MM1b _Xarxa_walkforard_normalitzat_multivariate_MULTISTEP_tempmin_v walkforwardaugment-Copy2

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 multi-step

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

```
Out[2]:          date  apparentTemperatureMax  apparentTemperatureMin  sunsetTimeHour  \
        0  2014-02-08                    5.67                    2.19              17
        1  2013-12-24                   11.93                    2.68              15
        2  2012-11-01                   11.46                    0.85              16
        3  2014-02-05                    5.86                    1.03              16
        4  2012-04-17                   10.01                    2.76              19
```

```
   weekday  season  cloudCover  humidity  visibility  month  dewPoint  \
0        6  winter        0.47      0.77       11.20      2      3.99
1        2  winter        0.40      0.81       10.86     12      5.42
2        4  autumn        0.44      0.85       12.54     11      5.06
3        3  winter        0.73      0.77       10.91      2      4.06
4        2  spring        0.60      0.87       11.86      4      5.74

   pressure  energy_sum
0    979.25   11.569300
1    979.52   11.981672
2    979.63   10.781689
3    982.20   11.415105
4    982.22   10.617443
```

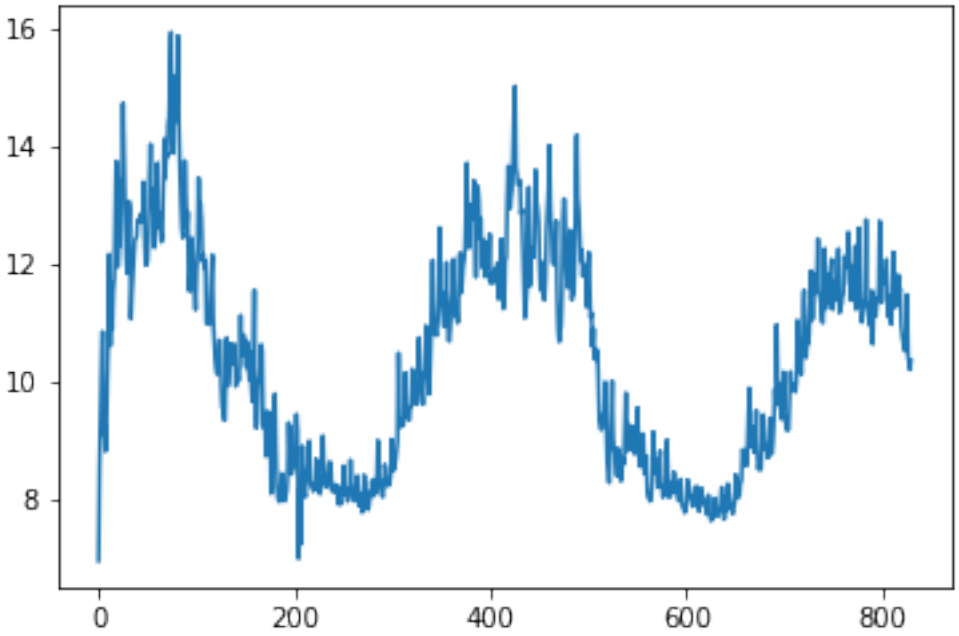
```
In [3]: #Ens quedem amb date i energy_sum, ordenem valors per data i resetejem index
        daily_dia=daily[['date','energy_sum','apparentTemperatureMax','apparentTemperatureMin'
        daily_dia.head(5)
```

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

   apparentTemperatureMin  weekday
0                    2.18        3
1                    7.01        4
2                    4.84        5
3                    4.69        6
4                    2.94        7
```

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

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



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


daily_dia
```

```
Out[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
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	weekday	y+1	y+2	y+3	\
0	2.18	3	8.536480	9.499781	10.267707	
1	7.01	4	9.499781	10.267707	10.850805	
2	4.84	5	10.267707	10.850805	9.103382	
3	4.69	6	10.850805	9.103382	9.274873	
4	2.94	7	9.103382	9.274873	8.813513	
5	1.31	1	9.274873	8.813513	9.227707	
6	3.39	2	8.813513	9.227707	10.145910	
7	3.34	3	9.227707	10.145910	10.780273	
8	5.29	4	10.145910	10.780273	12.163127	
9	0.46	5	10.780273	12.163127	10.609714	
10	4.71	6	12.163127	10.609714	11.673417	
11	1.03	7	10.609714	11.673417	10.889362	
12	-1.69	1	11.673417	10.889362	11.525150	
13	-1.61	2	10.889362	11.525150	11.759837	
14	0.94	3	11.525150	11.759837	12.633801	
15	0.63	4	11.759837	12.633801	13.749174	
16	-1.42	5	12.633801	13.749174	11.951958	
17	-3.42	6	13.749174	11.951958	11.957446	
18	0.11	7	11.951958	11.957446	12.392776	
19	-0.64	1	11.957446	12.392776	12.307079	
20	0.22	2	12.392776	12.307079	13.376080	
21	0.78	3	12.307079	13.376080	13.511968	
22	1.07	4	13.376080	13.511968	14.732271	
23	-2.65	5	13.511968	14.732271	13.774471	
24	-3.56	6	14.732271	13.774471	12.709106	
25	-4.12	7	13.774471	12.709106	12.148570	
26	-3.67	1	12.709106	12.148570	11.839403	
27	1.68	2	12.148570	11.839403	12.254989	
28	3.84	3	11.839403	12.254989	13.065317	
29	5.37	4	12.254989	13.065317	12.949429	
..	...	...	...	...	...	
800	0.18	3	11.685169	11.857957	11.710582	
801	0.61	4	11.857957	11.710582	12.078164	

802	0.29	5	11.710582	12.078164	11.280011	
803	1.10	6	12.078164	11.280011	11.095584	
804	3.21	7	11.280011	11.095584	11.415105	
805	1.96	1	11.095584	11.415105	11.445403	
806	1.12	2	11.415105	11.445403	10.972318	
807	1.03	3	11.445403	10.972318	11.569300	
808	1.96	4	10.972318	11.569300	12.202967	
809	-0.86	5	11.569300	12.202967	11.264175	
810	2.19	6	12.202967	11.264175	11.452649	
811	1.38	7	11.264175	11.452649	11.679099	
812	0.89	1	11.452649	11.679099	11.285737	
813	-0.57	2	11.679099	11.285737	11.816914	
814	-1.20	3	11.285737	11.816914	11.490470	
815	0.05	4	11.816914	11.490470	11.582159	
816	0.45	5	11.490470	11.582159	10.979566	
817	1.77	6	11.582159	10.979566	10.781898	
818	-1.03	7	10.979566	10.781898	10.674624	
819	2.84	1	10.781898	10.674624	10.573835	
820	3.83	2	10.674624	10.573835	10.518126	
821	2.65	3	10.573835	10.518126	10.776242	
822	3.95	4	10.518126	10.776242	11.480411	
823	0.19	5	10.776242	11.480411	10.411403	
824	1.59	6	11.480411	10.411403	10.294997	
825	5.53	7	10.411403	10.294997	10.202945	
826	5.52	1	10.294997	10.202945	10.356350	
827	3.89	2	10.202945	10.356350	NaN	
828	1.67	3	10.356350	NaN	NaN	
829	1.41	4	NaN	NaN	NaN	

	y+4	...	weekday(t-5)	weekday(t-6)	weekday(t-7)	weekday(t-8)	\
0	10.850805	...	NaN	NaN	NaN	NaN	
1	9.103382	...	NaN	NaN	NaN	NaN	
2	9.274873	...	NaN	NaN	NaN	NaN	
3	8.813513	...	NaN	NaN	NaN	NaN	
4	9.227707	...	NaN	NaN	NaN	NaN	
5	10.145910	...	3.0	NaN	NaN	NaN	
6	10.780273	...	4.0	3.0	NaN	NaN	
7	12.163127	...	5.0	4.0	3.0	NaN	
8	10.609714	...	6.0	5.0	4.0	3.0	
9	11.673417	...	7.0	6.0	5.0	4.0	
10	10.889362	...	1.0	7.0	6.0	5.0	
11	11.525150	...	2.0	1.0	7.0	6.0	
12	11.759837	...	3.0	2.0	1.0	7.0	
13	12.633801	...	4.0	3.0	2.0	1.0	
14	13.749174	...	5.0	4.0	3.0	2.0	
15	11.951958	...	6.0	5.0	4.0	3.0	
16	11.957446	...	7.0	6.0	5.0	4.0	
17	12.392776	...	1.0	7.0	6.0	5.0	

```
18   12.307079  ...          2.0          1.0          7.0          6.0
19   13.376080  ...          3.0          2.0          1.0          7.0
20   13.511968  ...          4.0          3.0          2.0          1.0
21   14.732271  ...          5.0          4.0          3.0          2.0
22   13.774471  ...          6.0          5.0          4.0          3.0
23   12.709106  ...          7.0          6.0          5.0          4.0
24   12.148570  ...          1.0          7.0          6.0          5.0
25   11.839403  ...          2.0          1.0          7.0          6.0
26   12.254989  ...          3.0          2.0          1.0          7.0
27   13.065317  ...          4.0          3.0          2.0          1.0
28   12.949429  ...          5.0          4.0          3.0          2.0
29   11.065577  ...          6.0          5.0          4.0          3.0
..         ...  ...          ...          ...          ...          ...
800  12.078164  ...          5.0          4.0          3.0          2.0
801  11.280011  ...          6.0          5.0          4.0          3.0
802  11.095584  ...          7.0          6.0          5.0          4.0
803  11.415105  ...          1.0          7.0          6.0          5.0
804  11.445403  ...          2.0          1.0          7.0          6.0
805  10.972318  ...          3.0          2.0          1.0          7.0
806  11.569300  ...          4.0          3.0          2.0          1.0
807  12.202967  ...          5.0          4.0          3.0          2.0
808  11.264175  ...          6.0          5.0          4.0          3.0
809  11.452649  ...          7.0          6.0          5.0          4.0
810  11.679099  ...          1.0          7.0          6.0          5.0
811  11.285737  ...          2.0          1.0          7.0          6.0
812  11.816914  ...          3.0          2.0          1.0          7.0
813  11.490470  ...          4.0          3.0          2.0          1.0
814  11.582159  ...          5.0          4.0          3.0          2.0
815  10.979566  ...          6.0          5.0          4.0          3.0
816  10.781898  ...          7.0          6.0          5.0          4.0
817  10.674624  ...          1.0          7.0          6.0          5.0
818  10.573835  ...          2.0          1.0          7.0          6.0
819  10.518126  ...          3.0          2.0          1.0          7.0
820  10.776242  ...          4.0          3.0          2.0          1.0
821  11.480411  ...          5.0          4.0          3.0          2.0
822  10.411403  ...          6.0          5.0          4.0          3.0
823  10.294997  ...          7.0          6.0          5.0          4.0
824  10.202945  ...          1.0          7.0          6.0          5.0
825  10.356350  ...          2.0          1.0          7.0          6.0
826        NaN  ...          3.0          2.0          1.0          7.0
827        NaN  ...          4.0          3.0          2.0          1.0
828        NaN  ...          5.0          4.0          3.0          2.0
829        NaN  ...          6.0          5.0          4.0          3.0

