.24895802550802504,
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0.07067119834065494,
0.0580003272576477,
0.006846372906836873,
0.06294619590037764,
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0.10097756882593001,
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0.02512846899506571,
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0.024495821826625797,
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0.08148096671908656,
0.08001402914812994,
0.0364758216534804,
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0.07902041241344249,
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0.009629945522890981,
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0.021779045724597434,
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0.0232140109755139,
0.008750938280914,
0.01935053288879718,

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0.012281963542373875,
0.007343378468714801,
0.012958838761150338,
0.01609750513100905,
0.08356382542582885,
0.03397573808661525,
0.06710882849150357,
0.15253661909933514,
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0.0003490192442974216,
0.18538833433756585,
0.06300637322424629,
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0.01203501727748979,
0.05884935489880794,
0.038605463729156186,
0.03198676447692017,
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0.0349150499747225,
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0.01770488182303631,
0.0076778937514397905,
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0.023878282730721567,
0.13238333490832233,

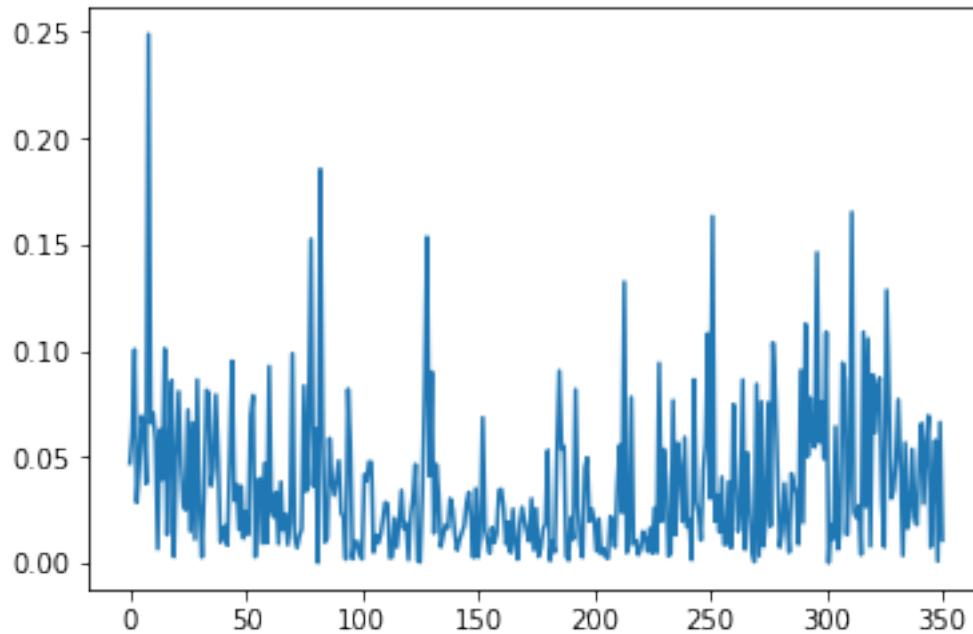
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0.07816983999409799,
0.009351351840257704,
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0.05667922081868282,
0.04447456250385984,
0.019815189702169667,
0.05932125356888607,
0.017145882320728445,
0.02091641735672556,
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0.010943666033983002,
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0.10814873896989718,
0.030457984067128185,
0.16325077827601553,
0.019856495438177912,
0.032269632591914066,
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0.01345520343705009,

```
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0.08277223256703015,  
0.08724066744122339,  
0.029071575474104883,  
0.00770401612117011,  
0.12855184557719435,  
0.07799264443363185,  
0.030554821025195134,  
0.0341627747615616,  
0.0483267781071568,  
0.077102915641996,  
0.044675119205320746,  
0.0036779914876536868,  
0.05676728381887042,  
0.01648142440646927,  
0.02193262540673313,  
0.05373833861459798,  
0.024586961475265623,  
0.018229098529463306,  
0.04872341616895559,  
0.06581569696239997,  
0.028101693034580988,  
0.05713779763497473,  
0.06948409936006605,  
0.007642556183540039,  
0.03686455227302399,  
0.05798879240979837,  
0.0010117704054501964,  
0.06638218431818799,  
0.010998310785294674]
```

```
In [23]: plt.plot(llista_scores)
```

```
Out[23]: [<matplotlib.lines.Line2D at 0x243f82345c0>]
```



```
In [24]: predis=list()
```

