

# MM1c

## \_Xarxa\_walkforard\_normalitzat\_multivariate2\_MULTISTEP\_tempmin\_walkforwardaugment-Copy1

December 21, 2019

### 1 Xarxa neuronal

```
In [3]: 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
```

#### 1.1 Consum diari total multivariate multi-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	

	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)
```

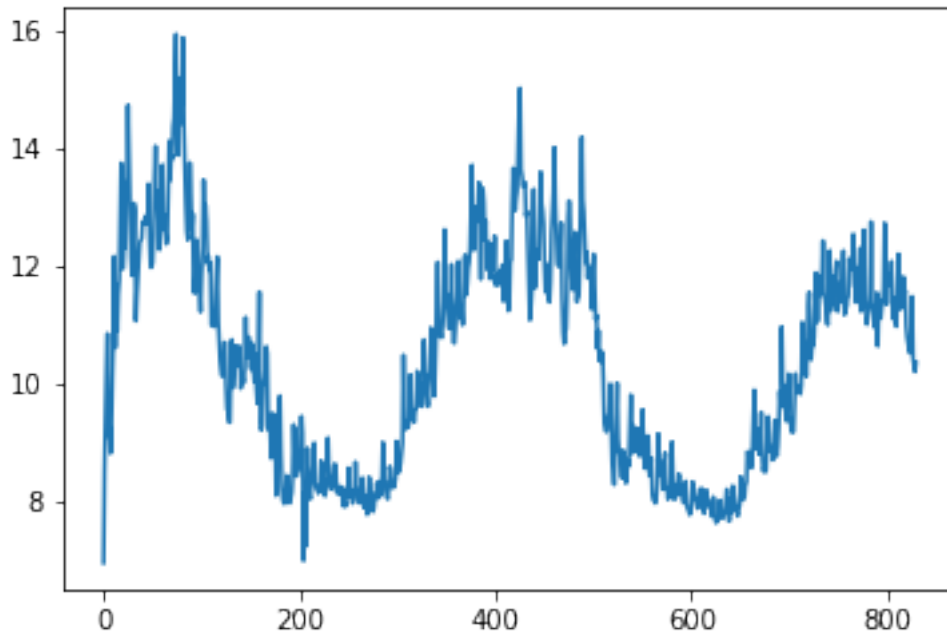
```
Out [5]:
```

	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	season
0	2.18	0.93	3	autumn
1	7.01	0.89	4	autumn
2	4.84	0.79	5	autumn
3	4.69	0.81	6	autumn
4	2.94	0.72	7	autumn

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

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



```
In [6]: daily_dia.season[daily_dia.season=='summer']=1
        daily_dia.season[daily_dia.season=='spring']=2
        daily_dia.season[daily_dia.season=='autumn']=3
        daily_dia.season[daily_dia.season=='winter']=4
```

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

See the caveats in the documentation: <http://pandas.pydata.org/pandas-docs/stable/indexing.html>  
 """Entry point for launching an IPython kernel.

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

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

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

See the caveats in the documentation: <http://pandas.pydata.org/pandas-docs/stable/indexing.html>  
 This is separate from the ipykernel package so we can avoid doing imports until

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

See the caveats in the documentation: <http://pandas.pydata.org/pandas-docs/stable/indexing.html>  
 after removing the cwd from sys.path.

```
In [7]: daily_dia['y+1']=daily_dia['energy_sum'].shift(-1)
daily_dia['y+2']=daily_dia['energy_sum'].shift(-2)
daily_dia['y+3']=daily_dia['energy_sum'].shift(-3)
daily_dia['y+4']=daily_dia['energy_sum'].shift(-4)
daily_dia['y+5']=daily_dia['energy_sum'].shift(-5)
daily_dia['y+6']=daily_dia['energy_sum'].shift(-6)
```

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

```

```

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

```

```

daily_dia['season(t-12)']=daily_dia['season'].shift(12)
daily_dia['season(t-13)']=daily_dia['season'].shift(13)
daily_dia['season(t-14)']=daily_dia['season'].shift(14)

```

daily\_dia

```

Out[7]:

```

	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	season	y+1	y+2 \
0	2.18	0.93	3	3	8.536480	9.499781
1	7.01	0.89	4	3	9.499781	10.267707
2	4.84	0.79	5	3	10.267707	10.850805
3	4.69	0.81	6	3	10.850805	9.103382
4	2.94	0.72	7	3	9.103382	9.274873
5	1.31	0.86	1	3	9.274873	8.813513
6	3.39	0.82	2	3	8.813513	9.227707
7	3.34	0.78	3	3	9.227707	10.145910
8	5.29	0.82	4	3	10.145910	10.780273
9	0.46	0.87	5	3	10.780273	12.163127
10	4.71	0.79	6	3	12.163127	10.609714
11	1.03	0.82	7	3	10.609714	11.673417
12	-1.69	0.77	1	3	11.673417	10.889362
13	-1.61	0.83	2	3	10.889362	11.525150
14	0.94	0.68	3	3	11.525150	11.759837
15	0.63	0.81	4	3	11.759837	12.633801
16	-1.42	0.71	5	3	12.633801	13.749174
17	-3.42	0.81	6	3	13.749174	11.951958
18	0.11	0.88	7	3	11.951958	11.957446
19	-0.64	0.84	1	3	11.957446	12.392776
20	0.22	0.75	2	3	12.392776	12.307079
21	0.78	0.79	3	3	12.307079	13.376080
22	1.07	0.77	4	3	13.376080	13.511968
23	-2.65	0.88	5	3	13.511968	14.732271

24	-3.56	0.86	6	3	14.732271	13.774471
25	-4.12	0.84	7	3	13.774471	12.709106
26	-3.67	0.94	1	3	12.709106	12.148570
27	1.68	0.81	2	3	12.148570	11.839403
28	3.84	0.94	3	3	11.839403	12.254989
29	5.37	0.87	4	4	12.254989	13.065317
..	...	...	...	...	...	...
800	0.18	0.90	3	4	11.685169	11.857957
801	0.61	0.91	4	4	11.857957	11.710582
802	0.29	0.91	5	4	11.710582	12.078164
803	1.10	0.76	6	4	12.078164	11.280011
804	3.21	0.72	7	4	11.280011	11.095584
805	1.96	0.79	1	4	11.095584	11.415105
806	1.12	0.75	2	4	11.415105	11.445403
807	1.03	0.77	3	4	11.445403	10.972318
808	1.96	0.82	4	4	10.972318	11.569300
809	-0.86	0.79	5	4	11.569300	12.202967
810	2.19	0.77	6	4	12.202967	11.264175
811	1.38	0.66	7	4	11.264175	11.452649
812	0.89	0.84	1	4	11.452649	11.679099
813	-0.57	0.76	2	4	11.679099	11.285737
814	-1.20	0.75	3	4	11.285737	11.816914
815	0.05	0.68	4	4	11.816914	11.490470
816	0.45	0.81	5	4	11.490470	11.582159
817	1.77	0.69	6	4	11.582159	10.979566
818	-1.03	0.76	7	4	10.979566	10.781898
819	2.84	0.83	1	4	10.781898	10.674624
820	3.83	0.87	2	4	10.674624	10.573835
821	2.65	0.87	3	4	10.573835	10.518126
822	3.95	0.84	4	4	10.518126	10.776242
823	0.19	0.72	5	4	10.776242	11.480411
824	1.59	0.71	6	4	11.480411	10.411403
825	5.53	0.76	7	4	10.411403	10.294997
826	5.52	0.74	1	4	10.294997	10.202945
827	3.89	0.78	2	4	10.202945	10.356350
828	1.67	0.73	3	4	10.356350	NaN
829	1.41	0.74	4	4	NaN	NaN

	...	season(t-5)	season(t-6)	season(t-7)	season(t-8)	season(t-9)	\
0	...	NaN	NaN	NaN	NaN	NaN	
1	...	NaN	NaN	NaN	NaN	NaN	
2	...	NaN	NaN	NaN	NaN	NaN	
3	...	NaN	NaN	NaN	NaN	NaN	
4	...	NaN	NaN	NaN	NaN	NaN	
5	...	3	NaN	NaN	NaN	NaN	
6	...	3	3	NaN	NaN	NaN	
7	...	3	3	3	NaN	NaN	
8	...	3	3	3	3	NaN	



9	...	3	3	3	3	3
10	...	3	3	3	3	3
11	...	3	3	3	3	3
12	...	3	3	3	3	3
13	...	3	3	3	3	3
14	...	3	3	3	3	3
15	...	3	3	3	3	3
16	...	3	3	3	3	3
17	...	3	3	3	3	3
18	...	3	3	3	3	3
19	...	3	3	3	3	3
20	...	3	3	3	3	3
21	...	3	3	3	3	3
22	...	3	3	3	3	3
23	...	3	3	3	3	3
24	...	3	3	3	3	3
25	...	3	3	3	3	3
26	...	3	3	3	3	3
27	...	3	3	3	3	3
28	...	3	3	3	3	3
29	...	3	3	3	3	3
..	...	...	...	...	...	...
800	...	4	4	4	4	4
801	...	4	4	4	4	4
802	...	4	4	4	4	4
803	...	4	4	4	4	4
804	...	4	4	4	4	4
805	...	4	4	4	4	4
806	...	4	4	4	4	4
807	...	4	4	4	4	4
808	...	4	4	4	4	4
809	...	4	4	4	4	4
810	...	4	4	4	4	4
811	...	4	4	4	4	4
812	...	4	4	4	4	4
813	...	4	4	4	4	4
814	...	4	4	4	4	4
815	...	4	4	4	4	4
816	...	4	4	4	4	4
817	...	4	4	4	4	4
818	...	4	4	4	4	4
819	...	4	4	4	4	4
820	...	4	4	4	4	4
821	...	4	4	4	4	4
822	...	4	4	4	4	4
823	...	4	4	4	4	4
824	...	4	4	4	4	4
825	...	4	4	4	4	4

826	...	4	4	4	4	4
827	...	4	4	4	4	4
828	...	4	4	4	4	4
829	...	4	4	4	4	4

	season(t-10)	season(t-11)	season(t-12)	season(t-13)	season(t-14)
0	NaN	NaN	NaN	NaN	NaN
1	NaN	NaN	NaN	NaN	NaN
2	NaN	NaN	NaN	NaN	NaN
3	NaN	NaN	NaN	NaN	NaN
4	NaN	NaN	NaN	NaN	NaN
5	NaN	NaN	NaN	NaN	NaN
6	NaN	NaN	NaN	NaN	NaN
7	NaN	NaN	NaN	NaN	NaN
8	NaN	NaN	NaN	NaN	NaN
9	NaN	NaN	NaN	NaN	NaN
10	3	NaN	NaN	NaN	NaN
11	3	3	NaN	NaN	NaN
12	3	3	3	NaN	NaN
13	3	3	3	3	NaN
14	3	3	3	3	3
15	3	3	3	3	3
16	3	3	3	3	3
17	3	3	3	3	3
18	3	3	3	3	3
19	3	3	3	3	3
20	3	3	3	3	3
21	3	3	3	3	3
22	3	3	3	3	3
23	3	3	3	3	3
24	3	3	3	3	3
25	3	3	3	3	3
26	3	3	3	3	3
27	3	3	3	3	3
28	3	3	3	3	3
29	3	3	3	3	3
..	...	...	...	...	...
800	4	4	4	4	4
801	4	4	4	4	4
802	4	4	4	4	4
803	4	4	4	4	4
804	4	4	4	4	4
805	4	4	4	4	4
806	4	4	4	4	4
807	4	4	4	4	4
808	4	4	4	4	4
809	4	4	4	4	4
810	4	4	4	4	4

811	4	4	4	4	4
812	4	4	4	4	4
813	4	4	4	4	4
814	4	4	4	4	4
815	4	4	4	4	4
816	4	4	4	4	4
817	4	4	4	4	4
818	4	4	4	4	4
819	4	4	4	4	4
820	4	4	4	4	4
821	4	4	4	4	4
822	4	4	4	4	4
823	4	4	4	4	4
824	4	4	4	4	4
825	4	4	4	4	4
826	4	4	4	4	4
827	4	4	4	4	4
828	4	4	4	4	4
829	4	4	4	4	4

