

M35

_Xarxa_walkforard_normalitzat_multivariate2tempmin_presiopostaclo
walkforward
augment_PCA

December 21, 2019

1 Xarxa neuronal

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

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

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

Using TensorFlow backend.

1.1 Consum diari total multivariate one-step

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

```
Out[2]:
```

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

4	2012-04-17		10.01		2.76		19
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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 [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	sunsetTimeHour	cloudCover
0	2.18	0.93	1027.12	16	0.36
1	7.01	0.89	1027.22	16	0.41
2	4.84	0.79	1024.47	16	0.48
3	4.69	0.81	1025.80	16	0.44
4	2.94	0.72	1021.11	16	0.42

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

```
In [6]: #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 [7]: from sklearn.decomposition import PCA
pca_d=PCA(n_components=1)
daily_PCA_d=pca_d.fit_transform(daily_PCA_scaled)
```

```
In [8]: daily_PCA_d
```

```
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[ 1.27028913e+00],
[-4.49531404e-01],
[ 2.15118596e-02]])
```

```
In [9]: daily_dia['presSunCloud']=daily_PCA_d
        daily_dia.head(5)
```

```
Out[9]:
```

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

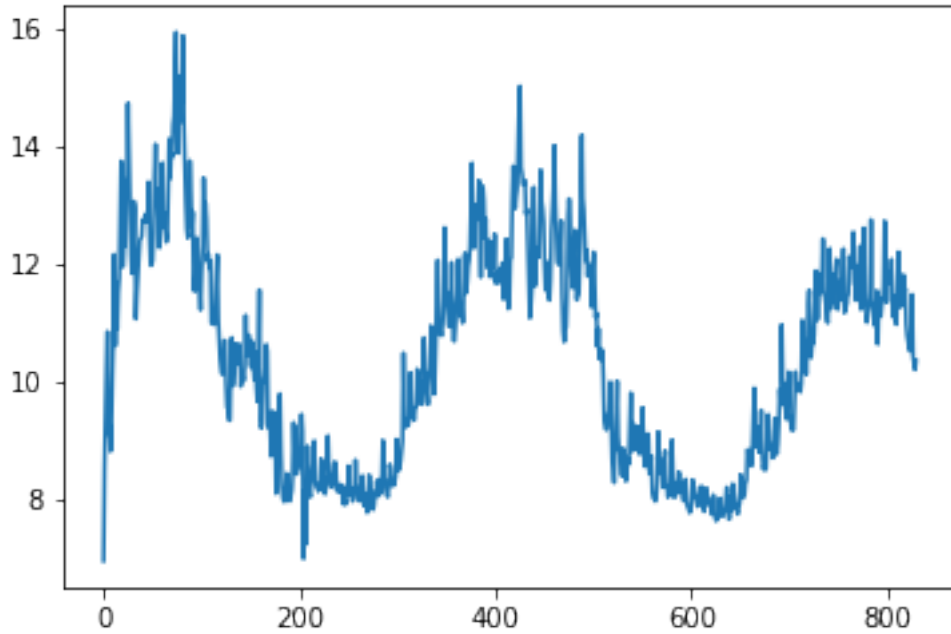
	apparentTemperatureMin	humidity	pressure	sunsetTimeHour	cloudCover	\
0	2.18	0.93	1027.12	16	0.36	
1	7.01	0.89	1027.22	16	0.41	
2	4.84	0.79	1024.47	16	0.48	
3	4.69	0.81	1025.80	16	0.44	
4	2.94	0.72	1021.11	16	0.42	

	presSunCloud
0	-0.499610
1	-0.349430
2	0.004989
3	-0.185493
4	-0.013602

```
In [ ]:
```

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

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



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

```

daily_dia

```
Out[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	
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	sunsetTimeHour	cloudCover	\
0	2.18	0.93	1027.12	16	0.36	
1	7.01	0.89	1027.22	16	0.41	
2	4.84	0.79	1024.47	16	0.48	
3	4.69	0.81	1025.80	16	0.44	
4	2.94	0.72	1021.11	16	0.42	
5	1.31	0.86	1022.80	15	0.56	
6	3.39	0.82	1009.70	15	0.60	
7	3.34	0.78	1019.43	15	0.31	
8	5.29	0.82	1007.12	15	0.57	
9	0.46	0.87	1012.12	15	0.32	
10	4.71	0.79	1003.55	15	0.54	
11	1.03	0.82	1001.15	15	0.36	
12	-1.69	0.77	1006.01	15	0.20	
13	-1.61	0.83	1007.32	15	0.34	
14	0.94	0.68	1008.76	15	0.29	
15	0.63	0.81	1010.84	15	0.53	
16	-1.42	0.71	1010.60	15	0.15	
17	-3.42	0.81	1015.58	15	0.17	
18	0.11	0.88	1007.71	15	0.56	
19	-0.64	0.84	1002.47	15	0.38	
20	0.22	0.75	990.27	15	0.42	
21	0.78	0.79	994.48	15	0.36	
22	1.07	0.77	996.75	15	0.42	
23	-2.65	0.88	988.10	15	0.70	
24	-3.56	0.86	1008.46	15	0.37	
25	-4.12	0.84	1016.37	15	0.22	
26	-3.67	0.94	1014.39	15	0.47	
27	1.68	0.81	1015.09	15	0.48	

28	3.84	0.94	1017.91	15	0.67
29	5.37	0.87	1024.71	15	0.38
..
800	0.18	0.90	993.99	16	0.93
801	0.61	0.91	1001.76	16	0.81
802	0.29	0.91	998.51	16	0.73
803	1.10	0.76	990.08	16	0.19
804	3.21	0.72	1005.39	16	0.22
805	1.96	0.79	1003.89	16	0.47
806	1.12	0.75	996.87	16	0.42
807	1.03	0.77	982.20	16	0.73
808	1.96	0.82	989.90	16	0.67
809	-0.86	0.79	988.77	17	0.63
810	2.19	0.77	979.25	17	0.47
811	1.38	0.66	984.71	17	0.52
812	0.89	0.84	992.84	17	0.55
813	-0.57	0.76	996.66	17	0.41
814	-1.20	0.75	994.27	17	0.59
815	0.05	0.68	992.43	17	0.36
816	0.45	0.81	990.31	17	0.67
817	1.77	0.69	988.63	17	0.35
818	-1.03	0.76	1006.70	17	0.13
819	2.84	0.83	1007.80	17	0.56
820	3.83	0.87	1008.67	17	0.57
821	2.65	0.87	1011.57	17	0.64
822	3.95	0.84	1001.54	17	0.61
823	0.19	0.72	1003.42	17	0.22
824	1.59	0.71	1009.09	17	0.25
825	5.53	0.76	1010.37	17	0.66
826	5.52	0.74	1005.19	17	0.50
827	3.89	0.78	1000.65	17	0.62
828	1.67	0.73	1012.73	17	0.26
829	1.41	0.74	1007.02	17	0.32