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

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

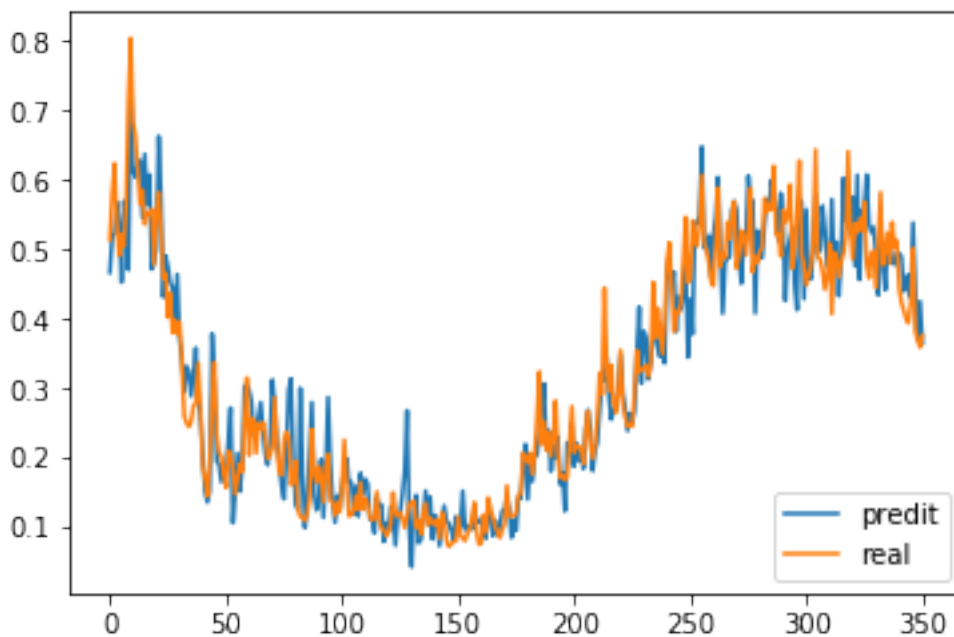
```
predis
```

```
Out[24]: array([0.46696037, 0.5190419 , 0.52368075, 0.56792551, 0.53623366,
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 0.63750094, 0.56570899, 0.60806507, 0.47177857, 0.48096806,
 0.50055265, 0.66319048, 0.57619375, 0.43145311, 0.49086133,
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 0.28903258, 0.31944722, 0.3582117 , 0.28596246, 0.2605716 ,
 0.20229371, 0.15184002, 0.13580772, 0.15102464, 0.37853819,
 0.30787572, 0.19439909, 0.19136491, 0.16520725, 0.18696997,
 0.18107271, 0.22360204, 0.2718434 , 0.10596685, 0.1502804 ,
 0.20664018, 0.1512963 , 0.18943089, 0.30250585, 0.30527881,
 0.29646069, 0.28176993, 0.23144785, 0.24008182, 0.25907692,
 0.2798028 , 0.23507172, 0.20351107, 0.1895216 , 0.22434138,
 0.31244826, 0.27460879, 0.2226276 , 0.19117852, 0.15896501,
 0.14052589, 0.20317116, 0.29736179, 0.31372279, 0.20243064,
```

0.13211679, 0.12584554, 0.30037808, 0.17724597, 0.09918343,
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0.19305453, 0.13807334, 0.10659949, 0.14555417, 0.12650895,
0.16111484, 0.18373308, 0.19870605, 0.16368383, 0.16454165,
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0.10781778, 0.15234964, 0.11923488, 0.14331771, 0.08265903,
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```
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0.43069017, 0.53858608, 0.44027442, 0.37029177, 0.42537767,
0.36513644])
```

```
In [25]: ##Mostrem
plt.plot(predis, label="predit")
plt.plot(y_daily[n_train:lenght], label="real")
plt.legend(loc="lower right")
plt.show()
```