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

3	NaN	NaN	NaN	NaN	NaN
4	NaN	NaN	NaN	NaN	NaN
5	NaN	NaN	NaN	NaN	NaN
6	NaN	NaN	NaN	NaN	NaN
7	NaN	NaN	NaN	NaN	NaN
8	NaN	NaN	NaN	NaN	NaN
9	3.0	NaN	NaN	NaN	NaN
10	4.0	3.0	NaN	NaN	NaN
11	5.0	4.0	3.0	NaN	NaN
12	6.0	5.0	4.0	3.0	NaN
13	7.0	6.0	5.0	4.0	3.0
14	1.0	7.0	6.0	5.0	4.0
15	2.0	1.0	7.0	6.0	5.0
16	3.0	2.0	1.0	7.0	6.0
17	4.0	3.0	2.0	1.0	7.0
18	5.0	4.0	3.0	2.0	1.0
19	6.0	5.0	4.0	3.0	2.0
20	7.0	6.0	5.0	4.0	3.0
21	1.0	7.0	6.0	5.0	4.0
22	2.0	1.0	7.0	6.0	5.0
23	3.0	2.0	1.0	7.0	6.0
24	4.0	3.0	2.0	1.0	7.0
25	5.0	4.0	3.0	2.0	1.0
26	6.0	5.0	4.0	3.0	2.0
27	7.0	6.0	5.0	4.0	3.0
28	1.0	7.0	6.0	5.0	4.0
29	2.0	1.0	7.0	6.0	5.0
..	...	...	...	...	...
800	1.0	7.0	6.0	5.0	4.0
801	2.0	1.0	7.0	6.0	5.0
802	3.0	2.0	1.0	7.0	6.0
803	4.0	3.0	2.0	1.0	7.0
804	5.0	4.0	3.0	2.0	1.0
805	6.0	5.0	4.0	3.0	2.0
806	7.0	6.0	5.0	4.0	3.0
807	1.0	7.0	6.0	5.0	4.0
808	2.0	1.0	7.0	6.0	5.0
809	3.0	2.0	1.0	7.0	6.0
810	4.0	3.0	2.0	1.0	7.0
811	5.0	4.0	3.0	2.0	1.0
812	6.0	5.0	4.0	3.0	2.0
813	7.0	6.0	5.0	4.0	3.0
814	1.0	7.0	6.0	5.0	4.0
815	2.0	1.0	7.0	6.0	5.0
816	3.0	2.0	1.0	7.0	6.0
817	4.0	3.0	2.0	1.0	7.0
818	5.0	4.0	3.0	2.0	1.0
819	6.0	5.0	4.0	3.0	2.0

820	7.0	6.0	5.0	4.0	3.0
821	1.0	7.0	6.0	5.0	4.0
822	2.0	1.0	7.0	6.0	5.0
823	3.0	2.0	1.0	7.0	6.0
824	4.0	3.0	2.0	1.0	7.0
825	5.0	4.0	3.0	2.0	1.0
826	6.0	5.0	4.0	3.0	2.0
827	7.0	6.0	5.0	4.0	3.0
828	1.0	7.0	6.0	5.0	4.0
829	2.0	1.0	7.0	6.0	5.0

	weekday(t-14)
0	NaN
1	NaN
2	NaN
3	NaN
4	NaN
5	NaN
6	NaN
7	NaN
8	NaN
9	NaN
10	NaN
11	NaN
12	NaN
13	NaN
14	3.0
15	4.0
16	5.0
17	6.0
18	7.0
19	1.0
20	2.0
21	3.0
22	4.0
23	5.0
24	6.0
25	7.0
26	1.0
27	2.0
28	3.0
29	4.0
..	...
800	3.0
801	4.0
802	5.0
803	6.0
804	7.0

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

[830 rows x 68 columns]
```

In [6]:
```
#Ens quedem amb energies i temperatures
#No agafem apparent temperature max ja que quan fem la predicció representa que no ho
daily_dia=daily_dia.drop(['index','date','apparentTemperatureMax','apparentTemperatureM
daily_dia.head(5)
```

Out[6]:

	energy_sum	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	...	weekday(t-5)	weekday(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	

	weekday(t-7)	weekday(t-8)	weekday(t-9)	weekday(t-10)	weekday(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

   weekday(t-12)  weekday(t-13)  weekday(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 63 columns]
```

In [7]:
```
#Eliminem les 14 primeres files ja que contenen NaN (valors buits)

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

Out[7]:
```
    energy_sum        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  ...  weekday(t-5)  \
14  11.957446  11.673417  10.609714  12.163127  ...           5.0
15  12.392776  10.889362  11.673417  10.609714  ...           6.0
16  12.307079  11.525150  10.889362  11.673417  ...           7.0
17  13.376080  11.759837  11.525150  10.889362  ...           1.0
18  13.511968  12.633801  11.759837  11.525150  ...           2.0

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

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

[5 rows x 63 columns]
```

```
In [8]: daily_dia=daily_dia.drop([829,828,827,826,825,824,823])
        daily_dia.tail(5)
```

Out[8]:

	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	...	weekday(t-5)	\
818	10.776242	11.490470	11.816914	11.285737	...	2.0	
819	11.480411	11.582159	11.490470	11.816914	...	3.0	
820	10.411403	10.979566	11.582159	11.490470	...	4.0	
821	10.294997	10.781898	10.979566	11.582159	...	5.0	
822	10.202945	10.674624	10.781898	10.979566	...	6.0	

	weekday(t-6)	weekday(t-7)	weekday(t-8)	weekday(t-9)	weekday(t-10)	\
818	1.0	7.0	6.0	5.0	4.0	
819	2.0	1.0	7.0	6.0	5.0	
820	3.0	2.0	1.0	7.0	6.0	
821	4.0	3.0	2.0	1.0	7.0	
822	5.0	4.0	3.0	2.0	1.0	

	weekday(t-11)	weekday(t-12)	weekday(t-13)	weekday(t-14)
818	3.0	2.0	1.0	7.0
819	4.0	3.0	2.0	1.0
820	5.0	4.0	3.0	2.0
821	6.0	5.0	4.0	3.0
822	7.0	6.0	5.0	4.0

[5 rows x 63 columns]

```
In [9]: len(daily_dia)
```

Out[9]: 809

```
In [10]: #normalitzem
         scaler=preprocessing.MinMaxScaler(feature_range=(0, 1))
         daily_dia_norm=scaler.fit_transform(daily_dia)

In [11]: #Seleccionem dades per test i train
         y_daily=daily_dia_norm[:,0:7]
         X_daily=daily_dia_norm[:,7:63]

         #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], 14,4))
```

In [12]:
```
        # definim model
        import tensorflow as tf
        model =Sequential()
        model.add(LSTM(50, activation='relu', input_shape=(14, 4)))
        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 [13]:
```
        import math
        from sklearn.metrics import mean_squared_error

        #Walk forward per test i train
        minim=100
        n_train=465
        lenght=len(daily_dia)

        llista_evaluate=list()
        llista_prediccions=list()
        llista_preditrain=list()
        llista_scores=list()
        llista_scoretrain=list()
        sumScores=0

        for i in range(n_train,lenght):
            #minim=minim+1
            X_train,X_test= X_daily[minim:i],X_daily[i:i+1]
            y_train,y_test= y_daily[minim:i],y_daily[i:i+1]

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

            #mostrem score per cada model
            score=model.evaluate(X_test,y_test,verbose=0)
            llista_evaluate.append(score)

            #Predim per cadascun
            preditest=model.predict(X_test)
            llista_prediccions.append(preditest)
```

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

            trainScore = math.sqrt(mean_squared_error(y_train, preditrain))
            llista_scoretrain.append(trainScore )


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

            sumScores=sumScores+testScore
```

```
WARNING:tensorflow:From c:\users\laura\appdata\local\programs\python\python37\lib\site-packages
Instructions for updating:
Use tf.cast instead.
```

```
In [14]: #Dividim la suma de scores de test entre el nombre de prediccions per obtenir la mitj
         sumScores/(lenght-n_train)
```

```
Out[14]: 0.05537781403489237
```

```
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]: [[[0.4788956046104431,
            0.5046525001525879,
            0.5500539541244507,
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            0.4896383285522461]],
          [[0.5727394223213196,
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```

```
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```
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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: 0.04766261526847275
Error predicció 2 dia següent: 0.05282975109263351
Error predicció 3 dia següent: 0.060496747220503855
Error predicció 4 dia següent: 0.065340869904399
Error predicció 5 dia següent: 0.06805877510044427
Error predicció 6 dia següent: 0.07140896449848305
Error predicció 7 dia següent: 0.07340117080446443
```

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

         for i in range(len(llista_prediccions)):
```

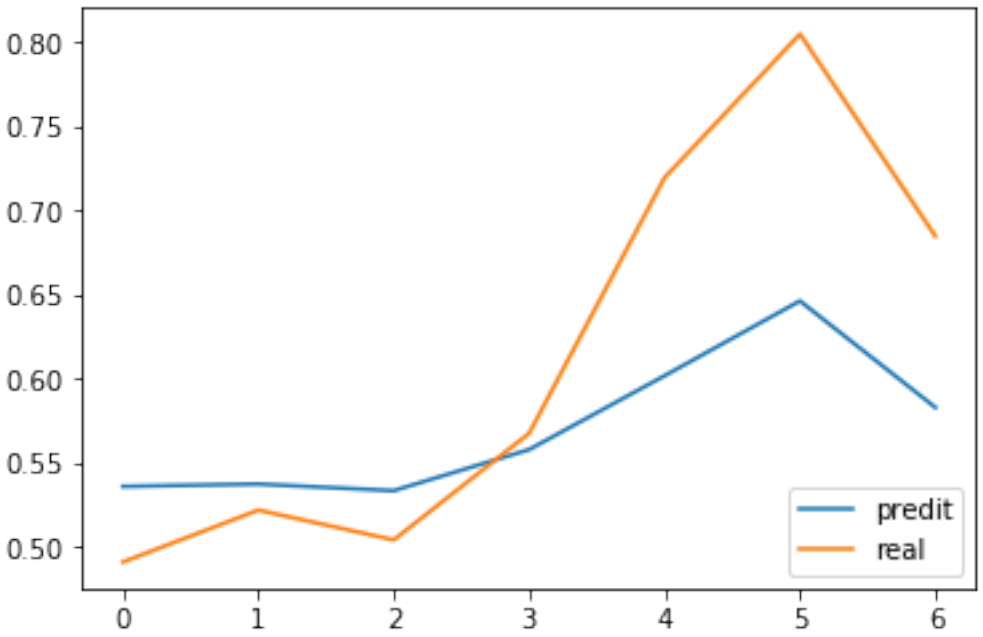
```
        predi=llista_prediccions[i].tolist()
        predis.append(predi)