	presSunCloud	...	presSunCloud(t-5)	presSunCloud(t-6)	\
0	-0.499610	...	NaN	NaN	
1	-0.349430	...	NaN	NaN	
2	0.004989	...	NaN	NaN	
3	-0.185493	...	NaN	NaN	
4	-0.013602	...	NaN	NaN	
5	0.693988	...	-0.499610	NaN	
6	1.471611	...	-0.349430	-0.499610	
7	0.086255	...	0.004989	-0.349430	
8	1.507211	...	-0.185493	0.004989	
9	0.481945	...	-0.013602	-0.185493	
10	1.592198	...	0.693988	-0.013602	
11	1.153313	...	1.471611	0.693988	
12	0.414334	...	0.086255	1.471611	

13	0.783458	...	1.507211	0.086255
14	0.556456	...	0.481945	1.507211
15	1.197506	...	1.592198	0.481945
16	0.030195	...	1.153313	1.592198
17	-0.156162	...	0.414334	1.153313
18	1.446746	...	0.783458	0.414334
19	1.149533	...	0.556456	0.783458
20	1.882260	...	1.197506	0.556456
21	1.486043	...	0.030195	1.197506
22	1.559008	...	-0.156162	0.030195
23	2.859454	...	1.446746	-0.156162
24	0.819691	...	1.149533	1.446746
25	-0.040402	...	1.882260	1.149533
26	0.834213	...	1.486043	1.882260
27	0.830328	...	1.559008	1.486043
28	1.279295	...	2.859454	1.559008
29	0.040101	...	0.819691	2.859454
..
800	2.921989	...	0.717972	0.111054
801	2.161981	...	0.479967	0.717972
802	2.075835	...	0.872636	0.479967
803	0.820539	...	1.420656	0.872636
804	0.149908	...	2.360909	1.420656
805	1.000579	...	2.921989	2.360909
806	1.195600	...	2.161981	2.921989
807	2.889452	...	2.075835	2.161981
808	2.319139	...	0.820539	2.075835
809	1.893951	...	0.149908	0.820539
810	1.872312	...	1.000579	0.149908
811	1.755111	...	1.195600	1.000579
812	1.442651	...	2.889452	1.195600
813	0.817620	...	2.319139	2.889452
814	1.495451	...	1.893951	2.319139
815	0.873462	...	1.872312	1.893951
816	1.941264	...	1.755111	1.872312
817	1.031990	...	1.442651	1.755111
818	-0.552167	...	0.817620	1.442651
819	0.727412	...	1.495451	0.817620
820	0.715046	...	0.873462	1.495451
821	0.787618	...	1.941264	0.873462
822	1.194858	...	1.031990	1.941264
823	-0.109241	...	-0.552167	1.031990
824	-0.298985	...	0.727412	-0.552167
825	0.909546	...	0.715046	0.727412
826	0.671408	...	0.787618	0.715046
827	1.270289	...	1.194858	0.787618
828	-0.449531	...	-0.109241	1.194858
829	0.021512	...	-0.298985	-0.109241

	presSunCloud(t-7)	presSunCloud(t-8)	presSunCloud(t-9)	\
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	-0.499610	NaN	NaN	
8	-0.349430	-0.499610	NaN	
9	0.004989	-0.349430	-0.499610	
10	-0.185493	0.004989	-0.349430	
11	-0.013602	-0.185493	0.004989	
12	0.693988	-0.013602	-0.185493	
13	1.471611	0.693988	-0.013602	
14	0.086255	1.471611	0.693988	
15	1.507211	0.086255	1.471611	
16	0.481945	1.507211	0.086255	
17	1.592198	0.481945	1.507211	
18	1.153313	1.592198	0.481945	
19	0.414334	1.153313	1.592198	
20	0.783458	0.414334	1.153313	
21	0.556456	0.783458	0.414334	
22	1.197506	0.556456	0.783458	
23	0.030195	1.197506	0.556456	
24	-0.156162	0.030195	1.197506	
25	1.446746	-0.156162	0.030195	
26	1.149533	1.446746	-0.156162	
27	1.882260	1.149533	1.446746	
28	1.486043	1.882260	1.149533	
29	1.559008	1.486043	1.882260	
..	
800	1.542647	0.378962	-0.120993	
801	0.111054	1.542647	0.378962	
802	0.717972	0.111054	1.542647	
803	0.479967	0.717972	0.111054	
804	0.872636	0.479967	0.717972	
805	1.420656	0.872636	0.479967	
806	2.360909	1.420656	0.872636	
807	2.921989	2.360909	1.420656	
808	2.161981	2.921989	2.360909	
809	2.075835	2.161981	2.921989	
810	0.820539	2.075835	2.161981	
811	0.149908	0.820539	2.075835	
812	1.000579	0.149908	0.820539	
813	1.195600	1.000579	0.149908	
814	2.889452	1.195600	1.000579	

815	2.319139	2.889452	1.195600
816	1.893951	2.319139	2.889452
817	1.872312	1.893951	2.319139
818	1.755111	1.872312	1.893951
819	1.442651	1.755111	1.872312
820	0.817620	1.442651	1.755111
821	1.495451	0.817620	1.442651
822	0.873462	1.495451	0.817620
823	1.941264	0.873462	1.495451
824	1.031990	1.941264	0.873462
825	-0.552167	1.031990	1.941264
826	0.727412	-0.552167	1.031990
827	0.715046	0.727412	-0.552167
828	0.787618	0.715046	0.727412
829	1.194858	0.787618	0.715046

	presSunCloud(t-10)	presSunCloud(t-11)	presSunCloud(t-12)	\
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	-0.499610	NaN	NaN	
11	-0.349430	-0.499610	NaN	
12	0.004989	-0.349430	-0.499610	
13	-0.185493	0.004989	-0.349430	
14	-0.013602	-0.185493	0.004989	
15	0.693988	-0.013602	-0.185493	
16	1.471611	0.693988	-0.013602	
17	0.086255	1.471611	0.693988	
18	1.507211	0.086255	1.471611	
19	0.481945	1.507211	0.086255	
20	1.592198	0.481945	1.507211	
21	1.153313	1.592198	0.481945	
22	0.414334	1.153313	1.592198	
23	0.783458	0.414334	1.153313	
24	0.556456	0.783458	0.414334	
25	1.197506	0.556456	0.783458	
26	0.030195	1.197506	0.556456	
27	-0.156162	0.030195	1.197506	
28	1.446746	-0.156162	0.030195	
29	1.149533	1.446746	-0.156162	
..	