```
In [26]: #Creem un dataset amb format (nombre prediccions,17) per tornar les prediccions i els
#El necessitem d'aquesta 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 aleatòries 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:
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[26]:
```

	predi	y	t-2	t-3	t-4	t-5	\
479	0.466960	0.514061	12.119938	12.852295	13.106773	12.823073	
480	0.519042	0.580609	11.786082	12.119938	12.852295	13.106773	
481	0.523681	0.624326	11.590859	11.786082	12.119938	12.852295	
482	0.567926	0.539280	12.186487	11.590859	11.786082	12.119938	
483	0.536234	0.491355	12.577783	12.186487	11.590859	11.786082	
484	0.452783	0.522145	11.816573	12.577783	12.186487	11.590859	
485	0.569630	0.504442	11.387627	11.816573	12.577783	12.186487	
486	0.530235	0.567725	11.663214	11.387627	11.816573	12.577783	
487	0.470502	0.719460	11.504756	11.663214	11.387627	11.816573	
488	0.738581	0.804631	12.071173	11.504756	11.663214	11.387627	
489	0.614044	0.684716	13.429271	12.071173	11.504756	11.663214	
490	0.604176	0.662177	14.191591	13.429271	12.071173	11.504756	
491	0.622041	0.615194	13.118295	14.191591	13.429271	12.071173	
492	0.628412	0.565466	12.916559	13.118295	14.191591	13.429271	
493	0.546279	0.585646	12.496044	12.916559	13.118295	14.191591	
494	0.637501	0.536523	12.050954	12.496044	12.916559	13.118295	
495	0.565709	0.552256	12.231576	12.050954	12.496044	12.916559	
496	0.608065	0.552256	11.791904	12.231576	12.050954	12.496044	
497	0.471779	0.557809	11.932721	11.791904	12.231576	12.050954	
498	0.480968	0.477794	11.932721	11.932721	11.791904	12.231576	
499	0.500553	0.551195	11.982423	11.932721	11.932721	11.791904	
500	0.663190	0.582339	11.266252	11.982423	11.932721	11.932721	
501	0.576194	0.529772	11.923226	11.266252	11.982423	11.932721	
502	0.431453	0.458904	12.201972	11.923226	11.266252	11.982423	
503	0.490861	0.465733	11.731479	12.201972	11.923226	11.266252	
504	0.474845	0.402622	11.097177	11.731479	12.201972	11.923226	

505	0.452008	0.436918	11.158295	11.097177	11.731479	12.201972
506	0.446277	0.380048	10.593420	11.158295	11.097177	11.731479
507	0.387480	0.398860	10.900388	10.593420	11.158295	11.097177
508	0.464313	0.377916	10.391372	10.900388	10.593420	11.158295
..
800	0.475993	0.537515	11.753871	12.729659	11.620778	11.409880
801	0.607371	0.524598	11.344805	11.753871	12.729659	11.620778
802	0.456663	0.543903	11.800777	11.344805	11.753871	12.729659
803	0.556509	0.527438	11.685169	11.800777	11.344805	11.753871
804	0.560802	0.568506	11.857957	11.685169	11.800777	11.344805
805	0.607884	0.479332	11.710582	11.857957	11.685169	11.800777
806	0.536719	0.458726	12.078164	11.710582	11.857957	11.685169
807	0.524980	0.494425	11.280011	12.078164	11.710582	11.857957
808	0.531973	0.497810	11.095584	11.280011	12.078164	11.710582
809	0.493281	0.444954	11.415105	11.095584	11.280011	12.078164
810	0.434550	0.511653	11.445403	11.415105	11.095584	11.280011
811	0.537775	0.582450	10.972318	11.445403	11.415105	11.095584
812	0.481240	0.477562	11.569300	10.972318	11.445403	11.415105
813	0.441853	0.498620	12.202967	11.569300	10.972318	11.445403
814	0.507439	0.523920	11.264175	12.202967	11.569300	10.972318
815	0.501904	0.479971	11.452649	11.264175	12.202967	11.569300
816	0.485579	0.539318	11.679099	11.452649	11.264175	12.202967
817	0.478258	0.502845	11.285737	11.679099	11.452649	11.264175
818	0.494860	0.513089	11.816914	11.285737	11.679099	11.452649
819	0.494488	0.445764	11.490470	11.816914	11.285737	11.679099