[830 rows x 98 columns]

```
In [8]: #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','apparentTemperatureMin'])
daily_dia.head(5)
```

```
Out [8]:
```

	energy_sum	y+1	y+2	y+3	y+4	y+5	\
0	6.952692	8.536480	9.499781	10.267707	10.850805	9.103382	
1	8.536480	9.499781	10.267707	10.850805	9.103382	9.274873	
2	9.499781	10.267707	10.850805	9.103382	9.274873	8.813513	
3	10.267707	10.850805	9.103382	9.274873	8.813513	9.227707	
4	10.850805	9.103382	9.274873	8.813513	9.227707	10.145910	

	y+6	t-1	t-2	t-3	...	season(t-5)	season(t-6)	\
0	9.274873	NaN	NaN	NaN	...	NaN	NaN	
1	8.813513	6.952692	NaN	NaN	...	NaN	NaN	
2	9.227707	8.536480	6.952692	NaN	...	NaN	NaN	
3	10.145910	9.499781	8.536480	6.952692	...	NaN	NaN	
4	10.780273	10.267707	9.499781	8.536480	...	NaN	NaN	

	season(t-7)	season(t-8)	season(t-9)	season(t-10)	season(t-11)	\
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	

	season(t-12)	season(t-13)	season(t-14)
0	NaN	NaN	NaN
1	NaN	NaN	NaN
2	NaN	NaN	NaN
3	NaN	NaN	NaN
4	NaN	NaN	NaN

[5 rows x 91 columns]

In [9]: *#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 [9]:
```

	energy_sum	y+1	y+2	y+3	y+4	y+5	\
14	10.889362	11.525150	11.759837	12.633801	13.749174	11.951958	
15	11.525150	11.759837	12.633801	13.749174	11.951958	11.957446	
16	11.759837	12.633801	13.749174	11.951958	11.957446	12.392776	
17	12.633801	13.749174	11.951958	11.957446	12.392776	12.307079	
18	13.749174	11.951958	11.957446	12.392776	12.307079	13.376080	

	y+6	t-1	t-2	t-3	...	season(t-5)	season(t-6)	\
14	11.957446	11.673417	10.609714	12.163127	...	3	3	
15	12.392776	10.889362	11.673417	10.609714	...	3	3	
16	12.307079	11.525150	10.889362	11.673417	...	3	3	
17	13.376080	11.759837	11.525150	10.889362	...	3	3	
18	13.511968	12.633801	11.759837	11.525150	...	3	3	

	season(t-7)	season(t-8)	season(t-9)	season(t-10)	season(t-11)	\
14	3	3	3	3	3	
15	3	3	3	3	3	
16	3	3	3	3	3	
17	3	3	3	3	3	
18	3	3	3	3	3	

	season(t-12)	season(t-13)	season(t-14)
14	3	3	3
15	3	3	3
16	3	3	3
17	3	3	3
18	3	3	3

[5 rows x 91 columns]

In [10]: `daily_dia=daily_dia.drop([829,828,827,826,825,824,823])`  
`daily_dia.tail(5)`

```
Out [10]:
```

	energy_sum	y+1	y+2	y+3	y+4	y+5	\
818	11.582159	10.979566	10.781898	10.674624	10.573835	10.518126	

819	10.979566	10.781898	10.674624	10.573835	10.518126	10.776242
820	10.781898	10.674624	10.573835	10.518126	10.776242	11.480411
821	10.674624	10.573835	10.518126	10.776242	11.480411	10.411403
822	10.573835	10.518126	10.776242	11.480411	10.411403	10.294997

	y+6	t-1	t-2	t-3	...	season(t-5)	\
818	10.776242	11.490470	11.816914	11.285737	...		4
819	11.480411	11.582159	11.490470	11.816914	...		4
820	10.411403	10.979566	11.582159	11.490470	...		4
821	10.294997	10.781898	10.979566	11.582159	...		4
822	10.202945	10.674624	10.781898	10.979566	...		4

	season(t-6)	season(t-7)	season(t-8)	season(t-9)	season(t-10)	\
818	4	4	4	4		4
819	4	4	4	4		4
820	4	4	4	4		4
821	4	4	4	4		4
822	4	4	4	4		4

	season(t-11)	season(t-12)	season(t-13)	season(t-14)
818	4	4	4	4
819	4	4	4	4
820	4	4	4	4
821	4	4	4	4
822	4	4	4	4

[5 rows x 91 columns]

In [9]: `len(daily_dia)`

Out[9]: 809

In [11]: `#normalitzem`

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

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

In [12]: `#Seleccionem dades per test i train`

```
y_daily=daily_dia_norm[:,0:7]
X_daily=daily_dia_norm[:,7:91]
```

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

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

```
#Enlloc de 14 features en son 7 de una feature i 7 duna altre
```

```
X_daily=np.reshape(X_daily, (X_daily.shape[0], 14,6))
```

```
In [13]: # definim model
```

```
import tensorflow as tf
```

```
model =Sequential()
```

```
model.add(LSTM(50, activation='relu', input_shape=(14, 6)))
```

```
model.add(Dense(7))
```

```
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 [14]: import math
```

```
from sklearn.metrics import mean_squared_error
```

```
#Walk forward per test i train
```

```
minim=100
```

```
n_train=465
```

```
lenght=len(daily_dia)
```

```
llista_evaluate=list()
```

```
llista_prediccions=list()
```

```
llista_preditrain=list()
```

```
llista_scores=list()
```

```
llista_scoretrain=list()
```

```
sumScores=0
```

```
for i in range(n_train,lenght):
```

```
    #minim=minim+1
```

```
    X_train,X_test= X_daily[minim:i],X_daily[i:i+1]
```

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

```
    #fem fit al model
```

```
    model.fit(X_train, y_train, epochs=50, verbose=0)
```

```
    #mostrem score per cada model
```

```
    score=model.evaluate(X_test,y_test,verbose=0)
```

```
    llista_evaluate.append(score)
```

```
    #Predim per cadascun
```

```
    preditest=model.predict(X_test)
```

```
    llista_prediccions.append(preditest)
```

```

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

trainScore = math.sqrt(mean_squared_error(y_train, 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\math\_ops.py:306: div (tf.nn.div) will be auto-casted to float. Instructions for updating:  
Use tf.cast instead.

```

In [15]: #Dividim la suma de scores de test entre el nombre de prediccions per obtenir la mitjana
          sumScores/(length-n_train)

```

```

Out[15]: 0.06156958384585391

```

```

In [16]: #Fem llista amb les prediccions
          llista_p=list()
          for i in range(len(llista_prediccions)):
              llista_p.append(llista_prediccions[i].tolist())

          llista_p

```

```

Out[16]: [[0.5612643361091614,
           0.6052665710449219,
           0.6175168752670288,
           0.6028528809547424,
           0.5617249608039856,
           0.5573030710220337,
           0.5593608617782593]],
          [[0.5933306217193604,
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           0.5452040433883667,
           0.5214798450469971,
           0.5074516534805298,
           0.5246480703353882]],
          [[0.6908684968948364,
           0.620354950428009,
           0.5773647427558899,
           0.5588578581809998,
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           0.5425146222114563,

```

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```

In [17]: *#Fem llista amb la predicció de només el dia següent*

```

llista_p0=list()
for i in range(len(llista_p)):
    llista_p0.append(llista_p[i][0][0])

```

*#Fem llista amb la predicció de 2 dies*

```

llista_p1=list()
for i in range(len(llista_p)):
    llista_p1.append(llista_p[i][0][1])

```

```

llista_p2=list()

```

```

for i in range(len(llista_p)):
    llista_p2.append(llista_p[i][0][2])

llista_p3=list()
for i in range(len(llista_p)):
    llista_p3.append(llista_p[i][0][3])

llista_p4=list()
for i in range(len(llista_p)):
    llista_p4.append(llista_p[i][0][4])

llista_p5=list()
for i in range(len(llista_p)):
    llista_p5.append(llista_p[i][0][5])

llista_p6=list()
for i in range(len(llista_p)):
    llista_p6.append(llista_p[i][0][6])

```

```

In [18]: score0=math.sqrt(mean_squared_error(y_daily[n_train:lenght,0], llista_p0))
print("Error predicció 1 dia següent: {}".format(score0))
score1=math.sqrt(mean_squared_error(y_daily[n_train:lenght,1], llista_p1))
print("Error predicció 2 dia següent: {}".format(score1))
score2=math.sqrt(mean_squared_error(y_daily[n_train:lenght,2], llista_p2))
print("Error predicció 3 dia següent: {}".format(score2))
score3=math.sqrt(mean_squared_error(y_daily[n_train:lenght,3], llista_p3))
print("Error predicció 4 dia següent: {}".format(score3))
score4=math.sqrt(mean_squared_error(y_daily[n_train:lenght,4], llista_p4))
print("Error predicció 5 dia següent: {}".format(score4))
score5=math.sqrt(mean_squared_error(y_daily[n_train:lenght,5], llista_p5))
print("Error predicció 6 dia següent: {}".format(score5))

score6=math.sqrt(mean_squared_error(y_daily[n_train:lenght,6], llista_p6))
print("Error predicció 7 dia següent: {}".format(score6))

```

```

Error predicció 1 dia següent: 0.05146226737728889
Error predicció 2 dia següent: 0.06427961550676087
Error predicció 3 dia següent: 0.07047695992418186
Error predicció 4 dia següent: 0.0729435021088956
Error predicció 5 dia següent: 0.07387084787639028
Error predicció 6 dia següent: 0.07592566299040113
Error predicció 7 dia següent: 0.07798694442206162

```

```

In [19]: predi=list()

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

```

```

predis.append(predi)

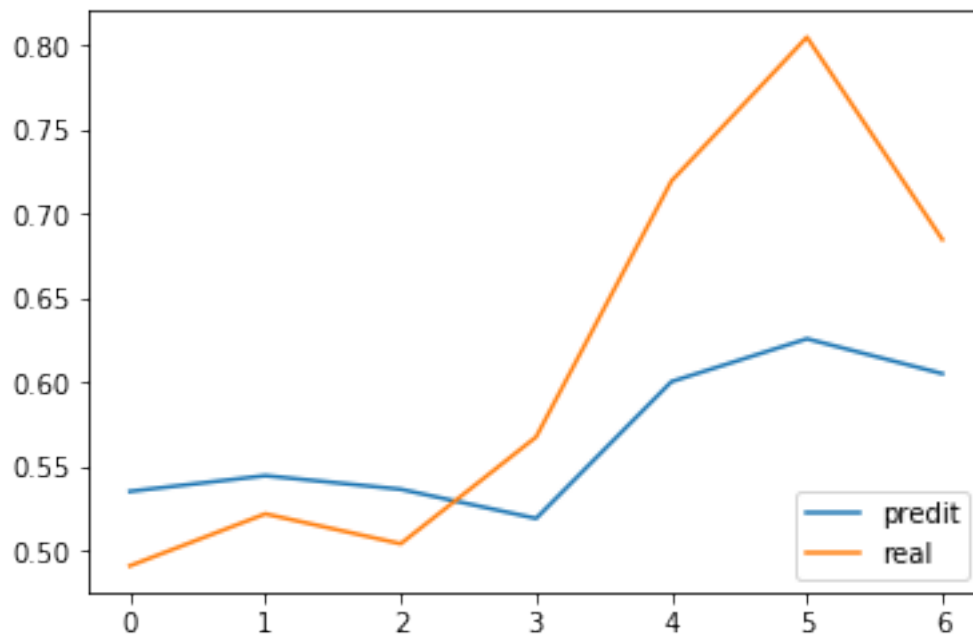
predis=np.reshape(predis, (len(llista_prediccions),7) )

predis

Out[19]: array([[0.56126434, 0.60526657, 0.61751688, ..., 0.56172496, 0.55730307,
0.55936086],
[0.59333062, 0.61039841, 0.57543713, ..., 0.52147985, 0.50745165,
0.52464807],
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0.60693997],
...,
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[0.40328908, 0.39076757, 0.39193285, ..., 0.58135939, 0.45182297,
0.49897343],
[0.47089735, 0.48615646, 0.49538165, ..., 0.53671372, 0.38485295,
0.32116598]])

In [20]: ##Mostrem
plt.plot(predis[4], label="predit")
plt.plot(y_daily[n_train+4], label="real")
plt.legend(loc="lower right")
plt.show()