800	0.983640	1.240756	1.653567
801	-0.120993	0.983640	1.240756
802	0.378962	-0.120993	0.983640
803	1.542647	0.378962	-0.120993
804	0.111054	1.542647	0.378962
805	0.717972	0.111054	1.542647
806	0.479967	0.717972	0.111054
807	0.872636	0.479967	0.717972
808	1.420656	0.872636	0.479967
809	2.360909	1.420656	0.872636
810	2.921989	2.360909	1.420656
811	2.161981	2.921989	2.360909
812	2.075835	2.161981	2.921989
813	0.820539	2.075835	2.161981
814	0.149908	0.820539	2.075835
815	1.000579	0.149908	0.820539
816	1.195600	1.000579	0.149908
817	2.889452	1.195600	1.000579
818	2.319139	2.889452	1.195600
819	1.893951	2.319139	2.889452
820	1.872312	1.893951	2.319139
821	1.755111	1.872312	1.893951
822	1.442651	1.755111	1.872312
823	0.817620	1.442651	1.755111
824	1.495451	0.817620	1.442651
825	0.873462	1.495451	0.817620
826	1.941264	0.873462	1.495451
827	1.031990	1.941264	0.873462
828	-0.552167	1.031990	1.941264
829	0.727412	-0.552167	1.031990

	presSunCloud(t-13)	presSunCloud(t-14)
0	NaN	NaN
1	NaN	NaN
2	NaN	NaN
3	NaN	NaN
4	NaN	NaN
5	NaN	NaN
6	NaN	NaN
7	NaN	NaN
8	NaN	NaN
9	NaN	NaN
10	NaN	NaN
11	NaN	NaN
12	NaN	NaN
13	-0.499610	NaN
14	-0.349430	-0.499610
15	0.004989	-0.349430

16	-0.185493	0.004989
17	-0.013602	-0.185493
18	0.693988	-0.013602
19	1.471611	0.693988
20	0.086255	1.471611
21	1.507211	0.086255
22	0.481945	1.507211
23	1.592198	0.481945
24	1.153313	1.592198
25	0.414334	1.153313
26	0.783458	0.414334
27	0.556456	0.783458
28	1.197506	0.556456
29	0.030195	1.197506
..
800	2.009904	2.196977
801	1.653567	2.009904
802	1.240756	1.653567
803	0.983640	1.240756
804	-0.120993	0.983640
805	0.378962	-0.120993
806	1.542647	0.378962
807	0.111054	1.542647
808	0.717972	0.111054
809	0.479967	0.717972
810	0.872636	0.479967
811	1.420656	0.872636
812	2.360909	1.420656
813	2.921989	2.360909
814	2.161981	2.921989
815	2.075835	2.161981
816	0.820539	2.075835
817	0.149908	0.820539
818	1.000579	0.149908
819	1.195600	1.000579
820	2.889452	1.195600
821	2.319139	2.889452
822	1.893951	2.319139
823	1.872312	1.893951
824	1.755111	1.872312
825	1.442651	1.755111
826	0.817620	1.442651
827	1.495451	0.817620
828	0.873462	1.495451
829	1.941264	0.873462

[830 rows x 80 columns]

```
In [11]: #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','apparentTemperatureMax'])
daily_dia.head(5)
```

```
Out[11]:
```

	energy_sum	t-1	t-2	t-3	t-4	t-5	t-6	t-7	t-8	\
0	6.952692	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
1	8.536480	6.952692	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
2	9.499781	8.536480	6.952692	NaN	NaN	NaN	NaN	NaN	NaN	
3	10.267707	9.499781	8.536480	6.952692	NaN	NaN	NaN	NaN	NaN	
4	10.850805	10.267707	9.499781	8.536480	6.952692	NaN	NaN	NaN	NaN	

	t-9	...	presSunCloud(t-5)	presSunCloud(t-6)	presSunCloud(t-7)	\
0	NaN	...	NaN	NaN	NaN	
1	NaN	...	NaN	NaN	NaN	
2	NaN	...	NaN	NaN	NaN	
3	NaN	...	NaN	NaN	NaN	
4	NaN	...	NaN	NaN	NaN	

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

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

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

[5 rows x 71 columns]

```
In [12]: #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[12]:
```

	energy_sum	t-1	t-2	t-3	t-4	t-5	\
14	10.889362	11.673417	10.609714	12.163127	10.780273	10.145910	

15	11.525150	10.889362	11.673417	10.609714	12.163127	10.780273
16	11.759837	11.525150	10.889362	11.673417	10.609714	12.163127
17	12.633801	11.759837	11.525150	10.889362	11.673417	10.609714
18	13.749174	12.633801	11.759837	11.525150	10.889362	11.673417

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

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

	presSunCloud(t-9)	presSunCloud(t-10)	presSunCloud(t-11) \
14	0.693988	-0.013602	-0.185493
15	1.471611	0.693988	-0.013602
16	0.086255	1.471611	0.693988
17	1.507211	0.086255	1.471611
18	0.481945	1.507211	0.086255

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

[5 rows x 71 columns]

In [13]: `len(daily_dia)`

Out[13]: 816

In [14]: `#normalitzem`

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

In [15]: `#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 [51]: # 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'])

In [52]: 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, preditrain))
llista_scoretrain.append(trainScore )
```

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

```
sumScores=sumScores+testScore
```

```
In [54]: #Dividim la suma de scores de test entre el nombre de prediccions per obtenir la mitja
sumScores/(lenght-n_train)
```