820	0.489495	0.423680	11.582159	11.490470	11.816914	11.285737
821	0.439796	0.411694	10.979566	11.582159	11.490470	11.816914
822	0.457571	0.400434	10.781898	10.979566	11.582159	11.490470
823	0.463693	0.394209	10.674624	10.781898	10.979566	11.582159
824	0.430690	0.423048	10.573835	10.674624	10.781898	10.979566
825	0.538586	0.501722	10.518126	10.573835	10.674624	10.781898
826	0.440274	0.382286	10.776242	10.518126	10.573835	10.674624
827	0.370292	0.369280	11.480411	10.776242	10.518126	10.573835
828	0.425378	0.358995	10.411403	11.480411	10.776242	10.518126
829	0.365136	0.376135	10.294997	10.411403	11.480411	10.776242

	t-6	t-7	t-8	t-9	...	presSunCloud(t-5) \
479	11.559878	10.930170	10.889469	10.675248	...	-1.325064
480	12.823073	11.559878	10.930170	10.889469	...	-1.129839
481	13.106773	12.823073	11.559878	10.930170	...	-0.434997
482	12.852295	13.106773	12.823073	11.559878	...	0.265121
483	12.119938	12.852295	13.106773	12.823073	...	0.908029
484	11.786082	12.119938	12.852295	13.106773	...	-0.576319
485	11.590859	11.786082	12.119938	12.852295	...	-1.183994
486	12.186487	11.590859	11.786082	12.119938	...	-1.226800
487	12.577783	12.186487	11.590859	11.786082	...	-1.279962
488	11.816573	12.577783	12.186487	11.590859	...	-1.150427
489	11.387627	11.816573	12.577783	12.186487	...	-1.194743

490	11.663214	11.387627	11.816573	12.577783	...	-0.125150
491	11.504756	11.663214	11.387627	11.816573	...	-0.591181
492	12.071173	11.504756	11.663214	11.387627	...	-0.997293
493	13.429271	12.071173	11.504756	11.663214	...	-0.700095
494	14.191591	13.429271	12.071173	11.504756	...	-0.685156
495	13.118295	14.191591	13.429271	12.071173	...	-0.673488
496	12.916559	13.118295	14.191591	13.429271	...	-0.023883
497	12.496044	12.916559	13.118295	14.191591	...	0.034093
498	12.050954	12.496044	12.916559	13.118295	...	-0.228134
499	12.231576	12.050954	12.496044	12.916559	...	-0.333357
500	11.791904	12.231576	12.050954	12.496044	...	0.038882
501	11.932721	11.791904	12.231576	12.050954	...	0.715692
502	11.932721	11.932721	11.791904	12.231576	...	0.818052
503	11.982423	11.932721	11.932721	11.791904	...	0.268054
504	11.266252	11.982423	11.932721	11.932721	...	-0.112297
505	11.923226	11.266252	11.982423	11.932721	...	-0.225197
506	12.201972	11.923226	11.266252	11.982423	...	1.503383
507	11.731479	12.201972	11.923226	11.266252	...	0.916743
508	11.097177	11.731479	12.201972	11.923226	...	0.407636
..
800	11.300414	11.109560	11.370601	11.430883	...	-0.612579
801	11.409880	11.300414	11.109560	11.370601	...	-0.288133
802	11.620778	11.409880	11.300414	11.109560	...	-0.590711
803	12.729659	11.620778	11.409880	11.300414	...	-1.654741
804	11.753871	12.729659	11.620778	11.409880	...	-2.504874
805	11.344805	11.753871	12.729659	11.620778	...	-2.979845
806	11.800777	11.344805	11.753871	12.729659	...	-2.136845
807	11.685169	11.800777	11.344805	11.753871	...	-1.963460
808	11.857957	11.685169	11.800777	11.344805	...	-0.622665
809	11.710582	11.857957	11.685169	11.800777	...	0.129437
810	12.078164	11.710582	11.857957	11.685169	...	-1.238968
811	11.280011	12.078164	11.710582	11.857957	...	-1.345168
812	11.095584	11.280011	12.078164	11.710582	...	-2.944660
813	11.415105	11.095584	11.280011	12.078164	...	-2.290861
814	11.445403	11.415105	11.095584	11.280011	...	-1.791655
815	10.972318	11.445403	11.415105	11.095584	...	-1.681162
816	11.569300	10.972318	11.445403	11.415105	...	-1.478817
817	12.202967	11.569300	10.972318	11.445403	...	-1.689246
818	11.264175	12.202967	11.569300	10.972318	...	-0.979968