```



```

In [21]: ##Mostrem
plt.plot(llista_p0, label="predit1")
plt.plot(y_daily[n_train:lenght,0], label="real")
plt.legend(loc="lower right")
plt.title("Predicció 1 dia següent")
plt.show()

plt.plot(llista_p1, label="predit2")
plt.plot(y_daily[n_train:lenght,1], label="real")
plt.legend(loc="lower right")
plt.title("Predicció 2 dia següent")
plt.show()

plt.plot(llista_p2, label="predit3")
plt.plot(y_daily[n_train:lenght,2], label="real")
plt.legend(loc="lower right")
plt.title("Predicció 3 dia següent")
plt.show()

plt.plot(llista_p3, label="predit4")
plt.plot(y_daily[n_train:lenght,3], label="real")
plt.legend(loc="lower right")
plt.title("Predicció 4 dia següent")
plt.show()

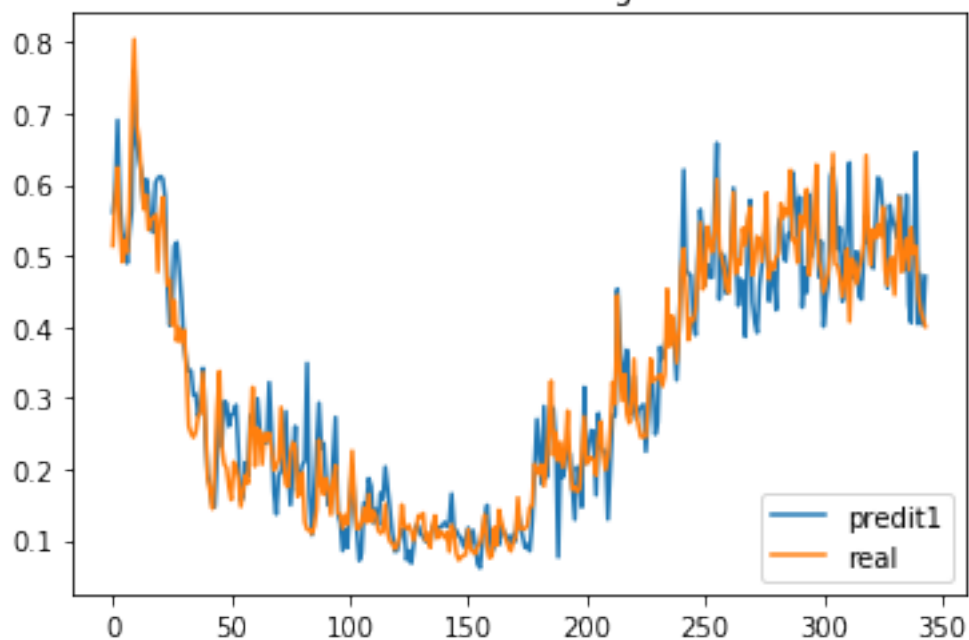
plt.plot(llista_p4, label="predit5")
plt.plot(y_daily[n_train:lenght,4], label="real")
plt.legend(loc="lower right")
plt.title("Predicció 5 dia següent")
plt.show()

plt.plot(llista_p5, label="predit6")
plt.plot(y_daily[n_train:lenght,5], label="real")
plt.legend(loc="lower right")
plt.title("Predicció 6 dia següent")
plt.show()

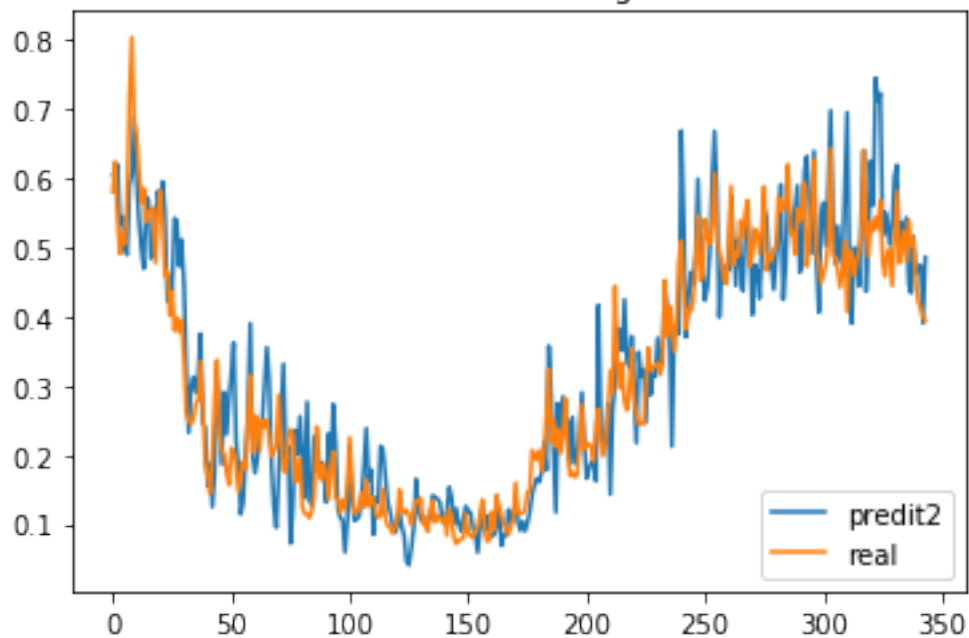
plt.plot(llista_p6, label="predit7")
plt.plot(y_daily[n_train:lenght,6], label="real")
plt.legend(loc="lower right")
plt.title("Predicció 7 dia següent")
plt.show()