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

    predis
```

Out[19]:
```
array([[0.4788956 , 0.5046525 , 0.55005395, ..., 0.46471238, 0.47103712,
        0.48963833],
       [0.57273942, 0.63497913, 0.5664379 , ..., 0.52470648, 0.53240144,
        0.53206372],
       [0.70624542, 0.6213057 , 0.59098238, ..., 0.58058405, 0.56984007,
        0.6189881 ],
       ...,
       [0.44351524, 0.43101487, 0.46848655, ..., 0.44569418, 0.47776979,
        0.2704508 ],
       [0.41249853, 0.40840313, 0.4214921 , ..., 0.55075002, 0.42166436,
        0.44965559],
       [0.44345877, 0.42970914, 0.46196213, ..., 0.47139215, 0.44683018,
        0.35566229]])
```

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()

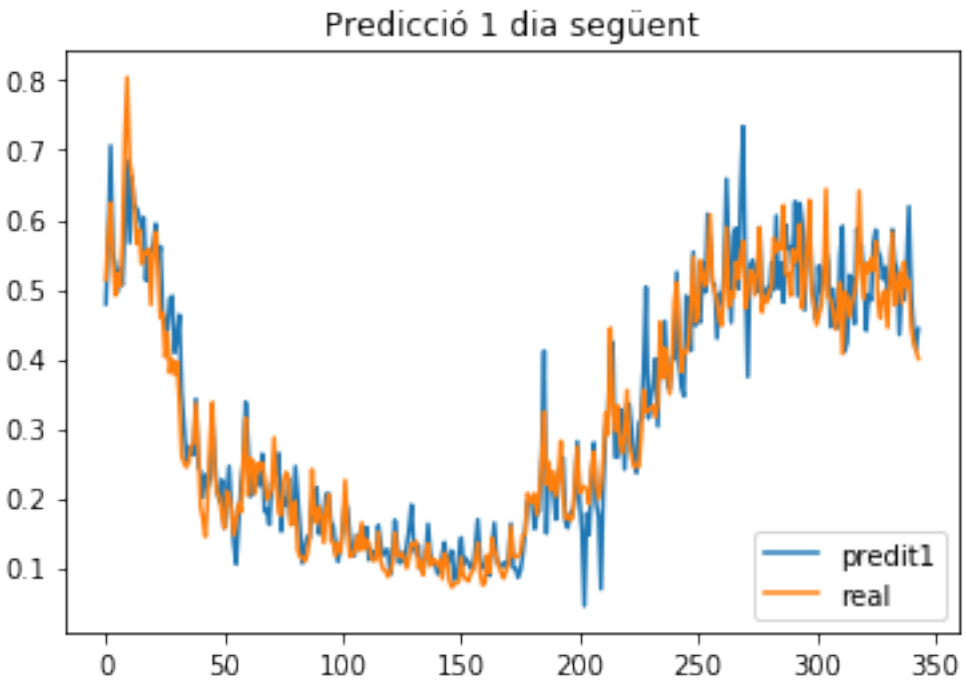

         plt.plot(llista_p2, label="predit3")
         plt.plot(y_daily[n_train:lenght,2], label="real")
         plt.legend(loc="lower right")
         plt.title("Predicció 3 dia següent")
         plt.show()

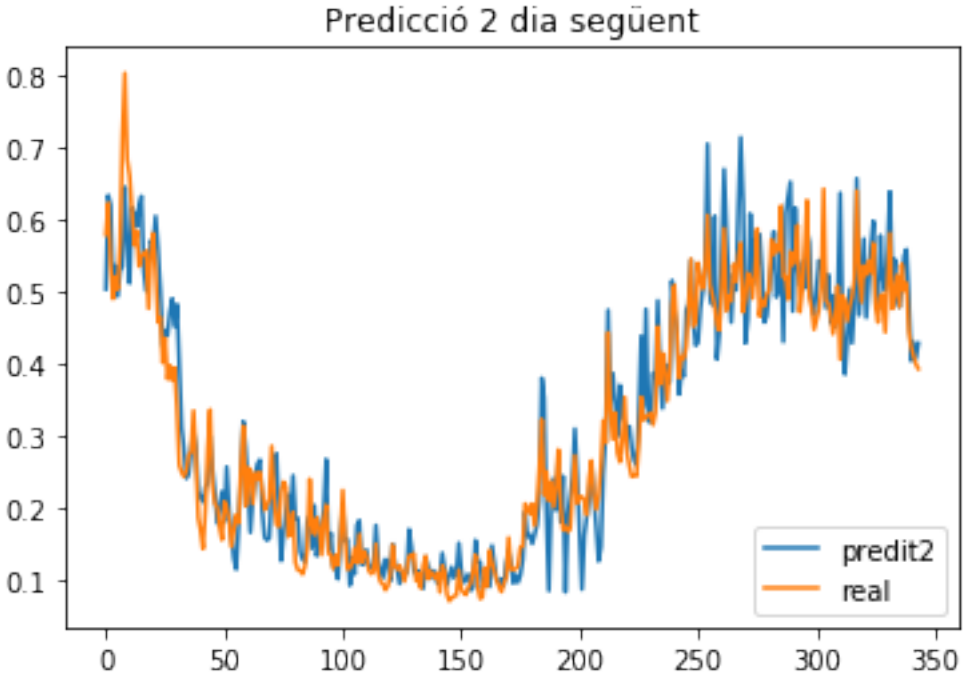
         plt.plot(llista_p3, label="predit4")
         plt.plot(y_daily[n_train:lenght,3], label="real")
         plt.legend(loc="lower right")
         plt.title("Predicció 4 dia següent")
         plt.show()

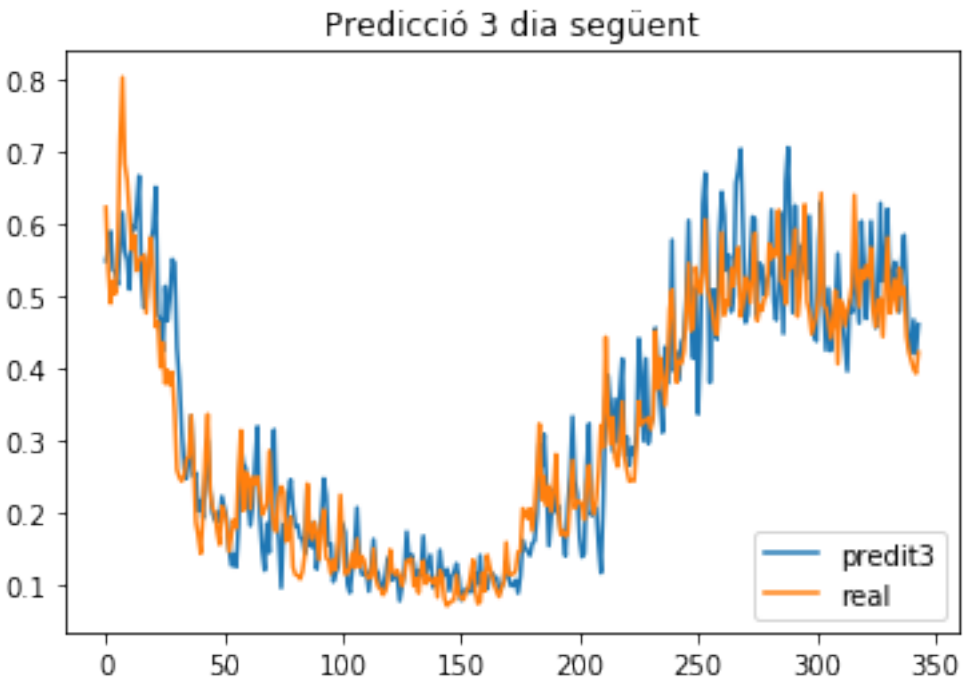
         plt.plot(llista_p4, label="predit5")
         plt.plot(y_daily[n_train:lenght,4], label="real")
         plt.legend(loc="lower right")
         plt.title("Predicció 5 dia següent")
         plt.show()

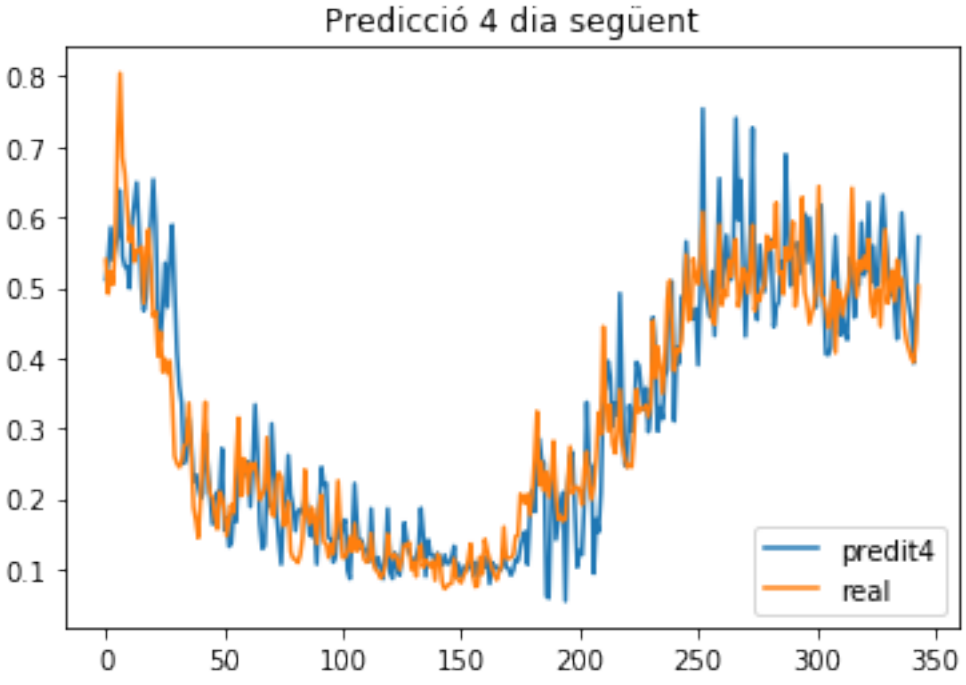
         plt.plot(llista_p5, label="predit6")
         plt.plot(y_daily[n_train:lenght,5], label="real")
         plt.legend(loc="lower right")
         plt.title("Predicció 6 dia següent")
         plt.show()

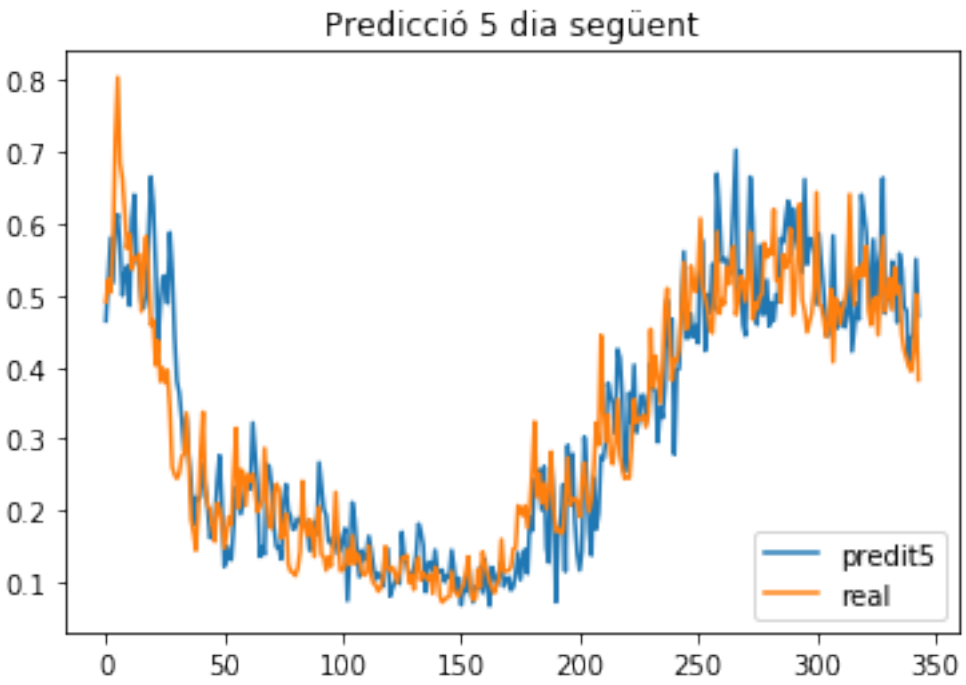
         plt.plot(llista_p6, label="predit7")
         plt.plot(y_daily[n_train:lenght,6], label="real")
         plt.legend(loc="lower right")
         plt.title("Predicció 7 dia següent")
         plt.show()
```