819	11.452649	11.264175	12.202967	11.569300	...	-1.568838
820	11.679099	11.452649	11.264175	12.202967	...	-0.861284
821	11.285737	11.679099	11.452649	11.264175	...	-1.839205
822	11.816914	11.285737	11.679099	11.452649	...	-0.845125
823	11.490470	11.816914	11.285737	11.679099	...	0.817565
824	11.582159	11.490470	11.816914	11.285737	...	-0.979271
825	10.979566	11.582159	11.490470	11.816914	...	-0.880435
826	10.781898	10.979566	11.582159	11.490470	...	-0.866791
827	10.674624	10.781898	10.979566	11.582159	...	-1.183981

828	10.573835	10.674624	10.781898	10.979566	...	0.203107
829	10.518126	10.573835	10.674624	10.781898	...	0.477764

	presSunCloud(t-6)	presSunCloud(t-7)	presSunCloud(t-8)	\
479	-1.679467	-1.975423	-1.627507	
480	-1.325064	-1.679467	-1.975423	
481	-1.129839	-1.325064	-1.679467	
482	-0.434997	-1.129839	-1.325064	
483	0.265121	-0.434997	-1.129839	
484	0.908029	0.265121	-0.434997	
485	-0.576319	0.908029	0.265121	
486	-1.183994	-0.576319	0.908029	
487	-1.226800	-1.183994	-0.576319	
488	-1.279962	-1.226800	-1.183994	
489	-1.150427	-1.279962	-1.226800	
490	-1.194743	-1.150427	-1.279962	
491	-0.125150	-1.194743	-1.150427	
492	-0.591181	-0.125150	-1.194743	
493	-0.997293	-0.591181	-0.125150	
494	-0.700095	-0.997293	-0.591181	
495	-0.685156	-0.700095	-0.997293	
496	-0.673488	-0.685156	-0.700095	
497	-0.023883	-0.673488	-0.685156	
498	0.034093	-0.023883	-0.673488	
499	-0.228134	0.034093	-0.023883	
500	-0.333357	-0.228134	0.034093	
501	0.038882	-0.333357	-0.228134	
502	0.715692	0.038882	-0.333357	
503	0.818052	0.715692	0.038882	
504	0.268054	0.818052	0.715692	
505	-0.112297	0.268054	0.818052	
506	-0.225197	-0.112297	0.268054	
507	1.503383	-0.225197	-0.112297	
508	0.916743	1.503383	-0.225197	
..	
800	-0.093538	-1.606919	-0.533656	
801	-0.612579	-0.093538	-1.606919	
802	-0.288133	-0.612579	-0.093538	
803	-0.590711	-0.288133	-0.612579	
804	-1.654741	-0.590711	-0.288133	
805	-2.504874	-1.654741	-0.590711	
806	-2.979845	-2.504874	-1.654741	
807	-2.136845	-2.979845	-2.504874	
808	-1.963460	-2.136845	-2.979845	
809	-0.622665	-1.963460	-2.136845	
810	0.129437	-0.622665	-1.963460	
811	-1.238968	0.129437	-0.622665	
812	-1.345168	-1.238968	0.129437	

813	-2.944660	-1.345168	-1.238968
814	-2.290861	-2.944660	-1.345168
815	-1.791655	-2.290861	-2.944660
816	-1.681162	-1.791655	-2.290861
817	-1.478817	-1.681162	-1.791655
818	-1.689246	-1.478817	-1.681162
819	-0.979968	-1.689246	-1.478817
820	-1.568838	-0.979968	-1.689246
821	-0.861284	-1.568838	-0.979968
822	-1.839205	-0.861284	-1.568838
823	-0.845125	-1.839205	-0.861284
824	0.817565	-0.845125	-1.839205
825	-0.979271	0.817565	-0.845125
826	-0.880435	-0.979271	0.817565
827	-0.866791	-0.880435	-0.979271
828	-1.183981	-0.866791	-0.880435
829	0.203107	-1.183981	-0.866791

	presSunCloud(t-9)	presSunCloud(t-10)	presSunCloud(t-11)	\
479	0.049268	0.309510	0.212638	
480	-1.627507	0.049268	0.309510	
481	-1.975423	-1.627507	0.049268	
482	-1.679467	-1.975423	-1.627507	
483	-1.325064	-1.679467	-1.975423	
484	-1.129839	-1.325064	-1.679467	
485	-0.434997	-1.129839	-1.325064	
486	0.265121	-0.434997	-1.129839	
487	0.908029	0.265121	-0.434997	
488	-0.576319	0.908029	0.265121	
489	-1.183994	-0.576319	0.908029	
490	-1.226800	-1.183994	-0.576319	
491	-1.279962	-1.226800	-1.183994	
492	-1.150427	-1.279962	-1.226800	
493	-1.194743	-1.150427	-1.279962	
494	-0.125150	-1.194743	-1.150427	
495	-0.591181	-0.125150	-1.194743	
496	-0.997293	-0.591181	-0.125150	
497	-0.700095	-0.997293	-0.591181	
498	-0.685156	-0.700095	-0.997293	