```

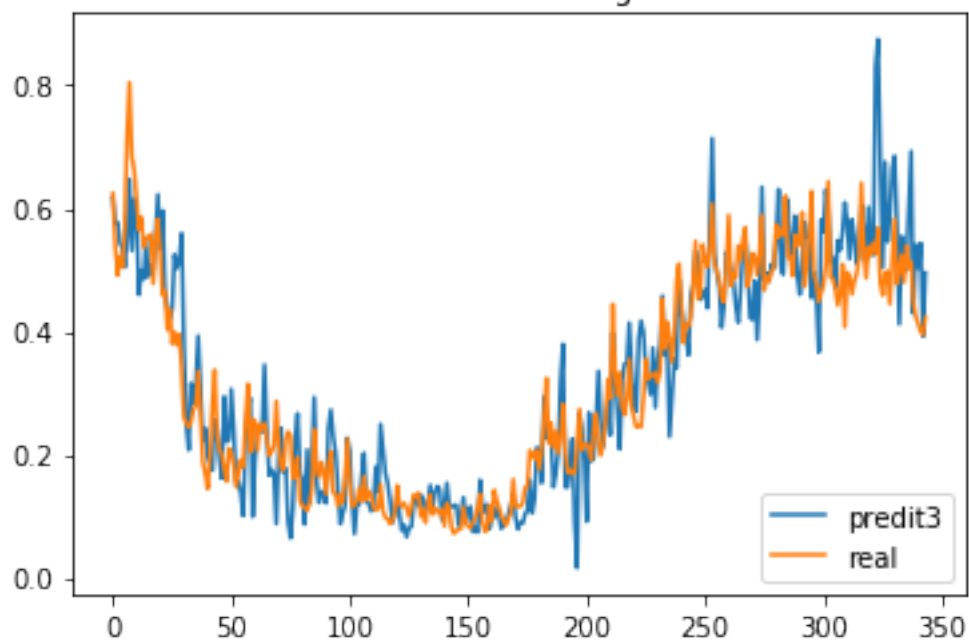
Predicció 1 dia següent



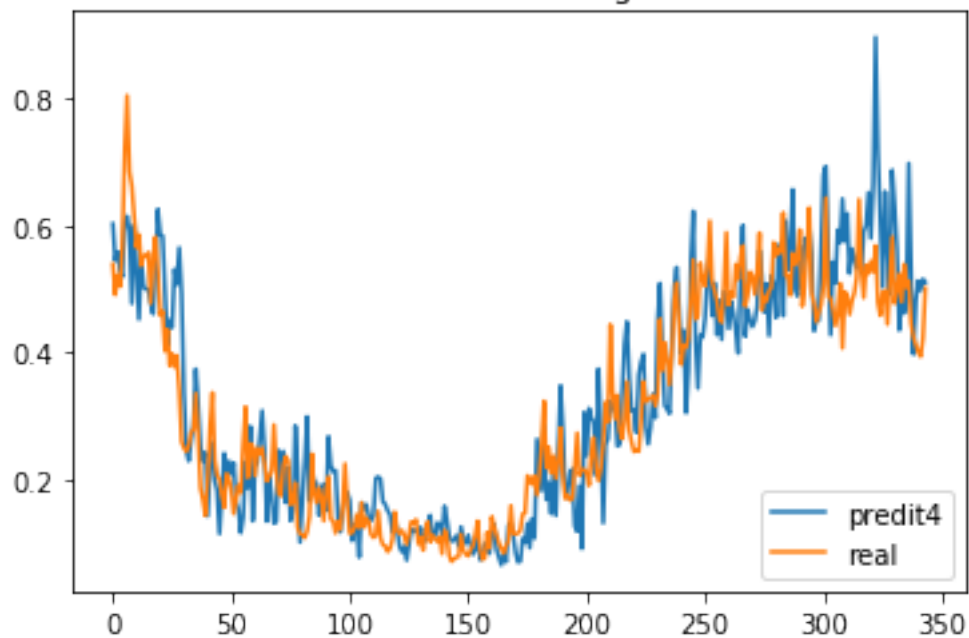
Predicció 2 dia següent



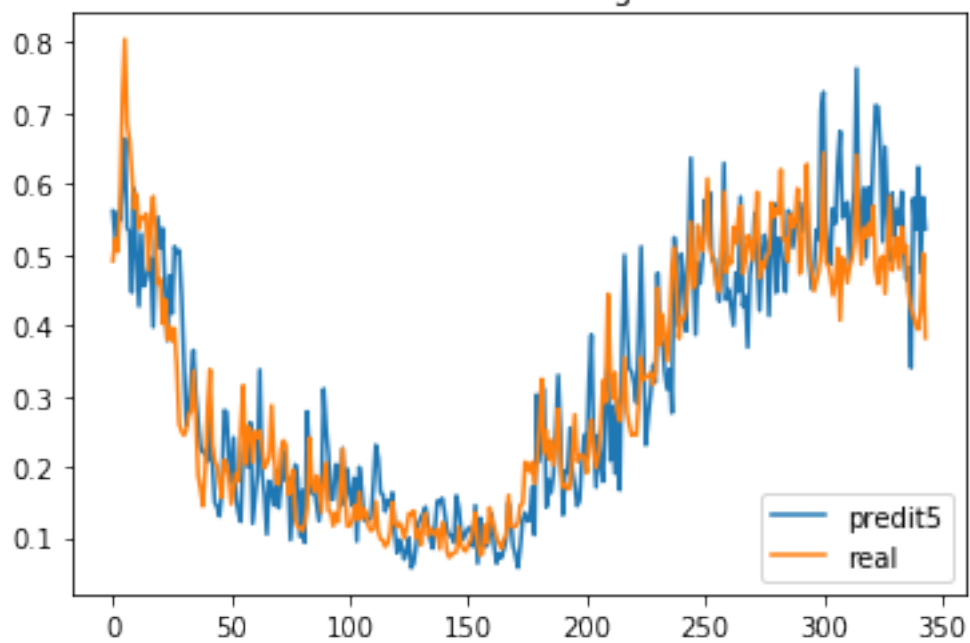
Predicció 3 dia següent



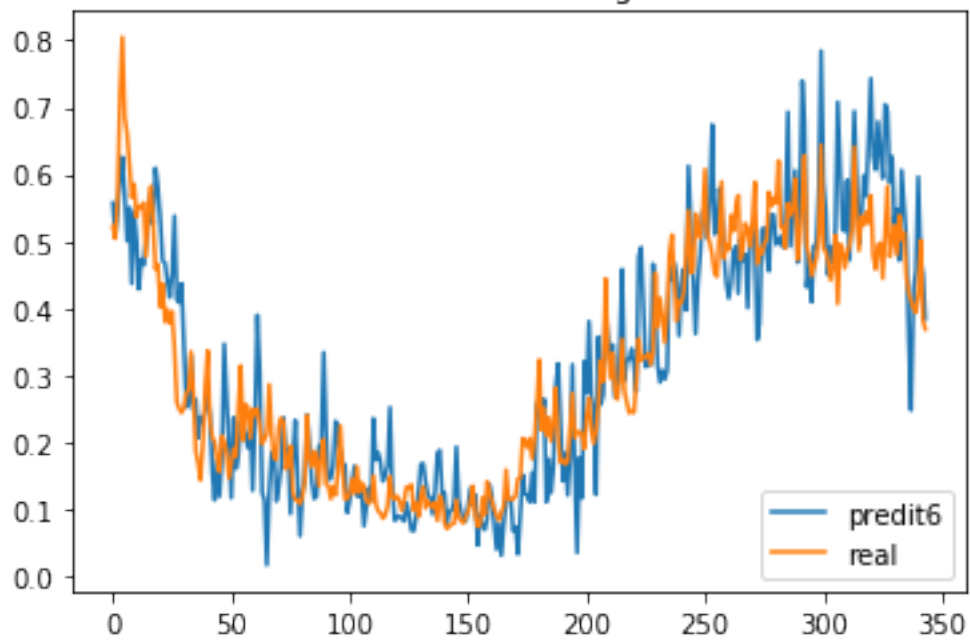
Predicció 4 dia següent

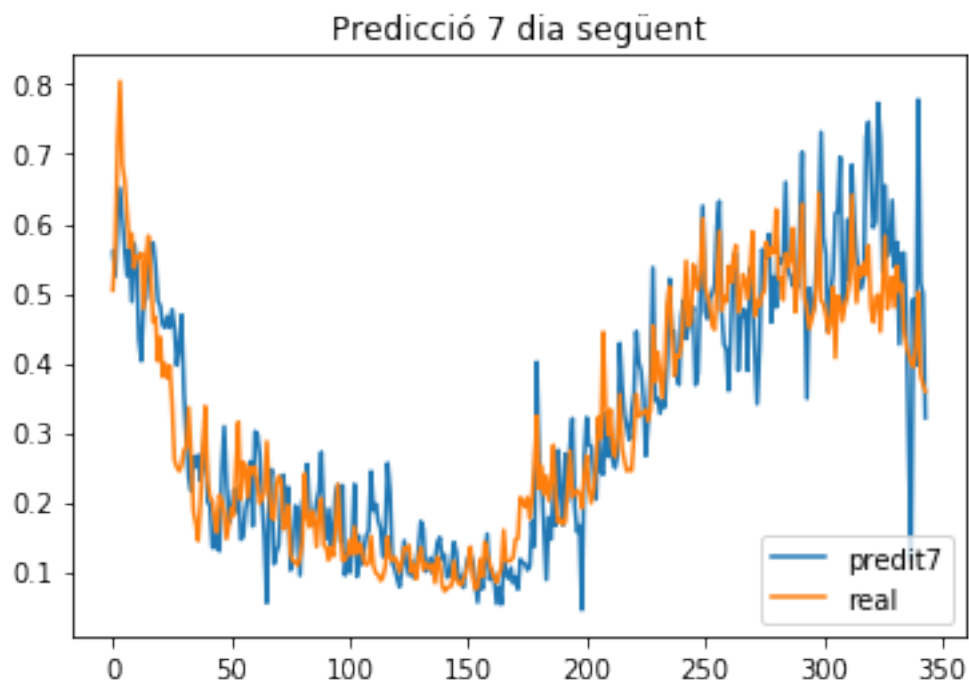


Predicció 5 dia següent



Predicció 6 dia següent





In [ ]:

In [22]: llista\_scores

Out [22]: [0.048000259271243094,  
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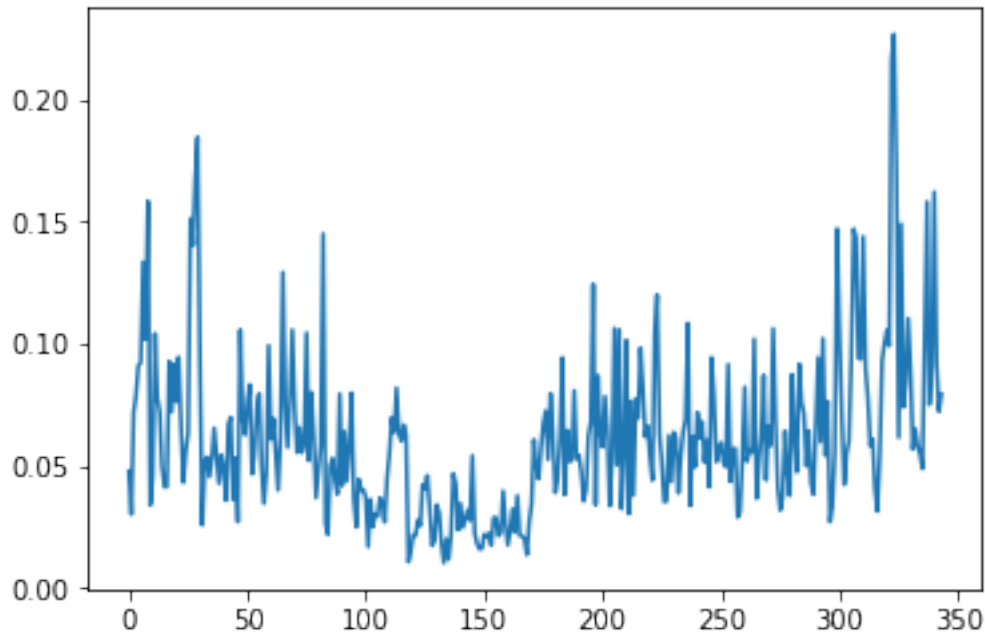
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0.14712837087439265,  
0.14367782988511887,  
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```
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0.05695115549917076,  
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0.15825323816697134,  
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0.09198423637031182,  
0.16222859140355783,  
0.09153410531956419,  
0.07247126246232746,  
0.07951342784069464]
```

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

```
Out[23]: [<matplotlib.lines.Line2D at 0x1a52aed3240>]
```



In [24]: *#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['predi1']=llista_p0
prova['predi2']=llista_p1
prova['predi3']=llista_p2
prova['predi4']=llista_p3
prova['predi5']=llista_p4
prova['predi6']=llista_p5
prova['predi7']=llista_p6

prova['y1']=y_daily[n_train:lenght,0]
prova['y2']=y_daily[n_train:lenght,1]
prova['y3']=y_daily[n_train:lenght,2]
prova['y4']=y_daily[n_train:lenght,3]
prova['y5']=y_daily[n_train:lenght,4]
prova['y6']=y_daily[n_train:lenght,5]
```



```
prova['y7']=y_daily[n_train:lenght,6]
```

```
prova=prova.drop(['energy_sum','t-1','t-2','t-3','t-4','t-5','t-6','t-7'], axis=1)
prova
```

```
prova=prova[['predi1','predi2','predi3','predi4','predi5','predi6','predi7','y1','y2']]
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>  
del 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

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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>  
from ipykernel import kernelapp as app

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>  
app.launch\_new\_instance()

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

See the caveats in the documentation: <http://pandas.pydata.org/pandas-docs/stable/indexing.html>  
c:\users\laura\appdata\local\programs\python\python37\lib\site-packages\ipykernel\_launcher.py:  
A value is trying to be set on a copy of a slice from a DataFrame.  
Try using .loc[row\_indexer,col\_indexer] = value instead

See the caveats in the documentation: <http://pandas.pydata.org/pandas-docs/stable/indexing.html>  
c:\users\laura\appdata\local\programs\python\python37\lib\site-packages\ipykernel\_launcher.py:  
A value is trying to be set on a copy of a slice from a DataFrame.  
Try using .loc[row\_indexer,col\_indexer] = value instead

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

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

See the caveats in the documentation: <http://pandas.pydata.org/pandas-docs/stable/indexing.html>  
c:\users\laura\appdata\local\programs\python\python37\lib\site-packages\ipykernel\_launcher.py:  
A value is trying to be set on a copy of a slice from a DataFrame.  
Try using .loc[row\_indexer,col\_indexer] = value instead

See the caveats in the documentation: <http://pandas.pydata.org/pandas-docs/stable/indexing.html>  
c:\users\laura\appdata\local\programs\python\python37\lib\site-packages\ipykernel\_launcher.py:  
A value is trying to be set on a copy of a slice from a DataFrame.  
Try using .loc[row\_indexer,col\_indexer] = value instead

See the caveats in the documentation: <http://pandas.pydata.org/pandas-docs/stable/indexing.html>  
c:\users\laura\appdata\local\programs\python\python37\lib\site-packages\ipykernel\_launcher.py:  
A value is trying to be set on a copy of a slice from a DataFrame.  
Try using .loc[row\_indexer,col\_indexer] = value instead

See the caveats in the documentation: <http://pandas.pydata.org/pandas-docs/stable/indexing.html>  
c:\users\laura\appdata\local\programs\python\python37\lib\site-packages\ipykernel\_launcher.py:  
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c:\users\laura\appdata\local\programs\python\python37\lib\site-packages\ipykernel\_launcher.py:  
A value is trying to be set on a copy of a slice from a DataFrame.  
Try using .loc[row\_indexer,col\_indexer] = value instead

See the caveats in the documentation: <http://pandas.pydata.org/pandas-docs/stable/indexing.html>  
c:\users\laura\appdata\local\programs\python\python37\lib\site-packages\ipykernel\_launcher.py:  
A value is trying to be set on a copy of a slice from a DataFrame.  
Try using .loc[row\_indexer,col\_indexer] = value instead

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