```
Out [54]: 0.033316675041634276
```

```
In [34]: llista_scores
```

```
Out [34]: [0.0018731050269655825,
0.0004130127271630979,
0.0001350345544830489,
0.001940242391487823,
0.0023764179453218404,
0.003626519726867228,
0.008451423941041147,
0.0017853031287264898,
0.006028358273604262,
0.02372993469874496,
0.00724238398432675,
0.0032857645468566954,
0.005024914567145711,
0.0011911436916023366,
0.0017384305016798773,
0.009627132615297684,
0.005008973563262575,
0.002788625275543577,
0.012126589127884557,
0.0036447698682697816,
6.190498451696946e-05,
0.0007925806883666286,
0.0022148440345832743,
0.005707398315594414,
0.0032440574216556772,
0.01063960565812705,
0.0025989032949769175,
0.001535944969907721,
0.011250212789308378,
0.005196471201250441,
0.005561101801227597,
0.007687609805147488,
```

0.029968878654452302,
0.007115857513840584,
0.02152875960162115,
0.01856668225872027,
0.013044263224427421,
0.004122668431456145,
0.00046844631209119747,
0.00596571646024735,
0.008162193783750271,
0.004649099453419292,
0.005154794722493028,
0.009574994224071709,
0.0008483862255239671,
0.0023709400653020296,
0.0046697693517110395,
0.005459434272820696,
0.0008308207356606534,
0.0016915689432548398,
0.010229280338643454,
0.006691490465443373,
0.01166171451817788,
0.01145516499694621,
0.0026589237604934812,
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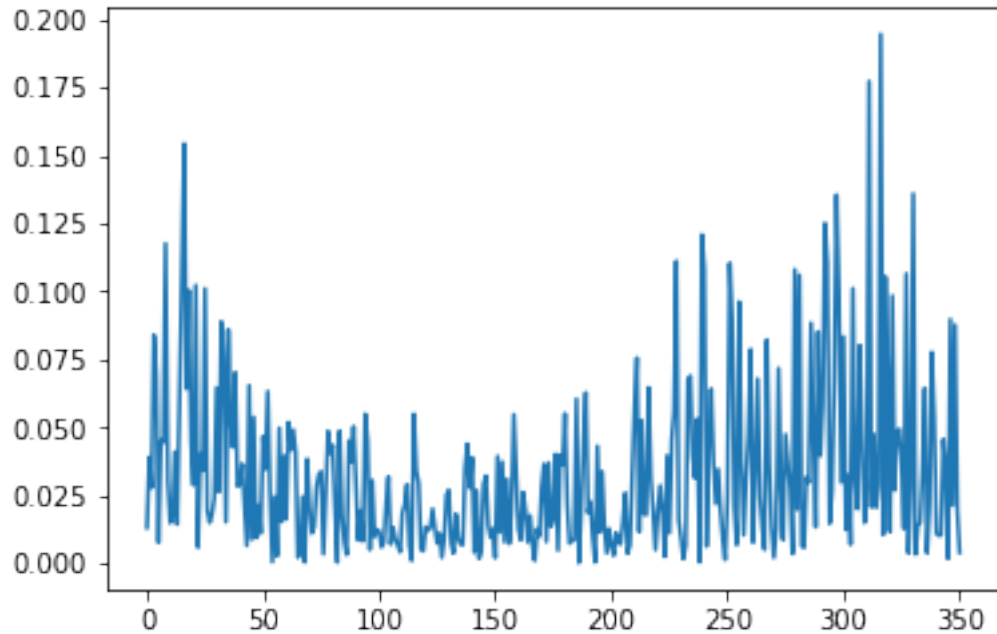
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```

```
In [55]: plt.plot(llista_scores)
```

```
Out[55]: [<matplotlib.lines.Line2D at 0x2497279f860>]
```



```
In [56]: predis=list()
```

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

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

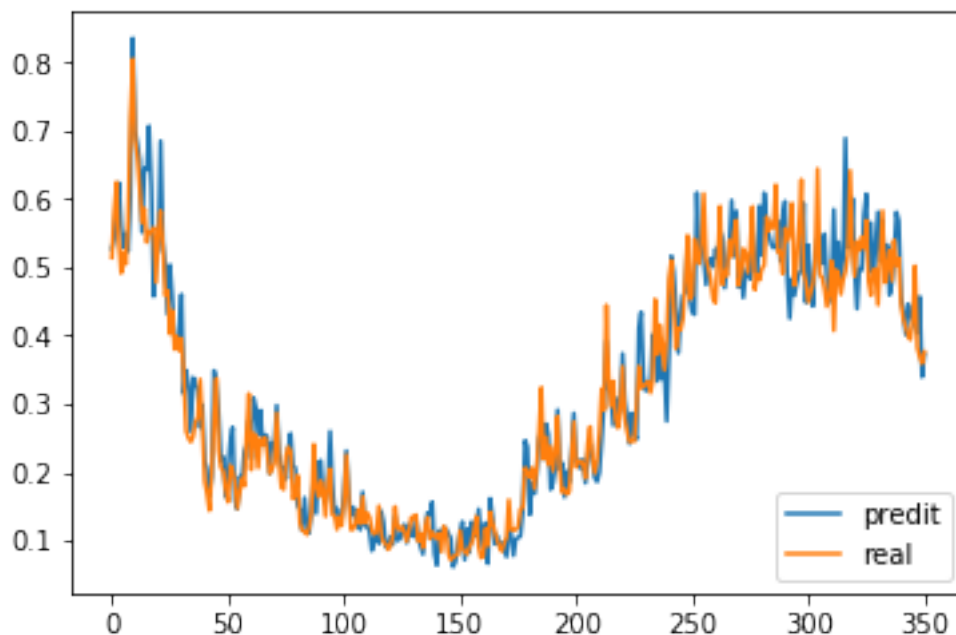
```
predis
```

```
Out [56]: array([0.52706063, 0.5417161 , 0.59666014, 0.62310904, 0.56044316,
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```

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0.37227541])
```

```
In [57]: ##Mostrem
plt.plot(predis, label="predit")
plt.plot(y_daily[n_train:lenght], label="real")
plt.legend(loc="lower right")
plt.show()
```