499	-0.673488	-0.685156	-0.700095	
500	-0.023883	-0.673488	-0.685156	
501	0.034093	-0.023883	-0.673488	
502	-0.228134	0.034093	-0.023883	
503	-0.333357	-0.228134	0.034093	
504	0.038882	-0.333357	-0.228134	
505	0.715692	0.038882	-0.333357	
506	0.818052	0.715692	0.038882	
507	0.268054	0.818052	0.715692	

508	-0.112297	0.268054	0.818052
...
800	-0.121102	-0.699912	-1.042179
801	-0.533656	-0.121102	-0.699912
802	-1.606919	-0.533656	-0.121102
803	-0.093538	-1.606919	-0.533656
804	-0.612579	-0.093538	-1.606919
805	-0.288133	-0.612579	-0.093538
806	-0.590711	-0.288133	-0.612579
807	-1.654741	-0.590711	-0.288133
808	-2.504874	-1.654741	-0.590711
809	-2.979845	-2.504874	-1.654741
810	-2.136845	-2.979845	-2.504874
811	-1.963460	-2.136845	-2.979845
812	-0.622665	-1.963460	-2.136845
813	0.129437	-0.622665	-1.963460
814	-1.238968	0.129437	-0.622665
815	-1.345168	-1.238968	0.129437
816	-2.944660	-1.345168	-1.238968
817	-2.290861	-2.944660	-1.345168
818	-1.791655	-2.290861	-2.944660
819	-1.681162	-1.791655	-2.290861
820	-1.478817	-1.681162	-1.791655
821	-1.689246	-1.478817	-1.681162
822	-0.979968	-1.689246	-1.478817
823	-1.568838	-0.979968	-1.689246
824	-0.861284	-1.568838	-0.979968
825	-1.839205	-0.861284	-1.568838
826	-0.845125	-1.839205	-0.861284
827	0.817565	-0.845125	-1.839205
828	-0.979271	0.817565	-0.845125
829	-0.880435	-0.979271	0.817565

	presSunCloud(t-12)	presSunCloud(t-13)	presSunCloud(t-14)
479	0.257610	0.128800	-0.409364
480	0.212638	0.257610	0.128800
481	0.309510	0.212638	0.257610
482	0.049268	0.309510	0.212638
483	-1.627507	0.049268	0.309510
484	-1.975423	-1.627507	0.049268
485	-1.679467	-1.975423	-1.627507
486	-1.325064	-1.679467	-1.975423
487	-1.129839	-1.325064	-1.679467
488	-0.434997	-1.129839	-1.325064
489	0.265121	-0.434997	-1.129839
490	0.908029	0.265121	-0.434997
491	-0.576319	0.908029	0.265121
492	-1.183994	-0.576319	0.908029

493	-1.226800	-1.183994	-0.576319
494	-1.279962	-1.226800	-1.183994
495	-1.150427	-1.279962	-1.226800
496	-1.194743	-1.150427	-1.279962
497	-0.125150	-1.194743	-1.150427
498	-0.591181	-0.125150	-1.194743
499	-0.997293	-0.591181	-0.125150
500	-0.700095	-0.997293	-0.591181
501	-0.685156	-0.700095	-0.997293
502	-0.673488	-0.685156	-0.700095
503	-0.023883	-0.673488	-0.685156
504	0.034093	-0.023883	-0.673488
505	-0.228134	0.034093	-0.023883
506	-0.333357	-0.228134	0.034093
507	0.038882	-0.333357	-0.228134
508	0.715692	0.038882	-0.333357
..
800	-1.540468	-1.982543	-2.257718
801	-1.042179	-1.540468	-1.982543
802	-0.699912	-1.042179	-1.540468
803	-0.121102	-0.699912	-1.042179
804	-0.533656	-0.121102	-0.699912
805	-1.606919	-0.533656	-0.121102
806	-0.093538	-1.606919	-0.533656
807	-0.612579	-0.093538	-1.606919
808	-0.288133	-0.612579	-0.093538
809	-0.590711	-0.288133	-0.612579
810	-1.654741	-0.590711	-0.288133
811	-2.504874	-1.654741	-0.590711
812	-2.979845	-2.504874	-1.654741
813	-2.136845	-2.979845	-2.504874
814	-1.963460	-2.136845	-2.979845
815	-0.622665	-1.963460	-2.136845
816	0.129437	-0.622665	-1.963460
817	-1.238968	0.129437	-0.622665
818	-1.345168	-1.238968	0.129437
819	-2.944660	-1.345168	-1.238968
820	-2.290861	-2.944660	-1.345168
821	-1.791655	-2.290861	-2.944660
822	-1.681162	-1.791655	-2.290861
823	-1.478817	-1.681162	-1.791655
824	-1.689246	-1.478817	-1.681162
825	-0.979968	-1.689246	-1.478817
826	-1.568838	-0.979968	-1.689246
827	-0.861284	-1.568838	-0.979968
828	-1.839205	-0.861284	-1.568838
829	-0.845125	-1.839205	-0.861284

[351 rows x 71 columns]

In [27]: *# Convert predictions back to normal values*