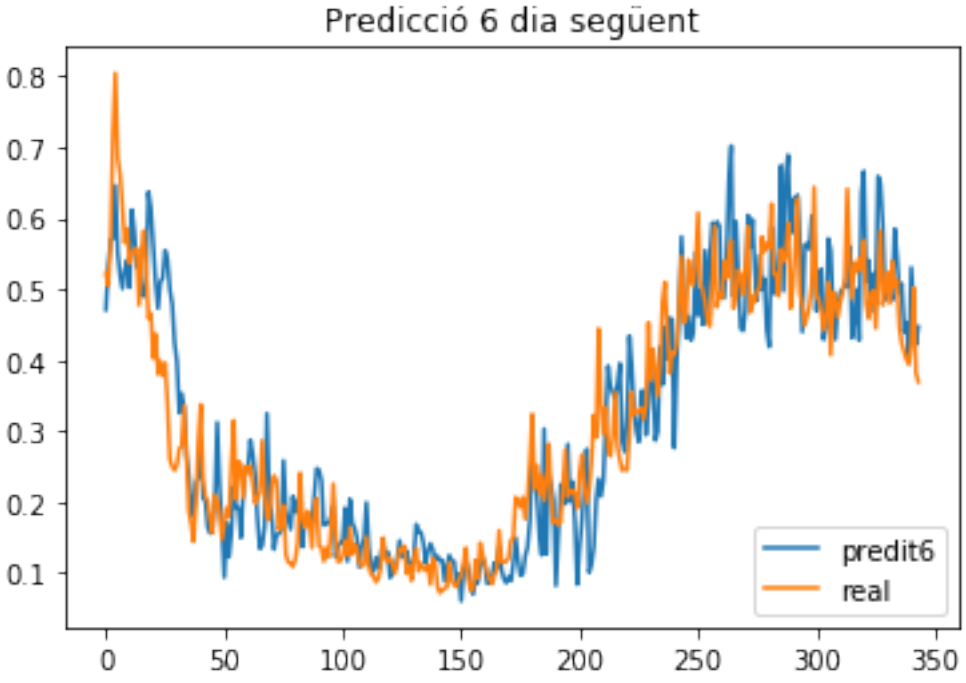

Predicció 1 dia següent
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
50
100
150
200
250
300
350
predit1
real

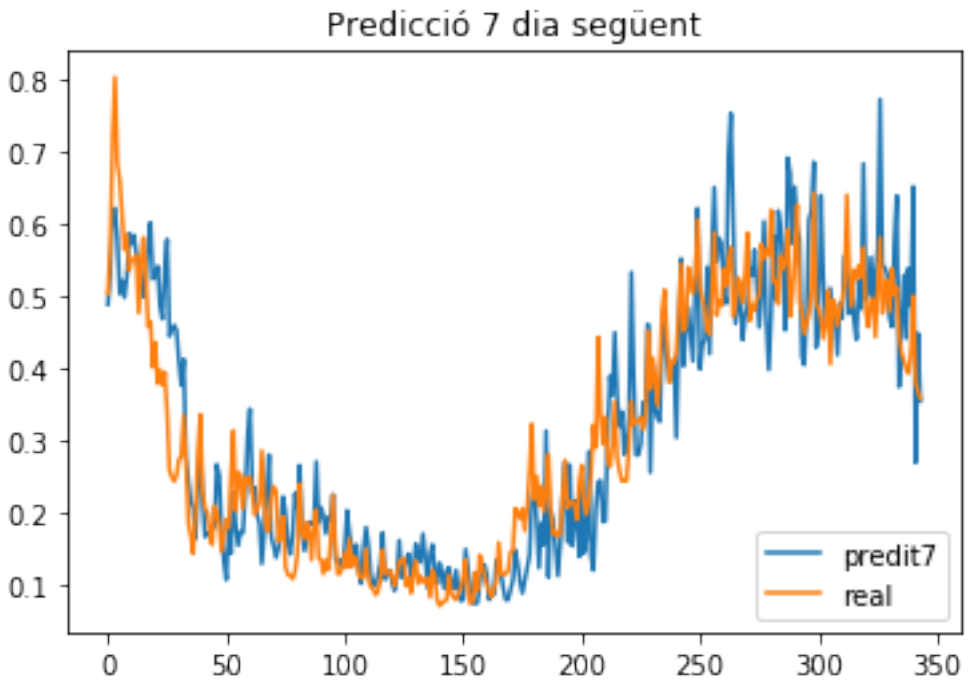

Predicció 2 dia següent
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
50
100
150
200
250
300
350
predit2
real


Predicció 3 dia següent
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
50
100
150
200
250
300
350
predit3
real


Predicció 4 dia següent
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
50
100
150
200
250
300
350
predit4
real


Predicció 5 dia següent
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
50
100
150
200
250
300
350
predit5
real


Predicció 6 dia següent
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
50
100
150
200
250
300
350
predit6
real




```
In [ ]:

In [22]: llista_scores

Out[22]: [0.04905088741948054,
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          0.11351475391602357,
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0.05673254322287349,
0.059028882559833594,
0.05126363126914593,
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0.06539386899556758,
0.09630967375211383,
0.031855068253580615,
0.03324227911685428,
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0.07255806598413585,
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0.05061006723447273,
0.05882403787324754,
0.10115528618505586,
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0.06896475950519967,
0.05045836102961876,
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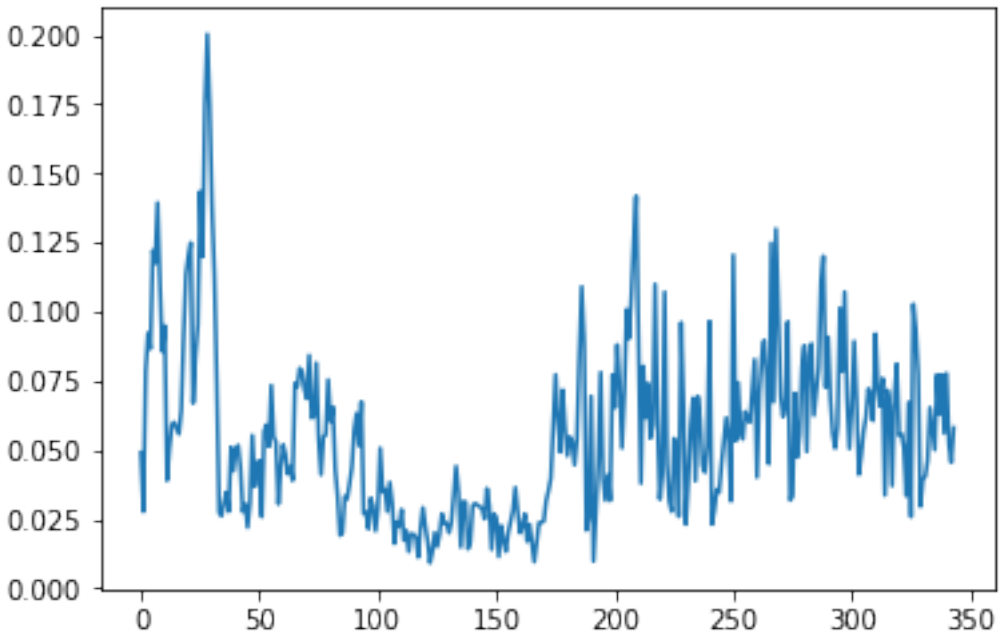
0.08928862649481249,
0.06837186260741074,
0.041097792896212314,
0.04821384708848428,
0.05684681440084872,
0.061885144590648714,
0.07210251304873619,
0.06922119535638219,

```
            0.06058876165260553,
            0.09195784537212547,
            0.07269621390975482,
            0.06585441431713636,
            0.07590334714827789,
            0.033603992878267576,
            0.07162325391104019,
            0.06592667431468392,
            0.03702040026497557,
            0.0700713329964776,
            0.08106581439424579,
            0.05514847196863907,
            0.055840418627637896,
            0.05065517187103292,
            0.03337685883086257,
            0.06721890361413702,
            0.025812631972998774,
            0.10274993771468065,
            0.09372572773404364,
            0.07745998300381059,
            0.029546583392752623,
            0.039477006543980134,
            0.04035365686898488,
            0.04617594966376215,
            0.06530667233359021,
            0.058097369876642393,
            0.05002052304248534,
            0.0771818977729364,
            0.0628427646336739,
            0.07720704522298501,
            0.056036357977280876,
            0.07766992281121322,
            0.052090681799906224,
            0.04545081363933654,
            0.05798482763820229]
```

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

```
Out[23]: [<matplotlib.lines.Line2D at 0x1e8f5641208>]
```



In [24]:
```
#Creem un dataset amb format (nombre prediccions,17) per tornar les prediccions i els
#El necessitem d'questa mida encara que només volguem passar 2 variables ja que al fe
#per fer la inversa necessitem 17 variables
#Com que només en tenim 2, les ajuntem al dataset inicial i ens quedem amb 15 variabl
#Obtenint un dataset amb 15 variables aleatories i les 2 variables que ens interessen


prova=daily_dia.iloc[n_train:lenght]
prova
#len(predis)
#lenght-n_train
#prova['predi']=predis
prova['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