```
In [58]: #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[58]:
```

	predi	y	t-2	t-3	t-4	t-5	\
479	0.527061	0.514061	12.119938	12.852295	13.106773	12.823073	
480	0.541716	0.580609	11.786082	12.119938	12.852295	13.106773	
481	0.596660	0.624326	11.590859	11.786082	12.119938	12.852295	
482	0.623109	0.539280	12.186487	11.590859	11.786082	12.119938	
483	0.560443	0.491355	12.577783	12.186487	11.590859	11.786082	
484	0.529681	0.522145	11.816573	12.577783	12.186487	11.590859	
485	0.549475	0.504442	11.387627	11.816573	12.577783	12.186487	
486	0.523388	0.567725	11.663214	11.387627	11.816573	12.577783	
487	0.601968	0.719460	11.504756	11.663214	11.387627	11.816573	
488	0.834908	0.804631	12.071173	11.504756	11.663214	11.387627	
489	0.699499	0.684716	13.429271	12.071173	11.504756	11.663214	
490	0.679819	0.662177	14.191591	13.429271	12.071173	11.504756	
491	0.656110	0.615194	13.118295	14.191591	13.429271	12.071173	
492	0.551172	0.565466	12.916559	13.118295	14.191591	13.429271	
493	0.644543	0.585646	12.496044	12.916559	13.118295	14.191591	
494	0.642029	0.536523	12.050954	12.496044	12.916559	13.118295	
495	0.706498	0.552256	12.231576	12.050954	12.496044	12.916559	
496	0.616397	0.552256	11.791904	12.231576	12.050954	12.496044	
497	0.457459	0.557809	11.932721	11.791904	12.231576	12.050954	
498	0.522487	0.477794	11.932721	11.932721	11.791904	12.231576	
499	0.522500	0.551195	11.982423	11.932721	11.932721	11.791904	
500	0.684497	0.582339	11.266252	11.982423	11.932721	11.932721	
501	0.535569	0.529772	11.923226	11.266252	11.982423	11.932721	
502	0.498951	0.458904	12.201972	11.923226	11.266252	11.982423	
503	0.431752	0.465733	11.731479	12.201972	11.923226	11.266252	
504	0.503547	0.402622	11.097177	11.731479	12.201972	11.923226	

505	0.456393	0.436918	11.158295	11.097177	11.731479	12.201972
506	0.394945	0.380048	10.593420	11.158295	11.097177	11.731479
507	0.380883	0.398860	10.900388	10.593420	11.158295	11.097177
508	0.401857	0.377916	10.391372	10.900388	10.593420	11.158295
..
800	0.439174	0.537515	11.753871	12.729659	11.620778	11.409880
801	0.497807	0.524598	11.344805	11.753871	12.729659	11.620778
802	0.495360	0.543903	11.800777	11.344805	11.753871	12.729659
803	0.576694	0.527438	11.685169	11.800777	11.344805	11.753871
804	0.606856	0.568506	11.857957	11.685169	11.800777	11.344805
805	0.491998	0.479332	11.710582	11.857957	11.685169	11.800777
806	0.565134	0.458726	12.078164	11.710582	11.857957	11.685169
807	0.490744	0.494425	11.280011	12.078164	11.710582	11.857957
808	0.526065	0.497810	11.095584	11.280011	12.078164	11.710582
809	0.580801	0.444954	11.415105	11.095584	11.280011	12.078164
810	0.508417	0.511653	11.445403	11.415105	11.095584	11.280011
811	0.568511	0.582450	10.972318	11.445403	11.415105	11.095584
812	0.492298	0.477562	11.569300	10.972318	11.445403	11.415105
813	0.532526	0.498620	12.202967	11.569300	10.972318	11.445403
814	0.459589	0.523920	11.264175	12.202967	11.569300	10.972318
815	0.476238	0.479971	11.452649	11.264175	12.202967	11.569300
816	0.518294	0.539318	11.679099	11.452649	11.264175	12.202967
817	0.580420	0.502845	11.285737	11.679099	11.452649	11.264175
818	0.567114	0.513089	11.816914	11.285737	11.679099	11.452649
819	0.456650	0.445764	11.490470	11.816914	11.285737	11.679099
820	0.433837	0.423680	11.582159	11.490470	11.816914	11.285737
821	0.401419	0.411694	10.979566	11.582159	11.490470	11.816914
822	0.445917	0.400434	10.781898	10.979566	11.582159	11.490470
823	0.430118	0.394209	10.674624	10.781898	10.979566	11.582159
824	0.421391	0.423048	10.573835	10.674624	10.781898	10.979566
825	0.412070	0.501722	10.518126	10.573835	10.674624	10.781898
826	0.403499	0.382286	10.776242	10.518126	10.573835	10.674624
827	0.456866	0.369280	11.480411	10.776242	10.518126	10.573835
828	0.339515	0.358995	10.411403	11.480411	10.776242	10.518126
829	0.372275	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	...	1.596041
480	12.823073	11.559878	10.930170	10.889469	...	0.878485
481	13.106773	12.823073	11.559878	10.930170	...	0.256542
482	12.852295	13.106773	12.823073	11.559878	...	-0.358829
483	12.119938	12.852295	13.106773	12.823073	...	-0.917592
484	11.786082	12.119938	12.852295	13.106773	...	0.659271
485	11.590859	11.786082	12.119938	12.852295	...	1.358076
486	12.186487	11.590859	11.786082	12.119938	...	1.489244
487	12.577783	12.186487	11.590859	11.786082	...	1.020850
488	11.816573	12.577783	12.186487	11.590859	...	0.976403
489	11.387627	11.816573	12.577783	12.186487	...	1.105610

490	11.663214	11.387627	11.816573	12.577783	...	0.118101
491	11.504756	11.663214	11.387627	11.816573	...	0.673660
492	12.071173	11.504756	11.663214	11.387627	...	1.167706
493	13.429271	12.071173	11.504756	11.663214	...	0.955985
494	14.191591	13.429271	12.071173	11.504756	...	0.419143
495	13.118295	14.191591	13.429271	12.071173	...	0.494574
496	12.916559	13.118295	14.191591	13.429271	...	-0.069338
497	12.496044	12.916559	13.118295	14.191591	...	-0.040693
498	12.050954	12.496044	12.916559	13.118295	...	0.309447
499	12.231576	12.050954	12.496044	12.916559	...	0.501741
500	11.791904	12.231576	12.050954	12.496044	...	0.215453
501	11.932721	11.791904	12.231576	12.050954	...	-0.463770
502	11.932721	11.932721	11.791904	12.231576	...	-1.087937
503	11.982423	11.932721	11.932721	11.791904	...	-0.450273
504	11.266252	11.982423	11.932721	11.932721	...	0.018698
505	11.923226	11.266252	11.982423	11.932721	...	0.218580
506	12.201972	11.923226	11.266252	11.982423	...	-1.429330
507	11.731479	12.201972	11.923226	11.266252	...	-0.753599
508	11.097177	11.731479	12.201972	11.923226	...	-0.152911
..
800	11.300414	11.109560	11.370601	11.430883	...	0.717972
801	11.409880	11.300414	11.109560	11.370601	...	0.479967
802	11.620778	11.409880	11.300414	11.109560	...	0.872636
803	12.729659	11.620778	11.409880	11.300414	...	1.420656
804	11.753871	12.729659	11.620778	11.409880	...	2.360909
805	11.344805	11.753871	12.729659	11.620778	...	2.921989
806	11.800777	11.344805	11.753871	12.729659	...	2.161981
807	11.685169	11.800777	11.344805	11.753871	...	2.075835
808	11.857957	11.685169	11.800777	11.344805	...	0.820539
809	11.710582	11.857957	11.685169	11.800777	...	0.149908
810	12.078164	11.710582	11.857957	11.685169	...	1.000579
811	11.280011	12.078164	11.710582	11.857957	...	1.195600
812	11.095584	11.280011	12.078164	11.710582	...	2.889452
813	11.415105	11.095584	11.280011	12.078164	...	2.319139
814	11.445403	11.415105	11.095584	11.280011	...	1.893951
815	10.972318	11.445403	11.415105	11.095584	...	1.872312
816	11.569300	10.972318	11.445403	11.415105	...	1.755111
817	12.202967	11.569300	10.972318	11.445403	...	1.442651
818	11.264175	12.202967	11.569300	10.972318	...	0.817620