```
Out[24]:
```

	predi1	predi2	predi3	predi4	predi5	predi6	predi7	\
479	0.561264	0.605267	0.617517	0.602853	0.561725	0.557303	0.559361	
480	0.593331	0.610398	0.575437	0.545204	0.521480	0.507452	0.524648	
481	0.690868	0.620355	0.577365	0.558858	0.560769	0.542515	0.606940	
482	0.573470	0.534431	0.542912	0.528896	0.548043	0.593966	0.651337	
483	0.535474	0.544789	0.536720	0.519434	0.600518	0.625890	0.605229	
484	0.520132	0.497864	0.504359	0.605975	0.664040	0.569691	0.562331	
485	0.489599	0.489711	0.555392	0.614664	0.538330	0.500710	0.524761	
486	0.534922	0.588407	0.647456	0.590958	0.532654	0.550713	0.563488	
487	0.563732	0.605978	0.531336	0.477458	0.446531	0.437215	0.487825	
488	0.760194	0.689556	0.615470	0.601397	0.593790	0.543452	0.571138	

489	0.662652	0.598581	0.585086	0.534143	0.502106	0.501731	0.545100
490	0.635172	0.540399	0.459884	0.452802	0.427216	0.429085	0.434377
491	0.616481	0.498869	0.499786	0.546551	0.529401	0.473333	0.402690
492	0.568700	0.469557	0.485126	0.503682	0.455465	0.465021	0.485651
493	0.607973	0.574279	0.550216	0.499865	0.464185	0.500722	0.492696
494	0.587339	0.567477	0.489342	0.500234	0.481443	0.529067	0.543848
495	0.543858	0.484539	0.507954	0.477353	0.495347	0.571919	0.571444
496	0.533066	0.488855	0.498851	0.461172	0.397925	0.525765	0.572189
497	0.602681	0.535243	0.555562	0.527757	0.518587	0.609412	0.539233
498	0.609111	0.581853	0.622616	0.625673	0.553246	0.581956	0.489312
499	0.611739	0.566458	0.533237	0.585613	0.509202	0.532856	0.481458
500	0.608705	0.595697	0.596420	0.583763	0.537199	0.471087	0.454794
501	0.583950	0.549033	0.465200	0.500300	0.451972	0.468106	0.450723
502	0.458599	0.422730	0.434601	0.410939	0.378550	0.440306	0.466676
503	0.402274	0.457142	0.418277	0.451359	0.470310	0.416805	0.450551
504	0.425440	0.437368	0.435134	0.439720	0.416747	0.451726	0.476787
505	0.513322	0.542514	0.524842	0.531223	0.511409	0.538092	0.451512
506	0.518930	0.538710	0.502674	0.507447	0.502717	0.413582	0.396532
507	0.481378	0.473135	0.515557	0.565310	0.505863	0.409106	0.422215
508	0.436742	0.511702	0.559405	0.492763	0.440710	0.437220	0.468746
...	...	...	...	...	...	...	...
793	0.505812	0.497207	0.510287	0.533032	0.763220	0.596847	0.552580
794	0.443300	0.444248	0.520742	0.560154	0.562539	0.497089	0.528978
795	0.438743	0.555811	0.605915	0.525205	0.515353	0.537129	0.506373
796	0.497125	0.641065	0.564685	0.590037	0.594052	0.598170	0.523006
797	0.557686	0.436699	0.514705	0.601502	0.495893	0.567742	0.723522
798	0.518082	0.513897	0.601970	0.652094	0.595230	0.649475	0.746243
799	0.525854	0.625599	0.527754	0.580085	0.548140	0.743034	0.670748
800	0.482162	0.561632	0.524119	0.666706	0.638384	0.626182	0.594329
801	0.542818	0.745325	0.830805	0.896478	0.711130	0.606785	0.603216
802	0.610142	0.713344	0.874903	0.713345	0.709200	0.678709	0.773410
803	0.606248	0.722994	0.672478	0.609629	0.649781	0.628714	0.721314
804	0.565461	0.517728	0.503885	0.503499	0.518518	0.594199	0.531841
805	0.546860	0.551371	0.675741	0.653739	0.652490	0.704107	0.654996
806	0.454401	0.537430	0.545817	0.563790	0.557557	0.694401	0.552651
807	0.571227	0.504255	0.582781	0.492474	0.491508	0.587930	0.563978
808	0.551046	0.533367	0.664417	0.687495	0.587183	0.626450	0.633739
809	0.540444	0.602868	0.685196	0.631588	0.527729	0.525291	0.537259
810	0.526136	0.619573	0.576116	0.562136	0.563415	0.548323	0.573042
811	0.584014	0.490689	0.411938	0.435489	0.543297	0.471767	0.426765
812	0.551340	0.536226	0.554869	0.511793	0.589346	0.606363	0.557307
813	0.479430	0.504084	0.496921	0.461862	0.508535	0.553266	0.557993
814	0.585657	0.543212	0.507710	0.482466	0.465150	0.500180	0.472194
815	0.431379	0.447360	0.596348	0.697991	0.481315	0.352315	0.271770
816	0.405988	0.434556	0.692910	0.524522	0.340085	0.248577	0.116295
817	0.515035	0.516135	0.429369	0.397650	0.579601	0.429751	0.491662
818	0.644992	0.462007	0.540951	0.481831	0.535981	0.455896	0.396300
819	0.404110	0.469355	0.503236	0.513181	0.623955	0.596196	0.778399

820	0.473565	0.474532	0.543538	0.498254	0.474782	0.476799	0.514991
821	0.403289	0.390768	0.391933	0.515769	0.581359	0.451823	0.498973
822	0.470897	0.486156	0.495382	0.510856	0.536714	0.384853	0.321166

	y1	y2	y3	...	season(t-5)	season(t-6)	season(t-7)	\
479	0.514061	0.580609	0.624326	...	4	4	4	
480	0.580609	0.624326	0.539280	...	4	4	4	
481	0.624326	0.539280	0.491355	...	4	4	4	
482	0.539280	0.491355	0.522145	...	4	4	4	
483	0.491355	0.522145	0.504442	...	4	4	4	
484	0.522145	0.504442	0.567725	...	4	4	4	
485	0.504442	0.567725	0.719460	...	4	4	4	
486	0.567725	0.719460	0.804631	...	4	4	4	
487	0.719460	0.804631	0.684716	...	4	4	4	
488	0.804631	0.684716	0.662177	...	4	4	4	
489	0.684716	0.662177	0.615194	...	4	4	4	
490	0.662177	0.615194	0.565466	...	4	4	4	
491	0.615194	0.565466	0.585646	...	2	4	4	
492	0.565466	0.585646	0.536523	...	2	2	4	
493	0.585646	0.536523	0.552256	...	2	2	2	
494	0.536523	0.552256	0.552256	...	2	2	2	
495	0.552256	0.552256	0.557809	...	2	2	2	
496	0.552256	0.557809	0.477794	...	2	2	2	
497	0.557809	0.477794	0.551195	...	2	2	2	
498	0.477794	0.551195	0.582339	...	2	2	2	
499	0.551195	0.582339	0.529772	...	2	2	2	
500	0.582339	0.529772	0.458904	...	2	2	2	
501	0.529772	0.458904	0.465733	...	2	2	2	
502	0.458904	0.465733	0.402622	...	2	2	2	
503	0.465733	0.402622	0.436918	...	2	2	2	
504	0.402622	0.436918	0.380048	...	2	2	2	
505	0.436918	0.380048	0.398860	...	2	2	2	
506	0.380048	0.398860	0.377916	...	2	2	2	
507	0.398860	0.377916	0.395717	...	2	2	2	
508	0.377916	0.395717	0.341266	...	2	2	2	
..	...	...	...	...	...	...	...	
793	0.460288	0.481611	0.493841	...	4	4	4	
794	0.481611	0.493841	0.517404	...	4	4	4	
795	0.493841	0.517404	0.641295	...	4	4	4	
796	0.517404	0.641295	0.532274	...	4	4	4	
797	0.641295	0.532274	0.486571	...	4	4	4	
798	0.532274	0.486571	0.537515	...	4	4	4	
799	0.486571	0.537515	0.524598	...	4	4	4	
800	0.537515	0.524598	0.543903	...	4	4	4	
801	0.524598	0.543903	0.527438	...	4	4	4	
802	0.543903	0.527438	0.568506	...	4	4	4	
803	0.527438	0.568506	0.479332	...	4	4	4	
804	0.568506	0.479332	0.458726	...	4	4	4	

805	0.479332	0.458726	0.494425	...	4	4	4
806	0.458726	0.494425	0.497810	...	4	4	4
807	0.494425	0.497810	0.444954	...	4	4	4
808	0.497810	0.444954	0.511653	...	4	4	4
809	0.444954	0.511653	0.582450	...	4	4	4
810	0.511653	0.582450	0.477562	...	4	4	4
811	0.582450	0.477562	0.498620	...	4	4	4
812	0.477562	0.498620	0.523920	...	4	4	4
813	0.498620	0.523920	0.479971	...	4	4	4
814	0.523920	0.479971	0.539318	...	4	4	4
815	0.479971	0.539318	0.502845	...	4	4	4
816	0.539318	0.502845	0.513089	...	4	4	4
817	0.502845	0.513089	0.445764	...	4	4	4
818	0.513089	0.445764	0.423680	...	4	4	4
819	0.445764	0.423680	0.411694	...	4	4	4
820	0.423680	0.411694	0.400434	...	4	4	4
821	0.411694	0.400434	0.394209	...	4	4	4
822	0.400434	0.394209	0.423048	...	4	4	4

	season(t-8)	season(t-9)	season(t-10)	season(t-11)	season(t-12)	\
479	4	4	4	4	4	
480	4	4	4	4	4	
481	4	4	4	4	4	
482	4	4	4	4	4	
483	4	4	4	4	4	
484	4	4	4	4	4	
485	4	4	4	4	4	
486	4	4	4	4	4	
487	4	4	4	4	4	
488	4	4	4	4	4	
489	4	4	4	4	4	
490	4	4	4	4	4	
491	4	4	4	4	4	
492	4	4	4	4	4	
493	4	4	4	4	4	
494	2	4	4	4	4	
495	2	2	4	4	4	
496	2	2	2	4	4	
497	2	2	2	2	4	
498	2	2	2	2	2	
499	2	2	2	2	2	
500	2	2	2	2	2	
501	2	2	2	2	2	
502	2	2	2	2	2	
503	2	2	2	2	2	
504	2	2	2	2	2	
505	2	2	2	2	2	
506	2	2	2	2	2	

507	2	2	2	2	2
508	2	2	2	2	2
..	...	...	...	...	...
793	4	4	4	4	4
794	4	4	4	4	4
795	4	4	4	4	4
796	4	4	4	4	4
797	4	4	4	4	4
798	4	4	4	4	4
799	4	4	4	4	4
800	4	4	4	4	4
801	4	4	4	4	4
802	4	4	4	4	4
803	4	4	4	4	4
804	4	4	4	4	4
805	4	4	4	4	4
806	4	4	4	4	4
807	4	4	4	4	4
808	4	4	4	4	4
809	4	4	4	4	4
810	4	4	4	4	4
811	4	4	4	4	4
812	4	4	4	4	4
813	4	4	4	4	4
814	4	4	4	4	4
815	4	4	4	4	4
816	4	4	4	4	4
817	4	4	4	4	4
818	4	4	4	4	4
819	4	4	4	4	4
820	4	4	4	4	4
821	4	4	4	4	4
822	4	4	4	4	4

	season(t-13)	season(t-14)
479	4	4
480	4	4
481	4	4
482	4	4
483	4	4
484	4	4
485	4	4
486	4	4
487	4	4
488	4	4
489	4	4
490	4	4
491	4	4

492	4	4
493	4	4
494	4	4
495	4	4
496	4	4
497	4	4
498	4	4
499	2	4
500	2	2
501	2	2
502	2	2
503	2	2
504	2	2
505	2	2
506	2	2
507	2	2
508	2	2
..	...	...
793	4	4
794	4	4
795	4	4
796	4	4
797	4	4
798	4	4
799	4	4
800	4	4
801	4	4
802	4	4
803	4	4
804	4	4
805	4	4
806	4	4
807	4	4
808	4	4
809	4	4
810	4	4
811	4	4
812	4	4
813	4	4
814	4	4
815	4	4
816	4	4
817	4	4
818	4	4
819	4	4
820	4	4
821	4	4
822	4	4

[344 rows x 91 columns]

In [25]: *# Convert predictions back to normal values*

```
predi = scaler.inverse_transform(prova)
print(predi)
#0-6 predi
print(predi[0][0])
print(predi[0][1])
print(predi[0][2])
print(predi[0][3])
print(predi[0][4])
print(predi[0][5])
print(predi[0][6])

#7-13 y

print(predi[0][7])
print(predi[0][8])
print(predi[0][9])
print(predi[0][10])
print(predi[0][11])
print(predi[0][12])
print(predi[0][13])
```

```
[[12.01334699 12.40718775 12.51683375 ... 13.      13.
  13.          ]
 [12.30035537 12.45312015 12.14020017 ... 13.      13.
  13.          ]
 [13.17336537 12.54223587 12.15745322 ... 13.      13.
  13.          ]
 ...
 [11.2283932  11.2370512  11.85468822 ... 13.      13.
  13.          ]
 [10.59939391 10.48732053 10.49775026 ... 13.      13.
  13.          ]
 [11.2045198  11.3410961  11.4236659  ... 13.      13.
  13.          ]]
12.013346989284086
12.407187751745315
12.516833754096336
12.38558408668491
12.017469797620592
11.977891797871582
11.99630999598358
11.590859170709699
12.186486909458
```



12.5777825527296  
11.816572589134799  
11.3876267050719  
11.6632140210701  
11.5047561338867