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
  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:2
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:2
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:2
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:2
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:2
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:2
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	0.478896	0.504653	0.550054	0.511377	0.464712	0.471037	0.489638
480	0.572739	0.634979	0.566438	0.540231	0.524706	0.532401	0.532064
481	0.706245	0.621306	0.590982	0.585418	0.580584	0.569840	0.618988
482	0.552644	0.512319	0.538027	0.538943	0.517681	0.570993	0.622796
483	0.536201	0.537587	0.533671	0.558043	0.601853	0.646269	0.583051
484	0.496602	0.494744	0.516656	0.572596	0.613128	0.550863	0.504755
485	0.529886	0.529766	0.564904	0.638006	0.566545	0.519426	0.522779
486	0.505978	0.536532	0.616846	0.544267	0.500044	0.500828	0.499092
487	0.592236	0.646292	0.563260	0.529838	0.528575	0.527935	0.527936
488	0.684924	0.574557	0.551159	0.529696	0.541100	0.540868	0.588187

489	0.566539	0.512982	0.510695	0.499079	0.486227	0.502503	0.573211
490	0.660770	0.617773	0.597772	0.591743	0.606399	0.611686	0.585732
491	0.617734	0.610118	0.593134	0.621409	0.640593	0.580874	0.559652
492	0.616924	0.591155	0.623633	0.649238	0.550260	0.530908	0.540181
493	0.604535	0.620661	0.667988	0.580890	0.539339	0.533339	0.539507
494	0.586971	0.633751	0.529387	0.499637	0.490283	0.491933	0.500062
495	0.602668	0.529695	0.485178	0.467040	0.482593	0.490009	0.520740
496	0.512531	0.502327	0.499275	0.485281	0.500216	0.520221	0.571773
497	0.556509	0.537817	0.549374	0.551354	0.582993	0.637081	0.603231
498	0.553513	0.572412	0.576157	0.596038	0.665745	0.613411	0.525073
499	0.564262	0.566547	0.595988	0.653561	0.624995	0.558508	0.529239
500	0.594010	0.605918	0.652280	0.587262	0.541536	0.509909	0.542801
501	0.542299	0.560379	0.475339	0.468103	0.430353	0.472985	0.487527
502	0.561339	0.503684	0.469750	0.425655	0.488481	0.510419	0.469468
503	0.464112	0.426031	0.424261	0.467687	0.525250	0.515359	0.538062
504	0.454491	0.447792	0.514780	0.534971	0.527783	0.554641	0.579816
505	0.440068	0.440235	0.466936	0.472292	0.489386	0.542166	0.445580
506	0.486732	0.472233	0.498127	0.540900	0.588037	0.499670	0.454413
507	0.490146	0.491491	0.552222	0.588977	0.533584	0.479412	0.460794
508	0.408777	0.453167	0.547038	0.495481	0.442171	0.424721	0.453735
..	...	...	...	...	...	...	...
793	0.520337	0.504724	0.493885	0.541545	0.603008	0.560734	0.516667
794	0.514853	0.429839	0.478170	0.545850	0.421999	0.431372	0.467864
795	0.450020	0.484397	0.554402	0.457347	0.455838	0.458042	0.440994
796	0.586773	0.658356	0.507648	0.505815	0.488975	0.499735	0.520678
797	0.541356	0.468715	0.463635	0.503691	0.466726	0.428086	0.483742
798	0.563138	0.522901	0.605016	0.592277	0.640617	0.635726	0.684750
799	0.519732	0.574797	0.544738	0.517668	0.615872	0.666499	0.496141
800	0.440374	0.465197	0.470084	0.524202	0.587790	0.511062	0.503714
801	0.492070	0.515111	0.518609	0.620658	0.532652	0.540838	0.555182
802	0.483968	0.564291	0.604975	0.507095	0.465945	0.468070	0.497381
803	0.566053	0.599127	0.536817	0.558875	0.578412	0.522202	0.535601
804	0.585277	0.484645	0.457219	0.501503	0.493664	0.479175	0.567455
805	0.553903	0.476767	0.498152	0.506422	0.541952	0.659185	0.774164
806	0.546393	0.579225	0.630144	0.578127	0.564310	0.648820	0.542295
807	0.514169	0.521099	0.521794	0.631092	0.663993	0.589054	0.541262
808	0.532029	0.502993	0.548242	0.580944	0.475096	0.485160	0.530499
809	0.495919	0.559958	0.621862	0.540968	0.503099	0.506025	0.471950
810	0.503524	0.639977	0.494417	0.487583	0.495455	0.498454	0.458908
811	0.586017	0.516409	0.529103	0.523022	0.547515	0.484622	0.572987
812	0.539021	0.546162	0.548649	0.470550	0.527883	0.585088	0.640456
813	0.530262	0.488715	0.513232	0.426860	0.462388	0.545463	0.375417
814	0.434893	0.479967	0.479278	0.523296	0.558510	0.493546	0.458599
815	0.503524	0.510922	0.546806	0.606092	0.538480	0.508021	0.530212
816	0.484838	0.550610	0.585970	0.550492	0.483015	0.439748	0.442950
817	0.531455	0.559759	0.512665	0.498738	0.479717	0.453308	0.539803
818	0.619013	0.494119	0.437953	0.474459	0.408917	0.399535	0.487693
819	0.494421	0.405196	0.422117	0.451971	0.441508	0.530568	0.653237

```
820  0.443515  0.431015  0.468487  0.392617  0.445694  0.477770  0.270451
821  0.412499  0.408403  0.421492  0.479944  0.550750  0.421664  0.449656
822  0.443459  0.429709  0.461962  0.572041  0.471392  0.446830  0.355662

           y1        y2        y3  ...  weekday(t-5)  weekday(t-6)  \
479  0.514061  0.580609  0.624326  ...           7.0           6.0
480  0.580609  0.624326  0.539280  ...           1.0           7.0
481  0.624326  0.539280  0.491355  ...           2.0           1.0
482  0.539280  0.491355  0.522145  ...           3.0           2.0
483  0.491355  0.522145  0.504442  ...           4.0           3.0
484  0.522145  0.504442  0.567725  ...           5.0           4.0
485  0.504442  0.567725  0.719460  ...           6.0           5.0
486  0.567725  0.719460  0.804631  ...           7.0           6.0
487  0.719460  0.804631  0.684716  ...           1.0           7.0
488  0.804631  0.684716  0.662177  ...           2.0           1.0
489  0.684716  0.662177  0.615194  ...           3.0           2.0
490  0.662177  0.615194  0.565466  ...           4.0           3.0
491  0.615194  0.565466  0.585646  ...           5.0           4.0
492  0.565466  0.585646  0.536523  ...           6.0           5.0
493  0.585646  0.536523  0.552256  ...           7.0           6.0
494  0.536523  0.552256  0.552256  ...           1.0           7.0
495  0.552256  0.552256  0.557809  ...           2.0           1.0
496  0.552256  0.557809  0.477794  ...           3.0           2.0
497  0.557809  0.477794  0.551195  ...           4.0           3.0
498  0.477794  0.551195  0.582339  ...           5.0           4.0
499  0.551195  0.582339  0.529772  ...           6.0           5.0
500  0.582339  0.529772  0.458904  ...           7.0           6.0
501  0.529772  0.458904  0.465733  ...           7.0           7.0
502  0.458904  0.465733  0.402622  ...           1.0           7.0
503  0.465733  0.402622  0.436918  ...           2.0           1.0
504  0.402622  0.436918  0.380048  ...           3.0           2.0
505  0.436918  0.380048  0.398860  ...           4.0           3.0
506  0.380048  0.398860  0.377916  ...           5.0           4.0
507  0.398860  0.377916  0.395717  ...           6.0           5.0
508  0.377916  0.395717  0.341266  ...           7.0           6.0
..        ...       ...       ...  ...           ...           ...
793  0.460288  0.481611  0.493841  ...           5.0           4.0
794  0.481611  0.493841  0.517404  ...           6.0           5.0
795  0.493841  0.517404  0.641295  ...           7.0           6.0
796  0.517404  0.641295  0.532274  ...           1.0           7.0
797  0.641295  0.532274  0.486571  ...           2.0           1.0
798  0.532274  0.486571  0.537515  ...           3.0           2.0
799  0.486571  0.537515  0.524598  ...           4.0           3.0
800  0.537515  0.524598  0.543903  ...           5.0           4.0
801  0.524598  0.543903  0.527438  ...           6.0           5.0
802  0.543903  0.527438  0.568506  ...           7.0           6.0
803  0.527438  0.568506  0.479332  ...           1.0           7.0
804  0.568506  0.479332  0.458726  ...           2.0           1.0
```

```
805  0.479332  0.458726  0.494425  ...          3.0          2.0
806  0.458726  0.494425  0.497810  ...          4.0          3.0
807  0.494425  0.497810  0.444954  ...          5.0          4.0
808  0.497810  0.444954  0.511653  ...          6.0          5.0
809  0.444954  0.511653  0.582450  ...          7.0          6.0
810  0.511653  0.582450  0.477562  ...          1.0          7.0
811  0.582450  0.477562  0.498620  ...          2.0          1.0
812  0.477562  0.498620  0.523920  ...          3.0          2.0
813  0.498620  0.523920  0.479971  ...          4.0          3.0
814  0.523920  0.479971  0.539318  ...          5.0          4.0
815  0.479971  0.539318  0.502845  ...          6.0          5.0
816  0.539318  0.502845  0.513089  ...          7.0          6.0
817  0.502845  0.513089  0.445764  ...          1.0          7.0
818  0.513089  0.445764  0.423680  ...          2.0          1.0
819  0.445764  0.423680  0.411694  ...          3.0          2.0
820  0.423680  0.411694  0.400434  ...          4.0          3.0
821  0.411694  0.400434  0.394209  ...          5.0          4.0
822  0.400434  0.394209  0.423048  ...          6.0          5.0

     weekday(t-7)  weekday(t-8)  weekday(t-9)  weekday(t-10)  weekday(t-11)  \
479           5.0           4.0           3.0            2.0            1.0
480           6.0           5.0           4.0            3.0            2.0
481           7.0           6.0           5.0            4.0            3.0
482           1.0           7.0           6.0            5.0            4.0
483           2.0           1.0           7.0            6.0            5.0
484           3.0           2.0           1.0            7.0            6.0
485           4.0           3.0           2.0            1.0            7.0
486           5.0           4.0           3.0            2.0            1.0
487           6.0           5.0           4.0            3.0            2.0
488           7.0           6.0           5.0            4.0            3.0
489           1.0           7.0           6.0            5.0            4.0
490           2.0           1.0           7.0            6.0            5.0
491           3.0           2.0           1.0            7.0            6.0
492           4.0           3.0           2.0            1.0            7.0
493           5.0           4.0           3.0            2.0            1.0
494           6.0           5.0           4.0            3.0            2.0
495           7.0           6.0           5.0            4.0            3.0
496           1.0           7.0           6.0            5.0            4.0
497           2.0           1.0           7.0            6.0            5.0
498           3.0           2.0           1.0            7.0            6.0
499           4.0           3.0           2.0            1.0            7.0
500           5.0           4.0           3.0            2.0            1.0
501           6.0           5.0           4.0            3.0            2.0
502           7.0           6.0           5.0            4.0            3.0
503           7.0           7.0           6.0            5.0            4.0
504           1.0           7.0           7.0            6.0            5.0
505           2.0           1.0           7.0            7.0            6.0
506           3.0           2.0           1.0            7.0            7.0
```