819	11.452649	11.264175	12.202967	11.569300	...	1.495451
820	11.679099	11.452649	11.264175	12.202967	...	0.873462
821	11.285737	11.679099	11.452649	11.264175	...	1.941264
822	11.816914	11.285737	11.679099	11.452649	...	1.031990
823	11.490470	11.816914	11.285737	11.679099	...	-0.552167
824	11.582159	11.490470	11.816914	11.285737	...	0.727412
825	10.979566	11.582159	11.490470	11.816914	...	0.715046
826	10.781898	10.979566	11.582159	11.490470	...	0.787618
827	10.674624	10.781898	10.979566	11.582159	...	1.194858

828	10.573835	10.674624	10.781898	10.979566	...	-0.109241
829	10.518126	10.573835	10.674624	10.781898	...	-0.298985

	presSunCloud(t-6)	presSunCloud(t-7)	presSunCloud(t-8)	\
479	1.865235	2.076141	1.640566	
480	1.596041	1.865235	2.076141	
481	0.878485	1.596041	1.865235	
482	0.256542	0.878485	1.596041	
483	-0.358829	0.256542	0.878485	
484	-0.917592	-0.358829	0.256542	
485	0.659271	-0.917592	-0.358829	
486	1.358076	0.659271	-0.917592	
487	1.489244	1.358076	0.659271	
488	1.020850	1.489244	1.358076	
489	0.976403	1.020850	1.489244	
490	1.105610	0.976403	1.020850	
491	0.118101	1.105610	0.976403	
492	0.673660	0.118101	1.105610	
493	1.167706	0.673660	0.118101	
494	0.955985	1.167706	0.673660	
495	0.419143	0.955985	1.167706	
496	0.494574	0.419143	0.955985	
497	-0.069338	0.494574	0.419143	
498	-0.040693	-0.069338	0.494574	
499	0.309447	-0.040693	-0.069338	
500	0.501741	0.309447	-0.040693	
501	0.215453	0.501741	0.309447	
502	-0.463770	0.215453	0.501741	
503	-1.087937	-0.463770	0.215453	
504	-0.450273	-1.087937	-0.463770	
505	0.018698	-0.450273	-1.087937	
506	0.218580	0.018698	-0.450273	
507	-1.429330	0.218580	0.018698	
508	-0.753599	-1.429330	0.218580	
..	
800	0.111054	1.542647	0.378962	
801	0.717972	0.111054	1.542647	
802	0.479967	0.717972	0.111054	
803	0.872636	0.479967	0.717972	
804	1.420656	0.872636	0.479967	
805	2.360909	1.420656	0.872636	
806	2.921989	2.360909	1.420656	
807	2.161981	2.921989	2.360909	
808	2.075835	2.161981	2.921989	
809	0.820539	2.075835	2.161981	
810	0.149908	0.820539	2.075835	
811	1.000579	0.149908	0.820539	
812	1.195600	1.000579	0.149908	

813	2.889452	1.195600	1.000579
814	2.319139	2.889452	1.195600
815	1.893951	2.319139	2.889452
816	1.872312	1.893951	2.319139
817	1.755111	1.872312	1.893951
818	1.442651	1.755111	1.872312
819	0.817620	1.442651	1.755111
820	1.495451	0.817620	1.442651
821	0.873462	1.495451	0.817620
822	1.941264	0.873462	1.495451
823	1.031990	1.941264	0.873462
824	-0.552167	1.031990	1.941264
825	0.727412	-0.552167	1.031990
826	0.715046	0.727412	-0.552167
827	0.787618	0.715046	0.727412
828	1.194858	0.787618	0.715046
829	-0.109241	1.194858	0.787618

	presSunCloud(t-9)	presSunCloud(t-10)	presSunCloud(t-11) \
479	-0.128225	-0.476946	-0.468881
480	1.640566	-0.128225	-0.476946
481	2.076141	1.640566	-0.128225
482	1.865235	2.076141	1.640566
483	1.596041	1.865235	2.076141
484	0.878485	1.596041	1.865235
485	0.256542	0.878485	1.596041
486	-0.358829	0.256542	0.878485
487	-0.917592	-0.358829	0.256542
488	0.659271	-0.917592	-0.358829
489	1.358076	0.659271	-0.917592
490	1.489244	1.358076	0.659271
491	1.020850	1.489244	1.358076
492	0.976403	1.020850	1.489244
493	1.105610	0.976403	1.020850
494	0.118101	1.105610	0.976403
495	0.673660	0.118101	1.105610
496	1.167706	0.673660	0.118101
497	0.955985	1.167706	0.673660
498	0.419143	0.955985	1.167706
499	0.494574	0.419143	0.955985
500	-0.069338	0.494574	0.419143
501	-0.040693	-0.069338	0.494574
502	0.309447	-0.040693	-0.069338
503	0.501741	0.309447	-0.040693
504	0.215453	0.501741	0.309447
505	-0.463770	0.215453	0.501741
506	-1.087937	-0.463770	0.215453
507	-0.450273	-1.087937	-0.463770

508	0.018698	-0.450273	-1.087937
...
800	-0.120993	0.983640	1.240756
801	0.378962	-0.120993	0.983640
802	1.542647	0.378962	-0.120993
803	0.111054	1.542647	0.378962
804	0.717972	0.111054	1.542647
805	0.479967	0.717972	0.111054
806	0.872636	0.479967	0.717972
807	1.420656	0.872636	0.479967
808	2.360909	1.420656	0.872636
809	2.921989	2.360909	1.420656
810	2.161981	2.921989	2.360909
811	2.075835	2.161981	2.921989
812	0.820539	2.075835	2.161981
813	0.149908	0.820539	2.075835
814	1.000579	0.149908	0.820539
815	1.195600	1.000579	0.149908
816	2.889452	1.195600	1.000579
817	2.319139	2.889452	1.195600
818	1.893951	2.319139	2.889452
819	1.872312	1.893951	2.319139
820	1.755111	1.872312	1.893951
821	1.442651	1.755111	1.872312
822	0.817620	1.442651	1.755111
823	1.495451	0.817620	1.442651
824	0.873462	1.495451	0.817620
825	1.941264	0.873462	1.495451
826	1.031990	1.941264	0.873462
827	-0.552167	1.031990	1.941264
828	0.727412	-0.552167	1.031990
829	0.715046	0.727412	-0.552167

	presSunCloud(t-12)	presSunCloud(t-13)	presSunCloud(t-14)
479	0.005295	0.046544	0.498792
480	-0.468881	0.005295	0.046544
481	-0.476946	-0.468881	0.005295
482	-0.128225	-0.476946	-0.468881
483	1.640566	-0.128225	-0.476946
484	2.076141	1.640566	-0.128225
485	1.865235	2.076141	1.640566
486	1.596041	1.865235	2.076141
487	0.878485	1.596041	1.865235
488	0.256542	0.878485	1.596041
489	-0.358829	0.256542	0.878485
490	-0.917592	-0.358829	0.256542
491	0.659271	-0.917592	-0.358829
492	1.358076	0.659271	-0.917592

493	1.489244	1.358076	0.659271
494	1.020850	1.489244	1.358076
495	0.976403	1.020850	1.489244
496	1.105610	0.976403	1.020850
497	0.118101	1.105610	0.976403
498	0.673660	0.118101	1.105610
499	1.167706	0.673660	0.118101
500	0.955985	1.167706	0.673660
501	0.419143	0.955985	1.167706
502	0.494574	0.419143	0.955985
503	-0.069338	0.494574	0.419143
504	-0.040693	-0.069338	0.494574
505	0.309447	-0.040693	-0.069338
506	0.501741	0.309447	-0.040693
507	0.215453	0.501741	0.309447
508	-0.463770	0.215453	0.501741
..
800	1.653567	2.009904	2.196977
801	1.240756	1.653567	2.009904
802	0.983640	1.240756	1.653567
803	-0.120993	0.983640	1.240756
804	0.378962	-0.120993	0.983640
805	1.542647	0.378962	-0.120993
806	0.111054	1.542647	0.378962
807	0.717972	0.111054	1.542647
808	0.479967	0.717972	0.111054
809	0.872636	0.479967	0.717972
810	1.420656	0.872636	0.479967
811	2.360909	1.420656	0.872636
812	2.921989	2.360909	1.420656
813	2.161981	2.921989	2.360909
814	2.075835	2.161981	2.921989
815	0.820539	2.075835	2.161981
816	0.149908	0.820539	2.075835
817	1.000579	0.149908	0.820539
818	1.195600	1.000579	0.149908
819	2.889452	1.195600	1.000579
820	2.319139	2.889452	1.195600
821	1.893951	2.319139	2.889452
822	1.872312	1.893951	2.319139
823	1.755111	1.872312	1.893951
824	1.442651	1.755111	1.872312
825	0.817620	1.442651	1.755111
826	1.495451	0.817620	1.442651
827	0.873462	1.495451	0.817620
828	1.941264	0.873462	1.495451
829	1.031990	1.941264	0.873462

[351 rows x 71 columns]

In [59]: *# 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