```
In [26]: llista1=list()  
         llista2=list()  
         llista3=list()  
         llista4=list()  
         llista5=list()  
         llista6=list()  
         llista7=list()  
         llista8=list()  
         llista9=list()  
         llista10=list()  
         llista11=list()  
         llista12=list()  
         llista13=list()  
         llista14=list()
```

```
         llista_errors1=list()  
         llista_errorsabs1=list()  
         llista_errorsres1=list()
```

```
         llista_errors2=list()  
         llista_errorsabs2=list()  
         llista_errorsres2=list()
```

```
         llista_errors3=list()  
         llista_errorsabs3=list()  
         llista_errorsres3=list()
```

```
         llista_errors4=list()  
         llista_errorsabs4=list()  
         llista_errorsres4=list()
```

```
         llista_errors5=list()  
         llista_errorsabs5=list()  
         llista_errorsres5=list()
```

```
         llista_errors6=list()
```

```

llista_errorsabs6=list()
llista_errorsres6=list()

llista_errors7=list()
llista_errorsabs7=list()
llista_errorsres7=list()

for i in range(len(predi)):

    llista1.append(predi[i][0])
    llista2.append(predi[i][1])
    llista3.append(predi[i][2])
    llista4.append(predi[i][3])
    llista5.append(predi[i][4])
    llista6.append(predi[i][5])
    llista7.append(predi[i][6])
    llista8.append(predi[i][7])
    llista9.append(predi[i][8])
    llista10.append(predi[i][9])
    llista11.append(predi[i][10])
    llista12.append(predi[i][11])
    llista13.append(predi[i][12])
    llista14.append(predi[i][13])

    valor1=predi[i][7] - predi[i][0]
    valorabs1=math.fabs(valor1)
    valorrespecte1=valorabs1/predi[i][7]
    llista_errors1.append(valor1)
    llista_errorsabs1.append(valorabs1)
    llista_errorsres1.append(valorrespecte1)

    valor2=predi[i][8] - predi[i][1]
    valorabs2=math.fabs(valor2)
    valorrespecte2=valorabs2/predi[i][8]
    llista_errors2.append(valor2)
    llista_errorsabs2.append(valorabs2)
    llista_errorsres2.append(valorrespecte2)

    valor3=predi[i][9] - predi[i][2]
    valorabs3=math.fabs(valor3)
    valorrespecte3=valorabs3/predi[i][9]
    llista_errors3.append(valor3)
    llista_errorsabs3.append(valorabs3)
    llista_errorsres3.append(valorrespecte3)

    valor4=predi[i][10] - predi[i][3]

```

```

valorabs4=math.fabs(valor4)
valorrespecte4=valorabs4/predi[i][10]
llista_errors4.append(valor4)
llista_errorsabs4.append(valorabs4)
llista_errorsres4.append(valorrespecte4)

valor5=predi[i][11] - predi[i][4]
valorabs5=math.fabs(valor5)
valorrespecte5=valorabs5/predi[i][11]
llista_errors5.append(valor5)
llista_errorsabs5.append(valorabs5)
llista_errorsres5.append(valorrespecte5)

valor6=predi[i][12] - predi[i][5]
valorabs6=math.fabs(valor6)
valorrespecte6=valorabs6/predi[i][12]
llista_errors6.append(valor6)
llista_errorsabs6.append(valorabs6)
llista_errorsres6.append(valorrespecte6)

valor7=predi[i][13] - predi[i][6]
valorabs7=math.fabs(valor7)
valorrespecte7=valorabs7/predi[i][13]
llista_errors7.append(valor7)
llista_errorsabs7.append(valorabs7)
llista_errorsres7.append(valorrespecte7)

plt.plot(llista1)
plt.plot(llista8)
plt.title("Predicció consum a 1 dia")
plt.show()

plt.plot(llista2)
plt.plot(llista9)
plt.title("Predicció consum a 2 dies")
plt.show()

plt.plot(llista3)
plt.plot(llista10)
plt.title("Predicció consum a 3 dies")
plt.show()

plt.plot(llista4)
plt.plot(llista11)
plt.title("Predicció consum a 4 dies")
plt.show()

```

```
plt.plot(llista5)
plt.plot(llista12)
plt.title("Predicció consum a 5 dies")
plt.show()
```

```
plt.plot(llista6)
plt.plot(llista13)
plt.title("Predicció consum a 6 dies")
plt.show()
```

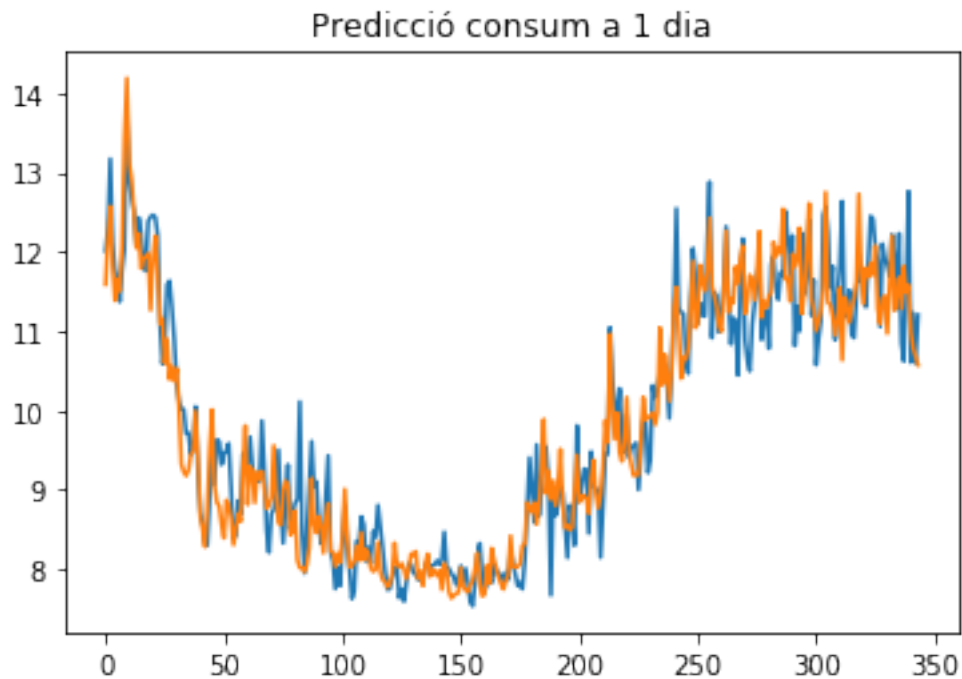
```
plt.plot(llista7)
plt.plot(llista14)
plt.title("Predicció consum a 7 dies")
plt.show()
```

```
plt.plot(llista_errorsres1)
plt.title("Error percentual a 1 dia")
plt.show()
plt.plot(llista_errorsres2)
plt.title("Error percentual a 2 dies")
plt.show()
plt.plot(llista_errorsres3)
plt.title("Error percentual a 3 dies")
plt.show()
plt.plot(llista_errorsres4)
plt.title("Error percentual a 4 dies")
plt.show()
plt.plot(llista_errorsres5)
plt.title("Error percentual a 5 dies")
plt.show()
plt.plot(llista_errorsres6)
plt.title("Error percentual a 6 dies")
plt.show()
plt.plot(llista_errorsres7)
plt.title("Error percentual a 7 dies")
plt.show()
```

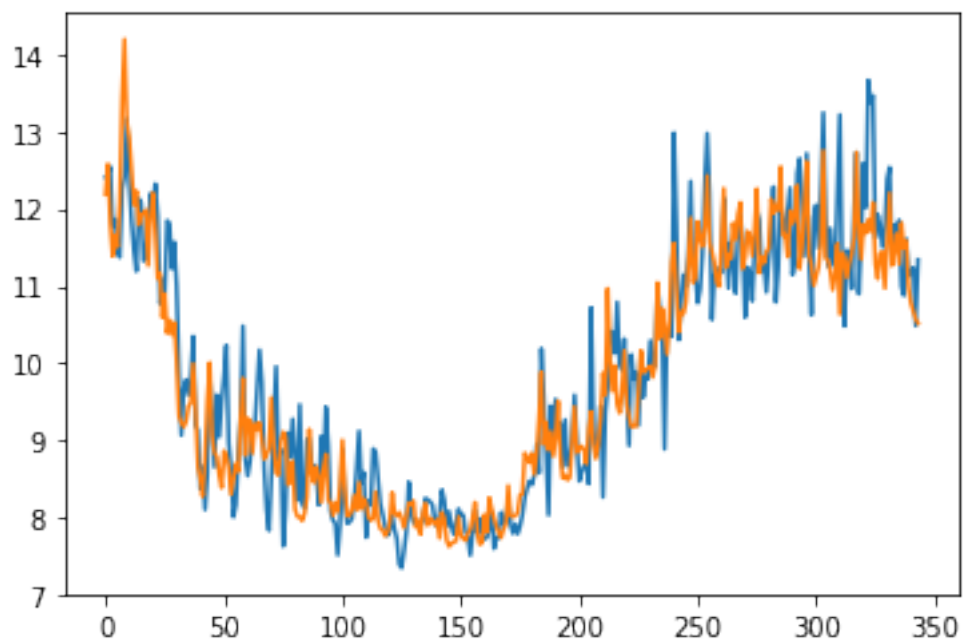
```
error_mitja1=sum(llista_errorsres1)/(len(llista_errorsres1))*100
error_mitja2=sum(llista_errorsres2)/(len(llista_errorsres2))*100
error_mitja3=sum(llista_errorsres3)/(len(llista_errorsres3))*100
error_mitja4=sum(llista_errorsres4)/(len(llista_errorsres4))*100
error_mitja5=sum(llista_errorsres5)/(len(llista_errorsres5))*100
error_mitja6=sum(llista_errorsres6)/(len(llista_errorsres6))*100
```