507	4.0	3.0	2.0	1.0	7.0
508	5.0	4.0	3.0	2.0	1.0
..	...	...	...	...	...
793	3.0	2.0	1.0	7.0	6.0
794	4.0	3.0	2.0	1.0	7.0
795	5.0	4.0	3.0	2.0	1.0
796	6.0	5.0	4.0	3.0	2.0
797	7.0	6.0	5.0	4.0	3.0
798	1.0	7.0	6.0	5.0	4.0
799	2.0	1.0	7.0	6.0	5.0
800	3.0	2.0	1.0	7.0	6.0
801	4.0	3.0	2.0	1.0	7.0
802	5.0	4.0	3.0	2.0	1.0
803	6.0	5.0	4.0	3.0	2.0
804	7.0	6.0	5.0	4.0	3.0
805	1.0	7.0	6.0	5.0	4.0
806	2.0	1.0	7.0	6.0	5.0
807	3.0	2.0	1.0	7.0	6.0
808	4.0	3.0	2.0	1.0	7.0
809	5.0	4.0	3.0	2.0	1.0
810	6.0	5.0	4.0	3.0	2.0
811	7.0	6.0	5.0	4.0	3.0
812	1.0	7.0	6.0	5.0	4.0
813	2.0	1.0	7.0	6.0	5.0
814	3.0	2.0	1.0	7.0	6.0
815	4.0	3.0	2.0	1.0	7.0
816	5.0	4.0	3.0	2.0	1.0
817	6.0	5.0	4.0	3.0	2.0
818	7.0	6.0	5.0	4.0	3.0
819	1.0	7.0	6.0	5.0	4.0
820	2.0	1.0	7.0	6.0	5.0
821	3.0	2.0	1.0	7.0	6.0
822	4.0	3.0	2.0	1.0	7.0

	weekday(t-12)	weekday(t-13)	weekday(t-14)
479	7.0	6.0	5.0
480	1.0	7.0	6.0
481	2.0	1.0	7.0
482	3.0	2.0	1.0
483	4.0	3.0	2.0
484	5.0	4.0	3.0
485	6.0	5.0	4.0
486	7.0	6.0	5.0
487	1.0	7.0	6.0
488	2.0	1.0	7.0
489	3.0	2.0	1.0
490	4.0	3.0	2.0
491	5.0	4.0	3.0

492	6.0	5.0	4.0
493	7.0	6.0	5.0
494	1.0	7.0	6.0
495	2.0	1.0	7.0
496	3.0	2.0	1.0
497	4.0	3.0	2.0
498	5.0	4.0	3.0
499	6.0	5.0	4.0
500	7.0	6.0	5.0
501	1.0	7.0	6.0
502	2.0	1.0	7.0
503	3.0	2.0	1.0
504	4.0	3.0	2.0
505	5.0	4.0	3.0
506	6.0	5.0	4.0
507	7.0	6.0	5.0
508	7.0	7.0	6.0
..	...	...	...
793	5.0	4.0	3.0
794	6.0	5.0	4.0
795	7.0	6.0	5.0
796	1.0	7.0	6.0
797	2.0	1.0	7.0
798	3.0	2.0	1.0
799	4.0	3.0	2.0
800	5.0	4.0	3.0
801	6.0	5.0	4.0
802	7.0	6.0	5.0
803	1.0	7.0	6.0
804	2.0	1.0	7.0
805	3.0	2.0	1.0
806	4.0	3.0	2.0
807	5.0	4.0	3.0
808	6.0	5.0	4.0
809	7.0	6.0	5.0
810	1.0	7.0	6.0
811	2.0	1.0	7.0
812	3.0	2.0	1.0
813	4.0	3.0	2.0
814	5.0	4.0	3.0
815	6.0	5.0	4.0
816	7.0	6.0	5.0
817	1.0	7.0	6.0
818	2.0	1.0	7.0
819	3.0	2.0	1.0
820	4.0	3.0	2.0
821	5.0	4.0	3.0
822	6.0	5.0	4.0

```
[344 rows x 63 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])
```

```
[[11.27610798 11.50664435 11.91300878 ... 43.         37.
  31.        ]
 [12.11605442 12.67312916 12.05965283 ...  7.         43.
  37.        ]
 [13.31099611 12.55074556 12.27933748 ... 13.          7.
  43.        ]
 ...
 [10.95943704 10.84755278 11.18294201 ... 25.         19.
  13.        ]
 [10.68182287 10.64516706 10.76231953 ... 31.         25.
  19.        ]
 [10.95893156 10.83586589 11.12454543 ... 37.         31.
  25.        ]]
11.276107981679603
11.506644348611012
11.913008781582006
11.566834256083785
11.149161442120436
11.205770833528192
11.372260429261571
11.590859170709699
12.186486909458
```

```
12.5777825527296
11.816572589134799
11.3876267050719
11.6632140210701
11.5047561338867
```

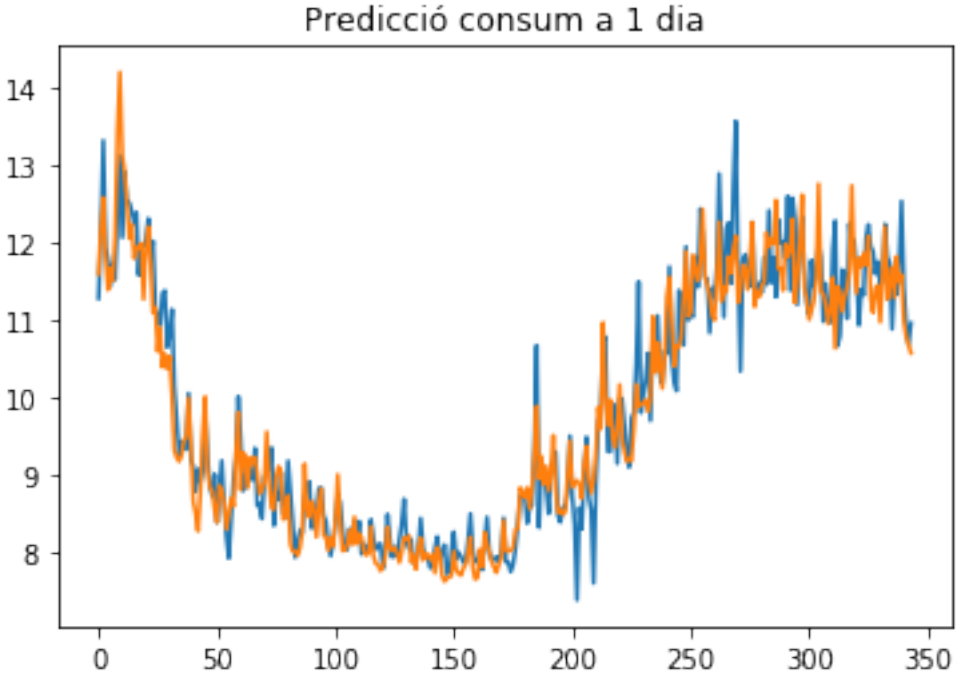
```
In [26]: llista1=list()
         llista2=list()
         llista3=list()
         llista4=list()
         llista5=list()
         llista6=list()
         llista7=list()
         llista8=list()
         llista9=list()
         llista10=list()
         llista11=list()
         llista12=list()
     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

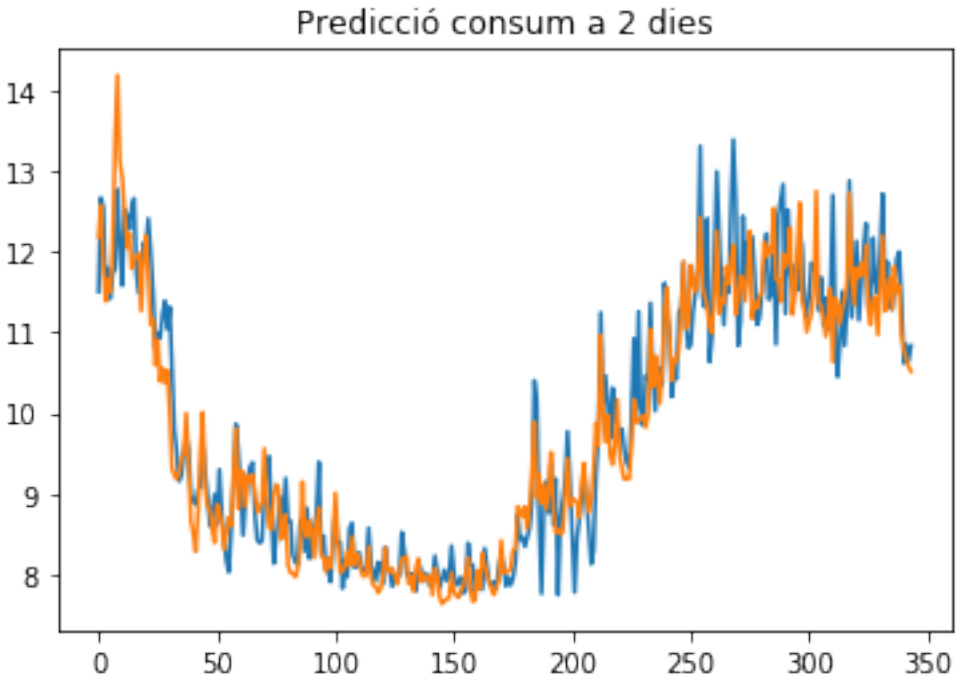
```
llista_errorsabs6=list()
llista_errorsres6=list()