```
[ [ 1.17072077e+01  1.15908592e+01  1.15468930e+02 ... -2.86435806e+00
   -2.62099493e+00  4.71886479e-02]
 [ 1.18383810e+01  1.21864869e+01  1.12480758e+02 ... -5.66190995e+00
   -2.86435806e+00 -2.62099493e+00]
 [ 1.23301561e+01  1.25777826e+01  1.10733424e+02 ... -5.70949304e+00
   -5.66190995e+00 -2.86435806e+00]
 ...
 [ 1.10789286e+01  1.02949966e+01  1.09744859e+02 ...  2.25767498e+00
   5.92729799e+00  1.92821247e+00]
 [ 1.00285815e+01  1.02029453e+01  1.00176736e+02 ...  8.55751381e+00
   2.25767498e+00  5.92729799e+00]
 [ 1.03218070e+01  1.03563499e+01  9.91348430e+01 ...  3.19295870e+00
   8.55751381e+00  2.25767498e+00]]
11.707207664200558
11.590859170709699
```

In [60]: *#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 [60]: [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,
11.266251710893302,
11.923225859637402,
12.2019722473821,
11.7314792668086,
11.097177003906697,
11.158295184648098,
10.593420449120199,
10.900387923175302,
10.391371941845799,
10.5597506942169,
10.3722930491566,
10.531617352131999,
10.0442564420545,
9.3196743918969,
9.22987664514932,
9.17927174876646,
9.25026850964928,
9.44901226100687,
9.48570009257196,
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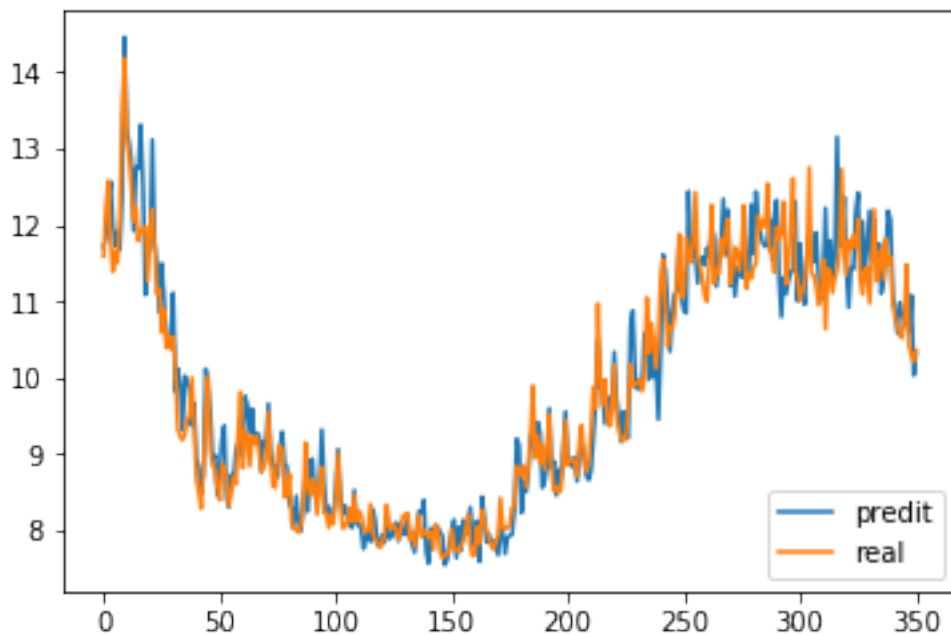
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```