```
error_mitja7=sum(llista_errorsres7)/(len(llista_errorsres7))*100
```

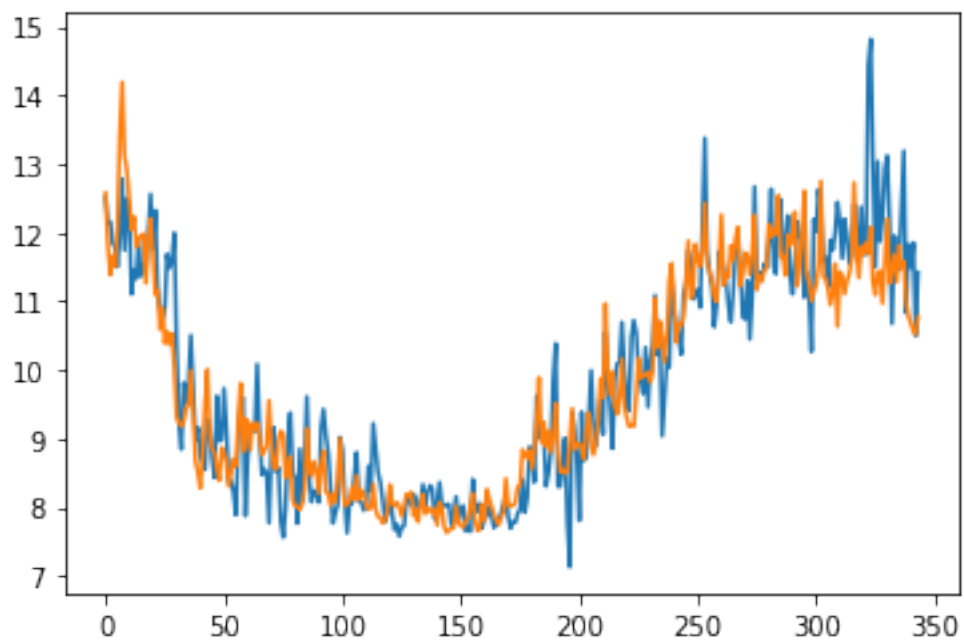
```
print("L'error mitjà a 1 dia és de {} % " .format(error_mitja1))  
print("L'error mitjà a 2 dies és de {} % " .format(error_mitja2))  
print("L'error mitjà a 3 dies és de {} % " .format(error_mitja3))  
print("L'error mitjà a 4 dies és de {} % " .format(error_mitja4))  
print("L'error mitjà a 5 dies és de {} % " .format(error_mitja5))  
print("L'error mitjà a 6 dies és de {} % " .format(error_mitja6))  
print("L'error mitjà a 7 dies és de {} % " .format(error_mitja7))
```



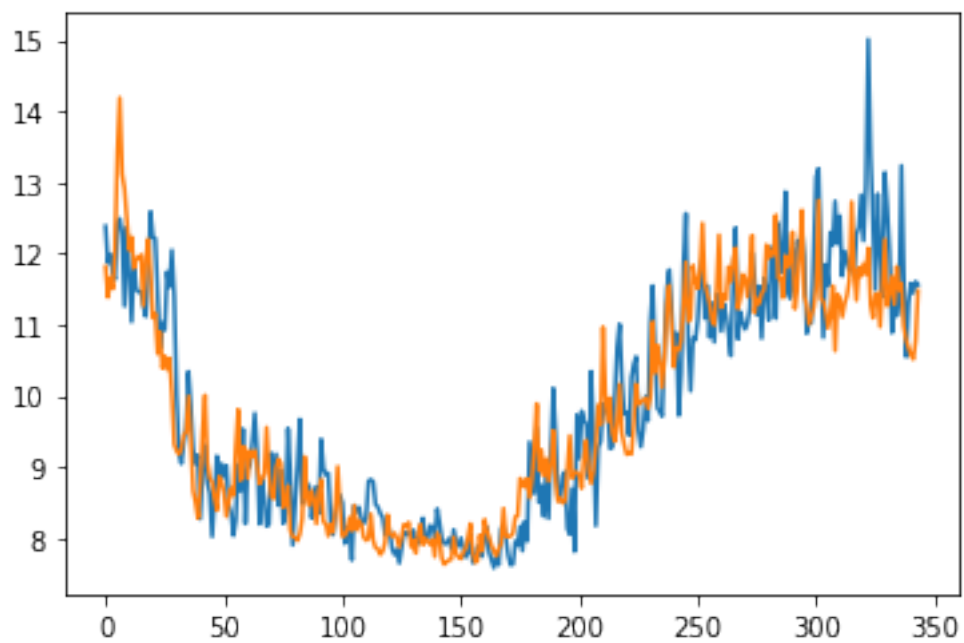
Predicció consum a 2 dies



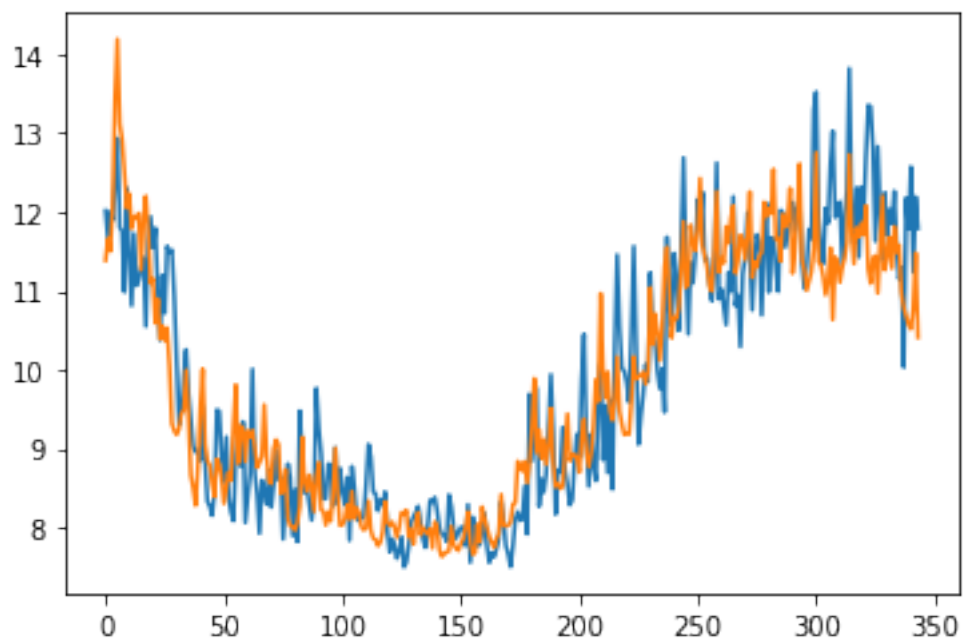
Predicció consum a 3 dies



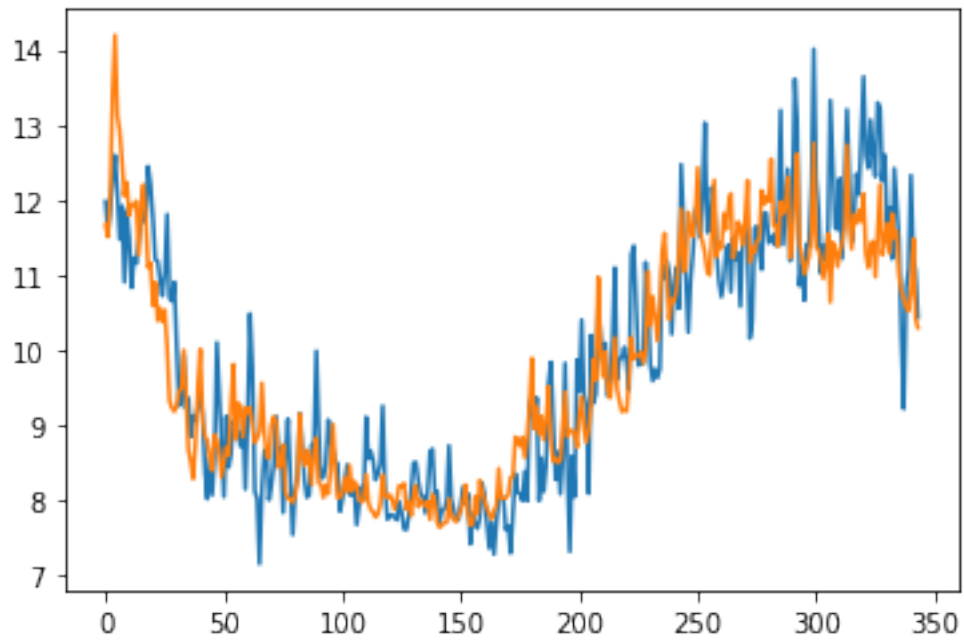
Predicció consum a 4 dies



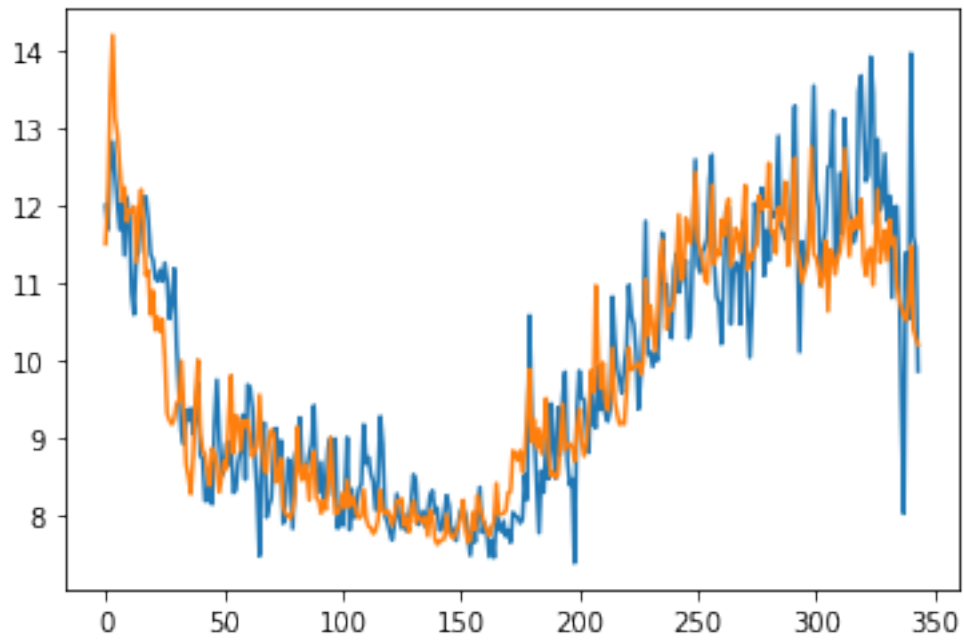
Predicció consum a 5 dies



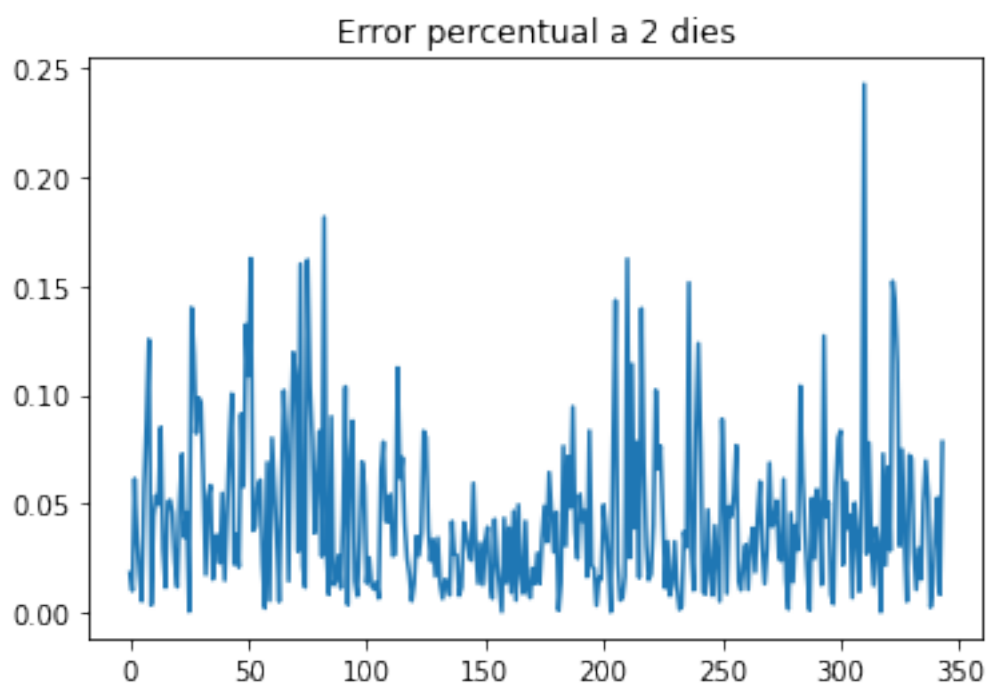