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]
```

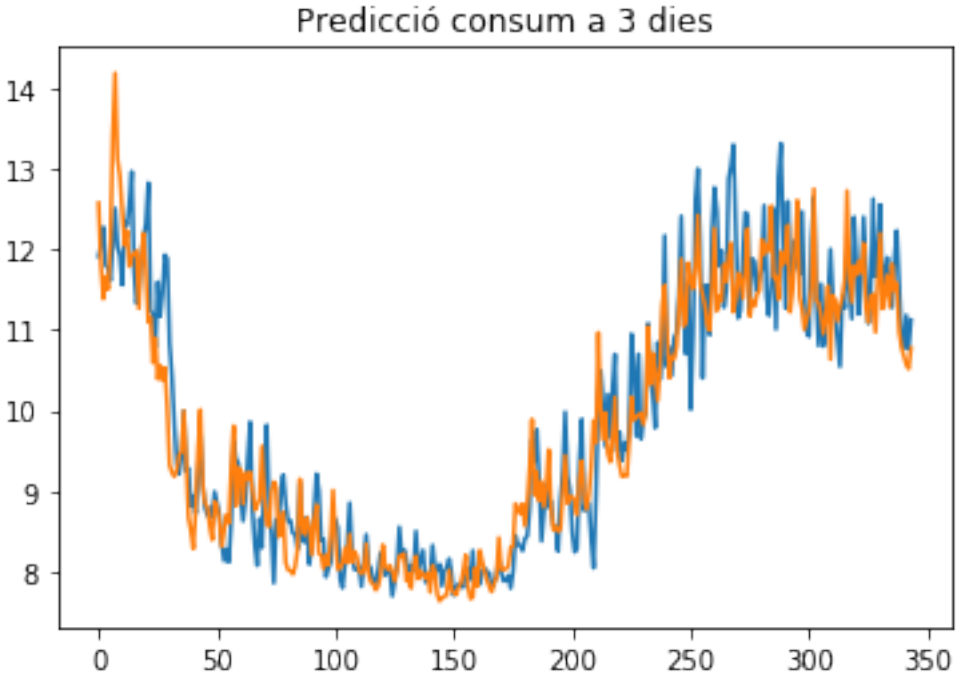
```
        valorabs4=math.fabs(valor4)
        valorrespecte4=valorabs4/predi[i][10]
        llista_errors4.append(valor4)
        llista_errorsabs4.append(valorabs4)
        llista_errorsres4.append(valorrespecte4)

        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()
```

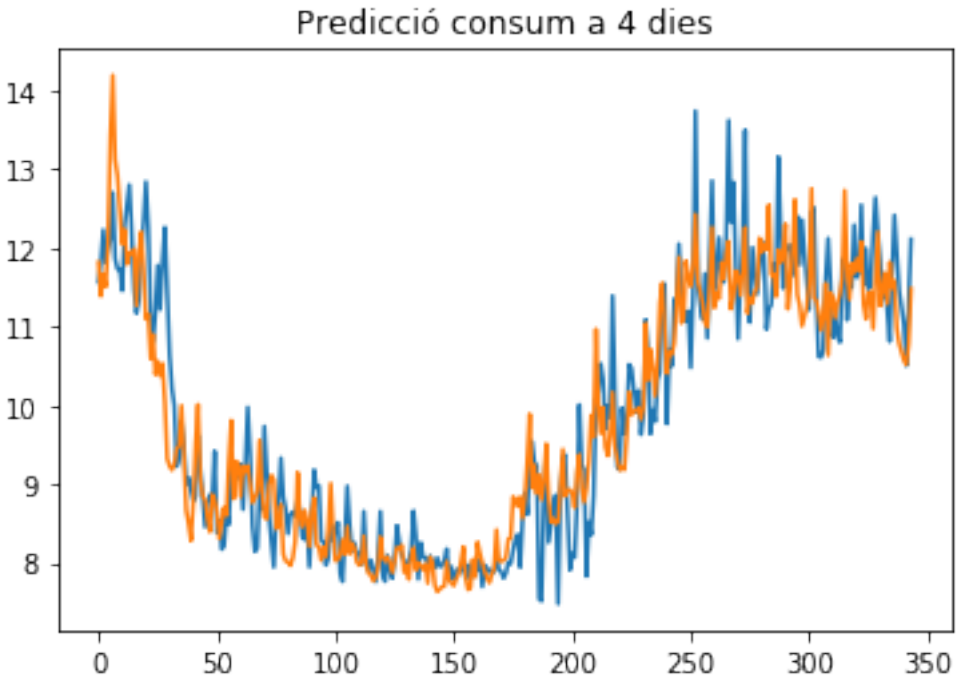
```
plt.plot(llista5)
plt.plot(llista12)
plt.title("Predicció consum a 5 dies")
plt.show()

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
```

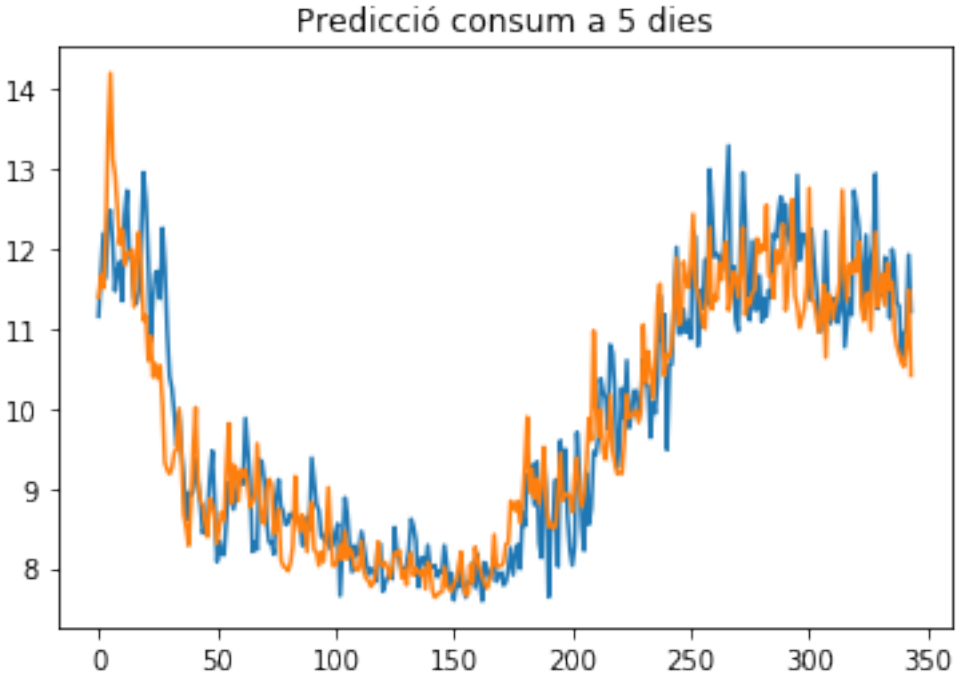
```
error_mitja7=sum(llista_errorsres7)/(len(llista_errorsres7))*100