```
In [61]: ##Mostrem  
plt.plot(listpredi, label="predit")  
plt.plot(listy, label="real")  
plt.legend(loc="lower right")  
plt.show()
```



```
In [42]: print(listy[300])  
         print(listpredi[300])  
  
         print(listy[300]-listpredi[300])  
         (listy[300]-listpredi[300])/listy[300]
```

```
11.0061509800784  
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```

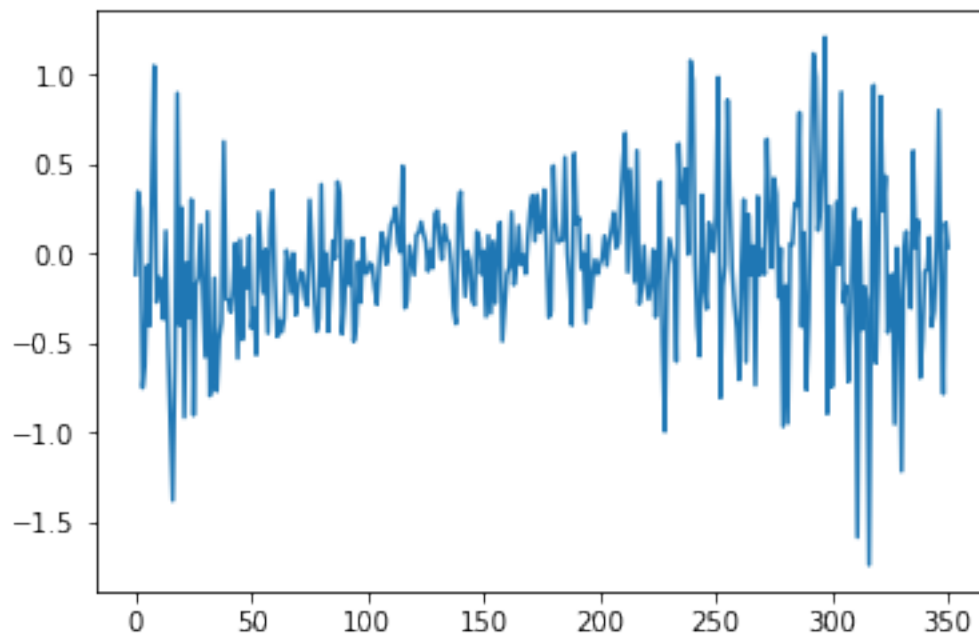
```
Out [42]: -0.05924557944327957
```

```
In [62]: 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)
```

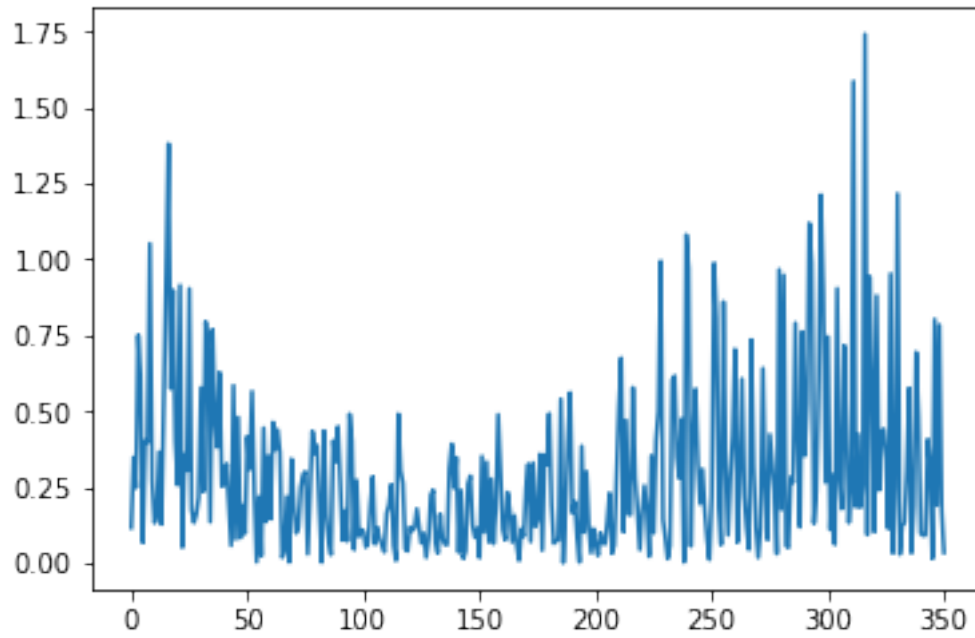
```
In [63]: plt.plot(llista_errors)
```

```
Out[63]: [<matplotlib.lines.Line2D at 0x2497288b320>]
```



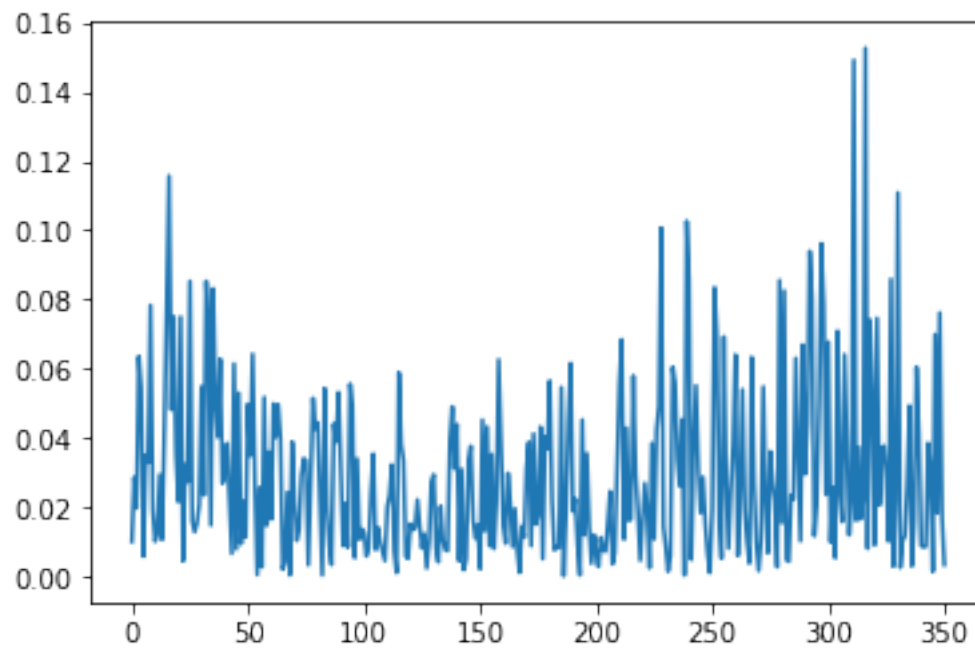
```
In [64]: plt.plot(llista_errorsabs)
```

```
Out[64]: [<matplotlib.lines.Line2D at 0x249728e0898>]
```



```
In [65]: plt.plot(llista_errorsres)
```

```
Out[65]: [<matplotlib.lines.Line2D at 0x2497293dba8>]
```



```
In [66]: sum(llista_errorsres)/(len(llista_errorsres))
```

```
Out[66]: 0.029282023629052786
```

```
In [ ]:
```