```
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

```
[[ 11.16928201  11.59085917 115.46893021 ... -1.4119989  -2.19595355
  -5.47128672]
 [ 11.63543623  12.18648691 112.48075791 ... -1.68570686  -1.4119989
  -2.19595355]
 [ 11.67695613  12.57778255 110.7334244  ... -1.0961303  -1.68570686
  -1.4119989 ]
 ...
 [ 10.30405242  10.2949966  109.74485905 ... -8.22172471 -12.5279876
  -8.94405216]
 [ 10.79709719  10.20294532 100.17673598 ... -14.17347766  -8.22172471
 -12.5279876 ]
 [ 10.25790983  10.3563499   99.13484299 ... -8.12338337 -14.17347766
  -8.22172471]]
11.169282005838257
11.590859170709699
```

In [28]: *#Fem una llista amb les prediccions i una llista amb y(valor real)*

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

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

Out[28]: [11.590859170709699,
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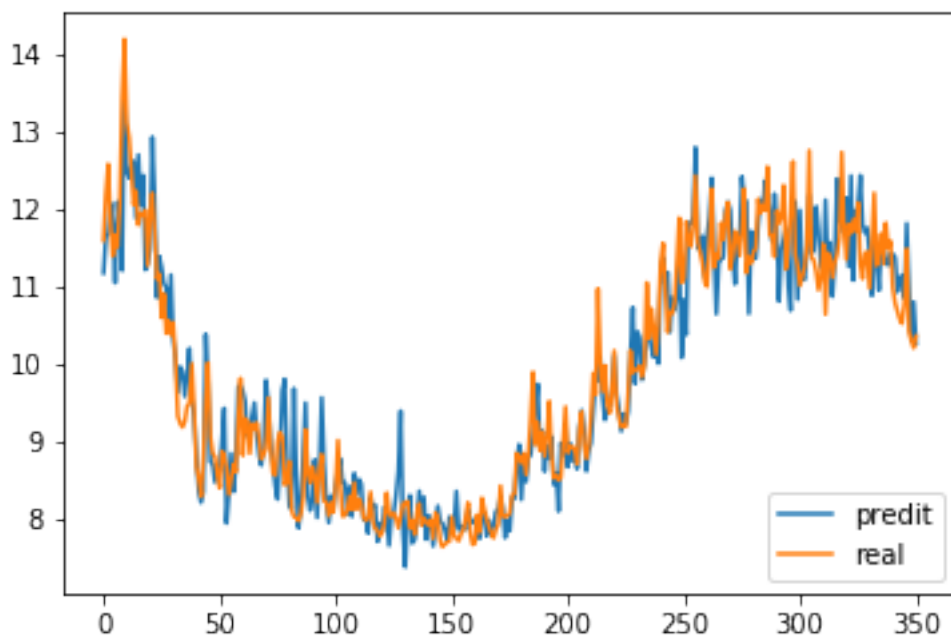
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```
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10.411403084521401,  
10.294996596876901,  
10.202945322371301,  
10.3563498993587]
```

```
In [29]: ##Mostrem  
plt.plot(listpredi, label="predit")  
plt.plot(listy, label="real")  
plt.legend(loc="lower right")  
plt.show()
```



```
In [30]: print(listy[300])  
         print(listpredi[300])  
  
         print(listy[300]-listpredi[300])  
         (listy[300]-listpredi[300])/listy[300]
```

```
11.0061509800784  
11.980685149896678  
-0.974534169818277
```

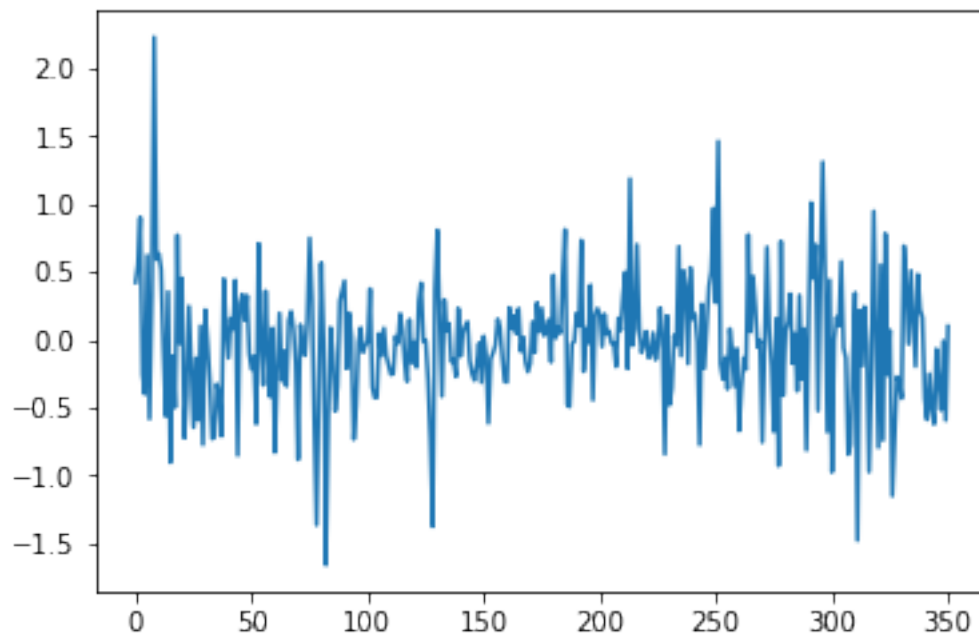
```
Out [30]: -0.08854450312213825
```