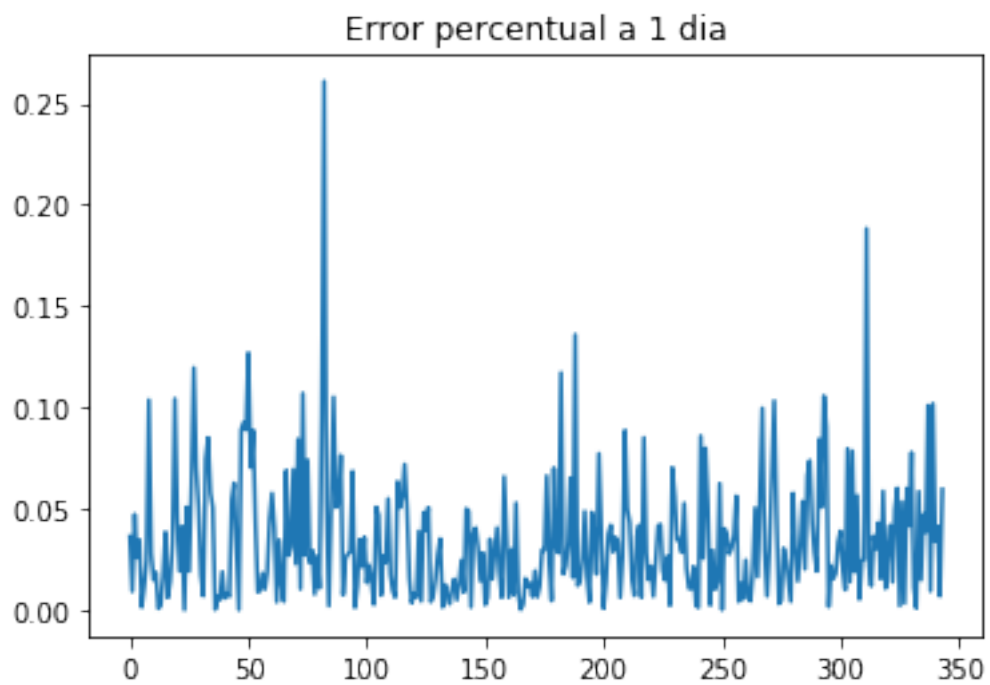
Predicció consum a 6 dies



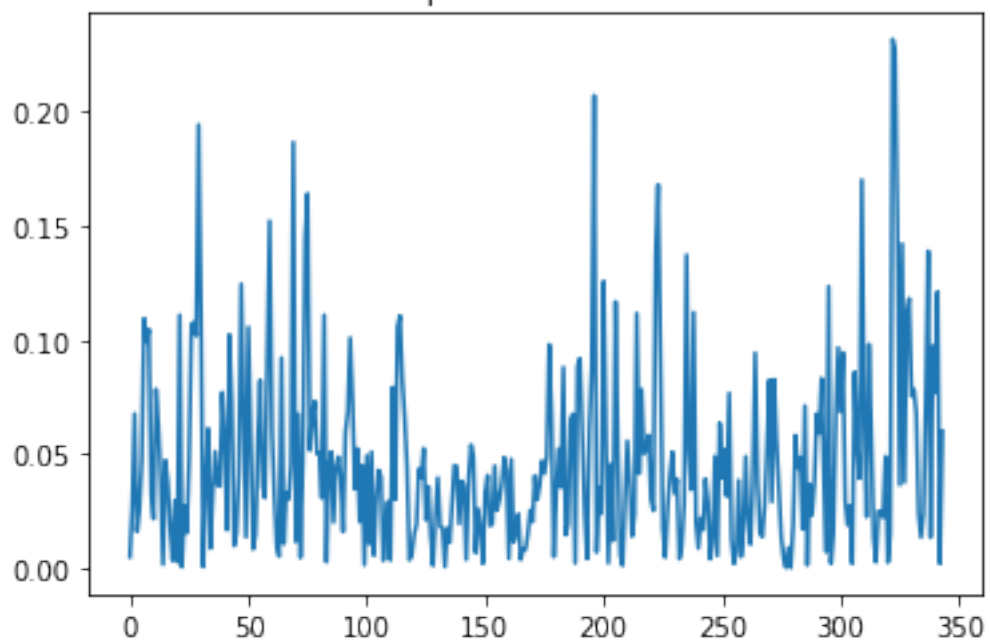
Predicció consum a 7 dies



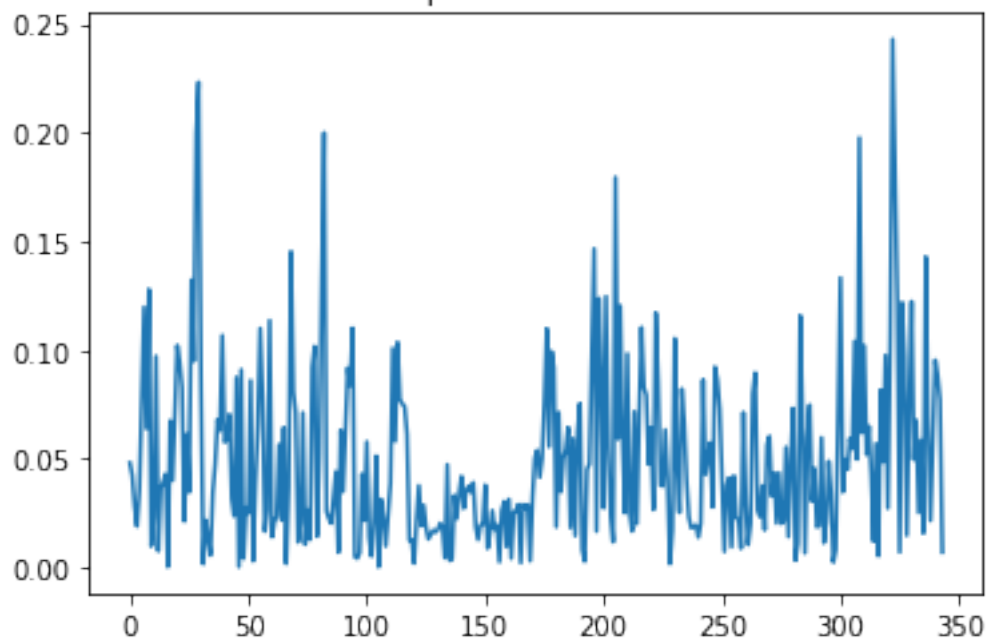




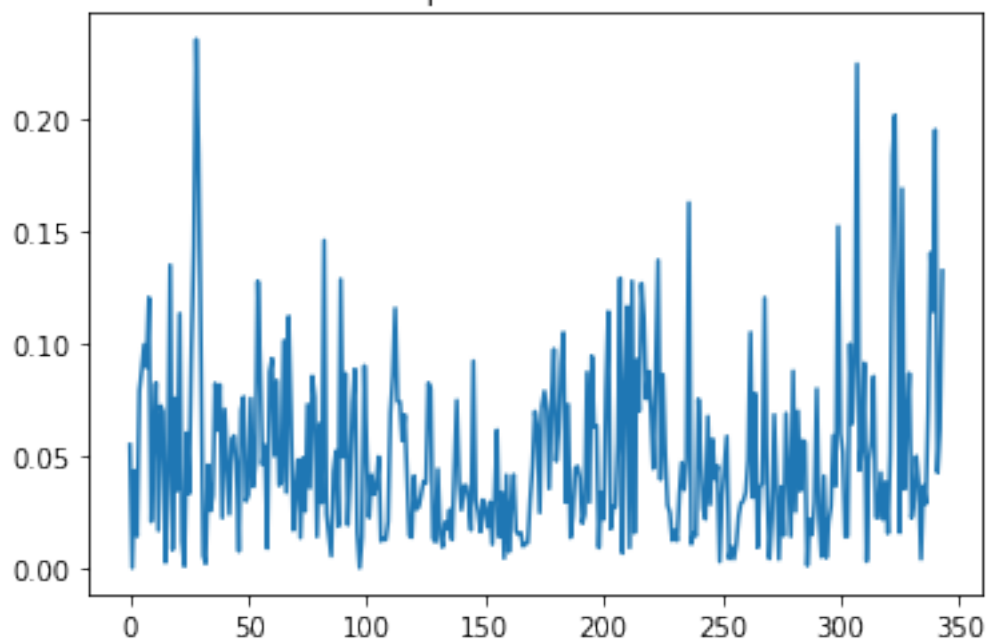
Error percentual a 3 dies



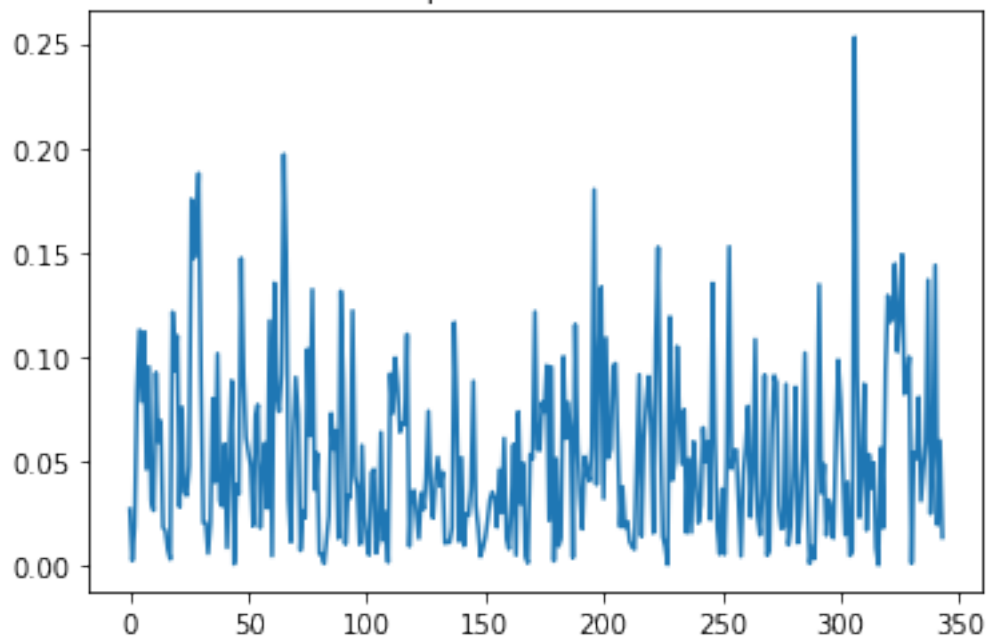
Error percentual a 4 dies

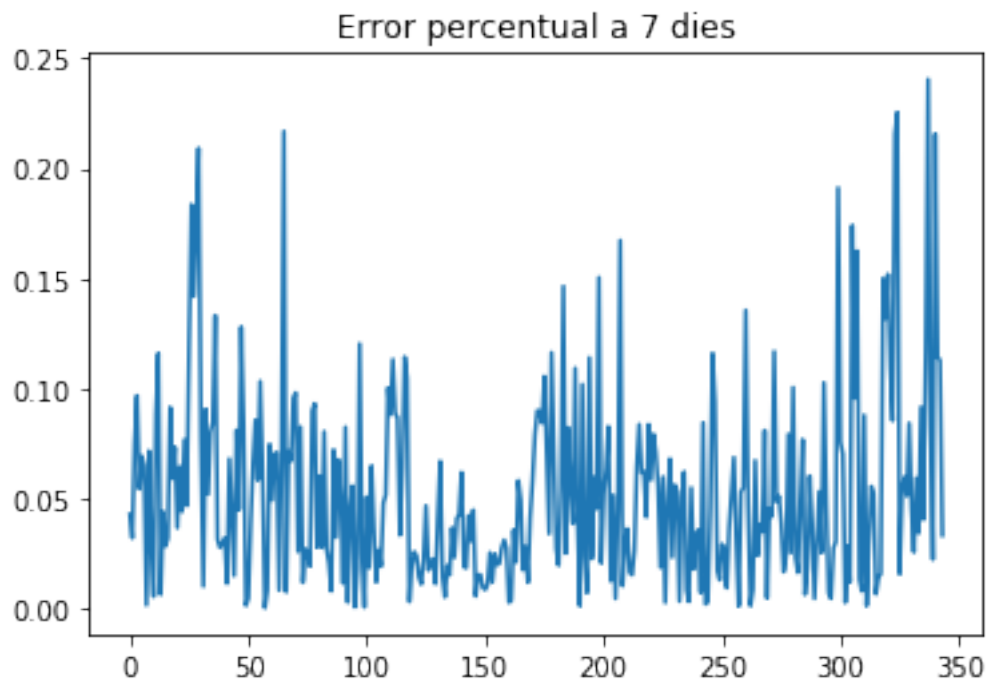


Error percentual a 5 dies



Error percentual a 6 dies





```
L'error mitjà a 1 dia és de 3.4457691113463613 %
L'error mitjà a 2 dies és de 4.379628225399063 %
L'error mitjà a 3 dies és de 4.635675119622094 %
L'error mitjà a 4 dies és de 4.9615905778450475 %
L'error mitjà a 5 dies és de 5.139195232117659 %
L'error mitjà a 6 dies és de 5.299377130256948 %
L'error mitjà a 7 dies és de 5.260351754615196 %
```

```
In [27]: (error_mitja1+error_mitja2+error_mitja3+error_mitja4+error_mitja5+error_mitja6+error_mitja7)
```

```
Out[27]: 4.731655307314624
```

```
In [ ]:
```