```
In [31]: 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)
```

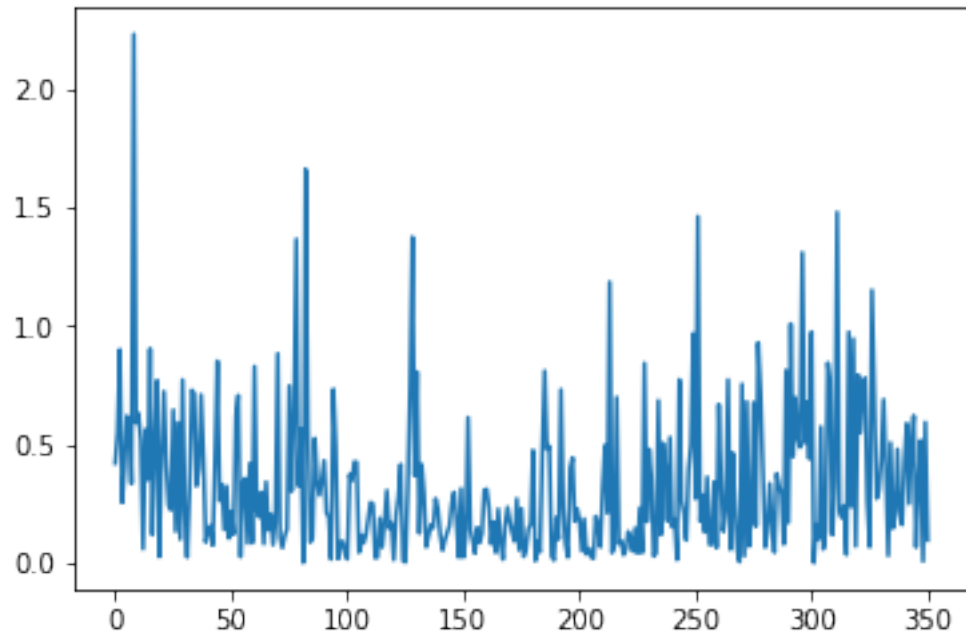
```
In [32]: plt.plot(llista_errors)
```

```
Out[32]: [<matplotlib.lines.Line2D at 0x243f836ddd8>]
```



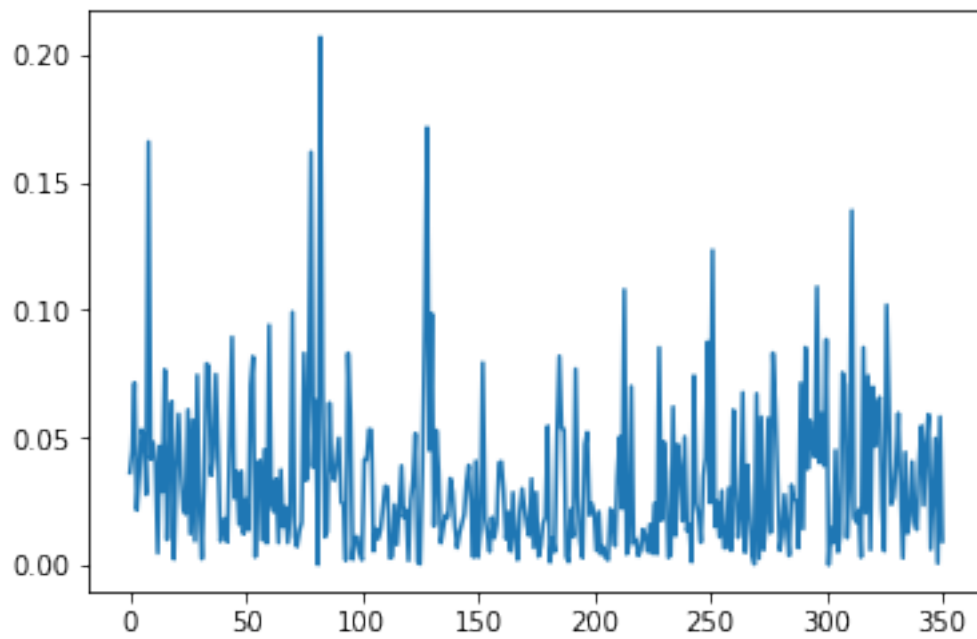
```
In [33]: plt.plot(llista_errorsabs)
```

```
Out[33]: [<matplotlib.lines.Line2D at 0x243f83cdc50>]
```



```
In [34]: plt.plot(llista_errorsres)
```

```
Out[34]: [<matplotlib.lines.Line2D at 0x243f8424e80>]
```



```
In [35]: sum(llista_errorsres)/(len(llista_errorsres))
```

```
Out[35]: 0.03285875722484588
```

```
In [ ]:
```