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))
```

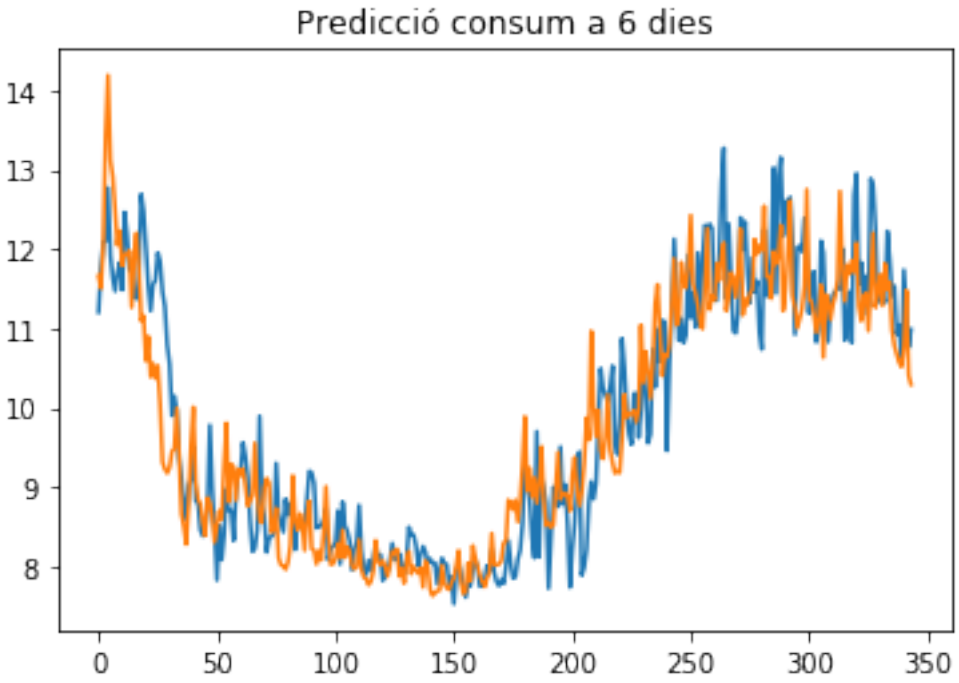


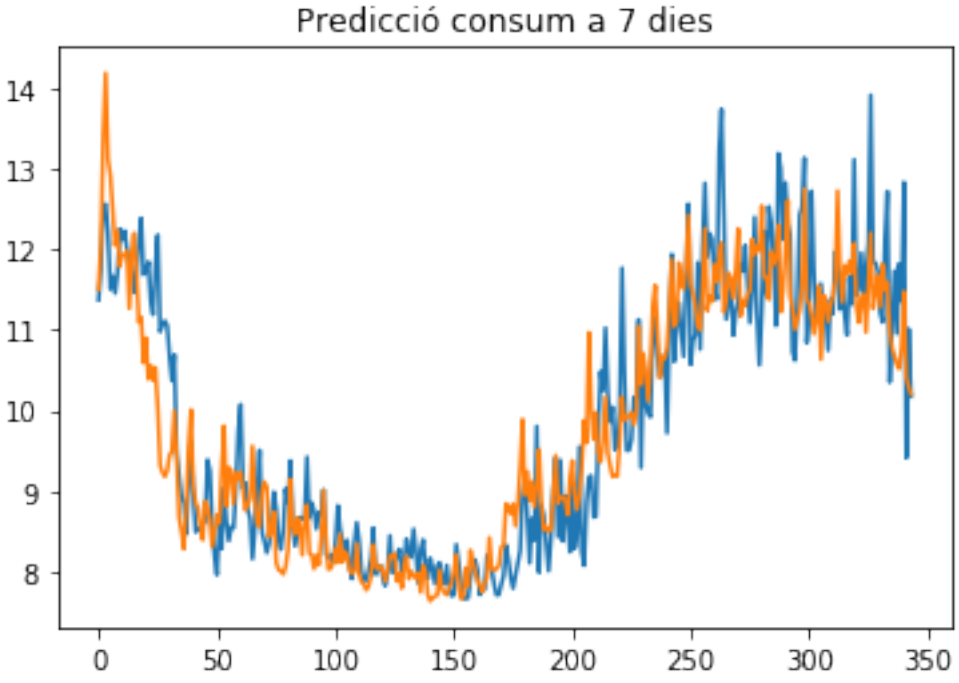

Predicció consum a 2 dies
14
13
12
11
10
9
8
0
50
100
150
200
250
300
350

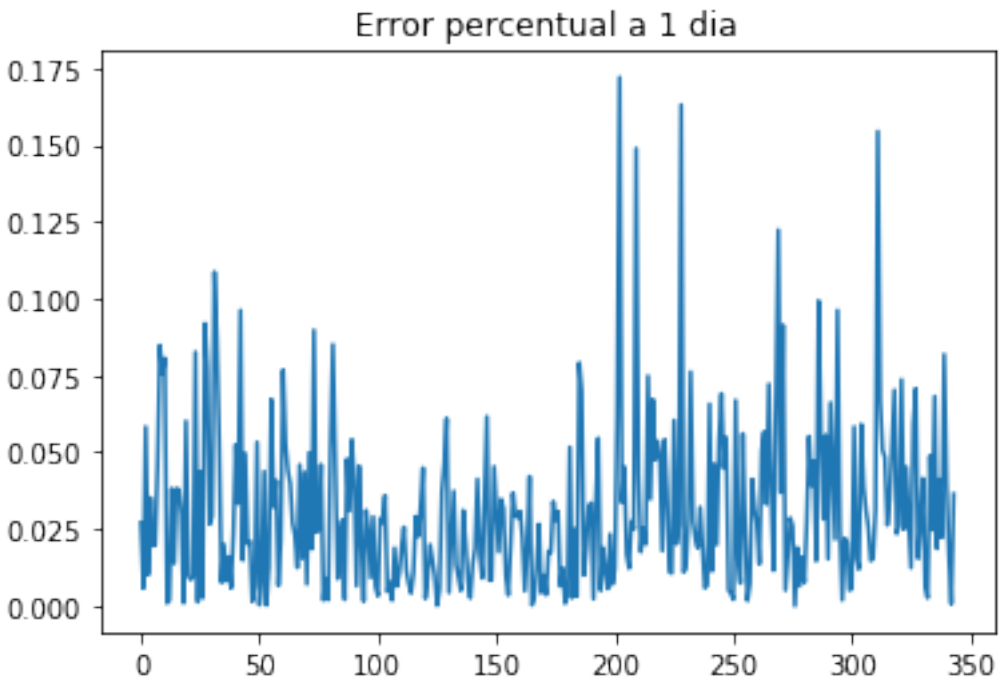

Predicció consum a 3 dies
14
13
12
11
10
9
8
0
50
100
150
200
250
300
350

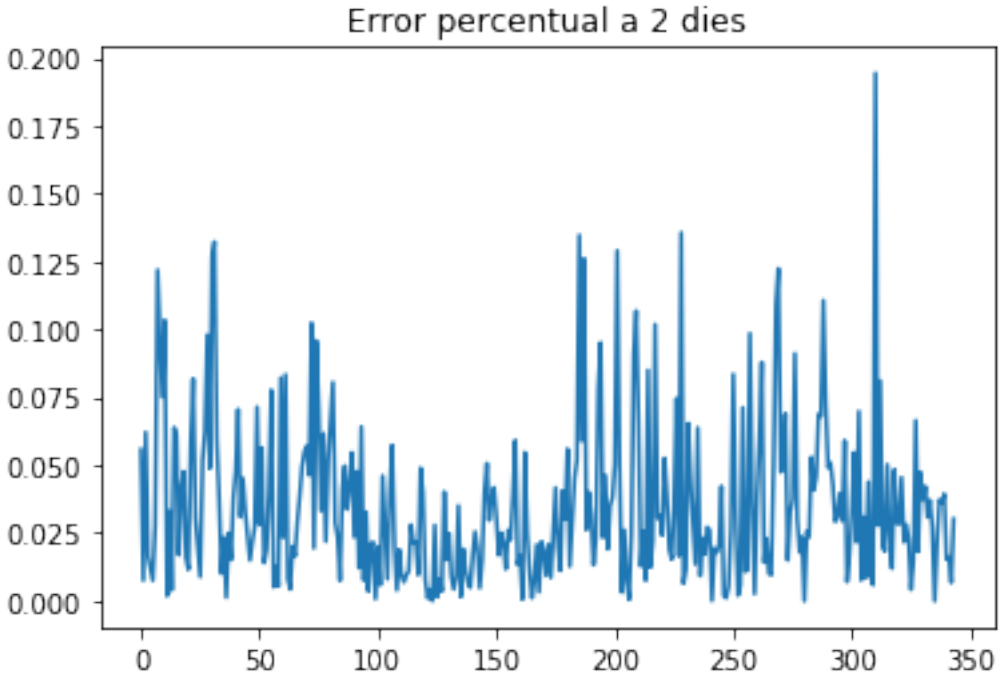

Predicció consum a 4 dies
14
13
12
11
10
9
8
0
50
100
150
200
250
300
350

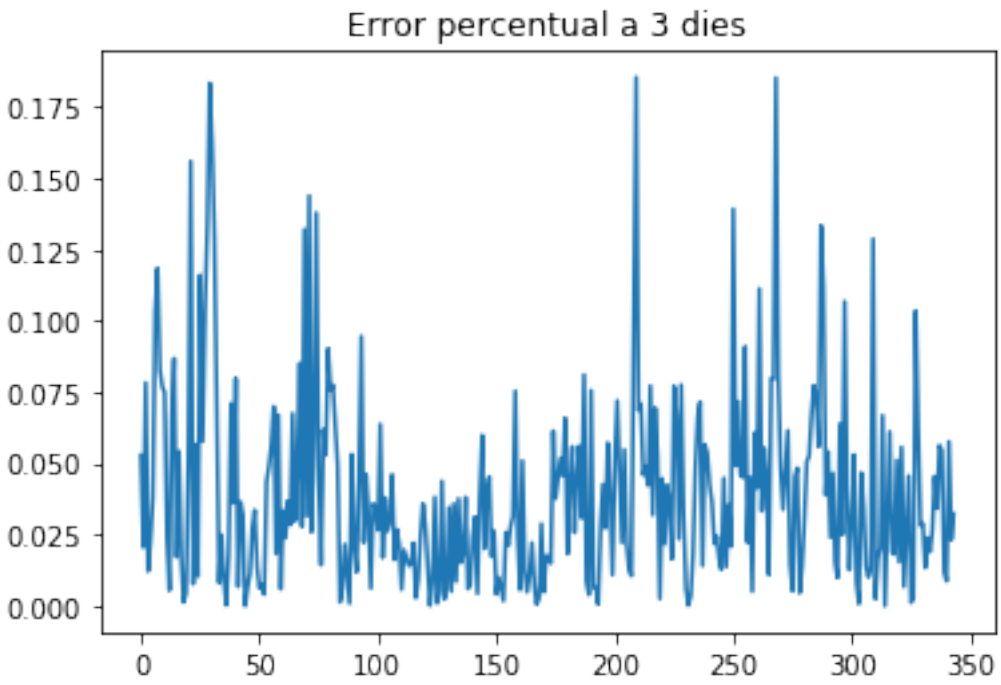

Predicció consum a 5 dies
14
13
12
11
10
9
8
0
50
100
150
200
250
300
350

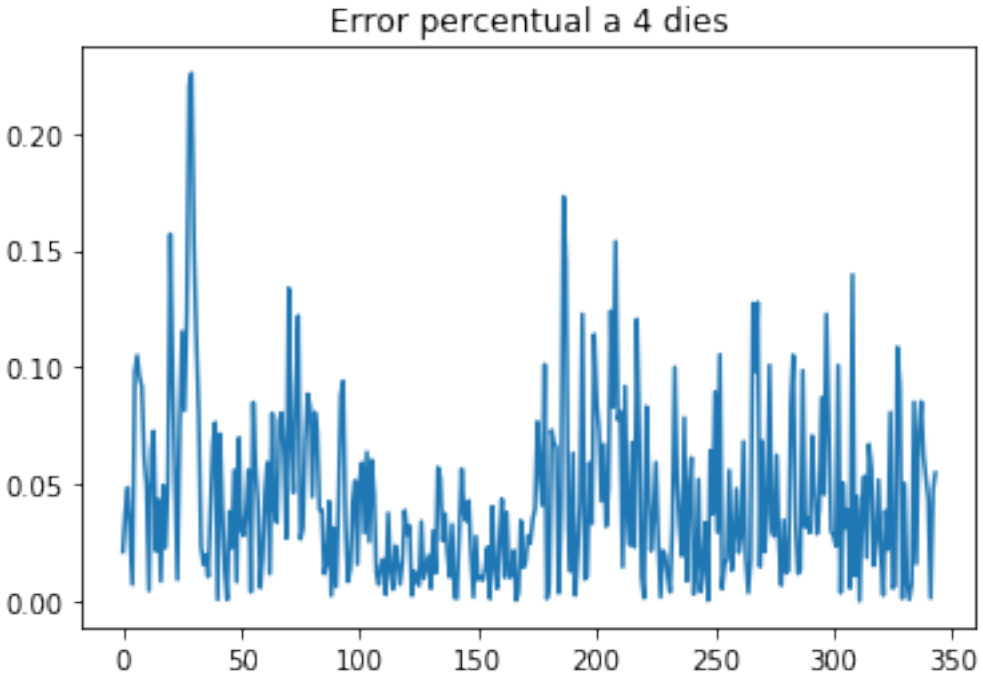

Predicció consum a 6 dies
14
13
12
11
10
9
8
0
50
100
150
200
250
300
350

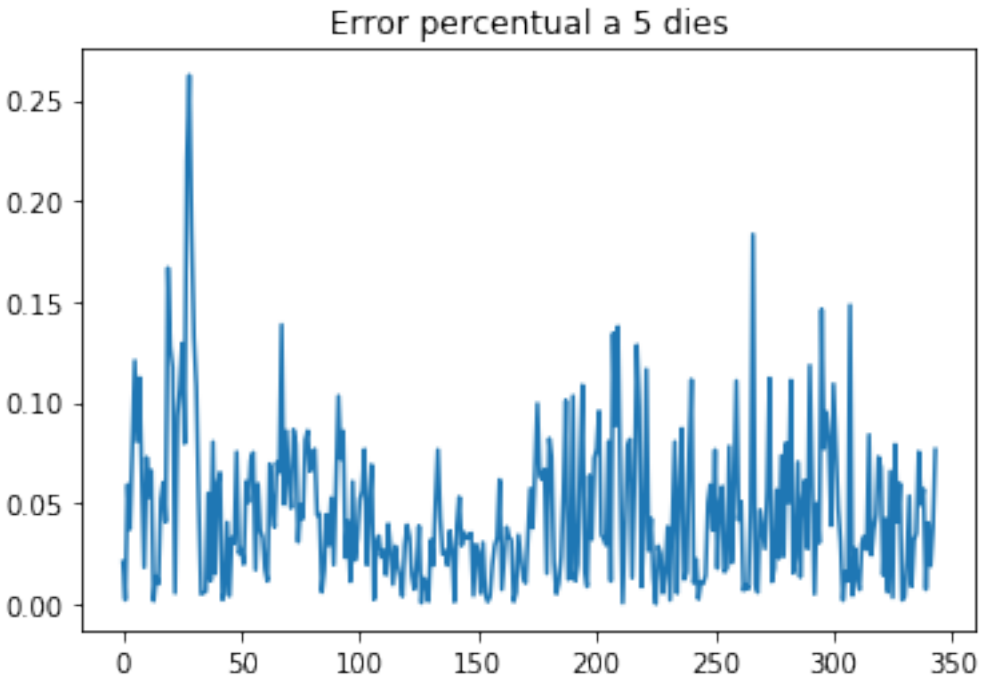

Predicció consum a 7 dies
14
13
12
11
10
9
8
0
50
100
150
200
250
300
350

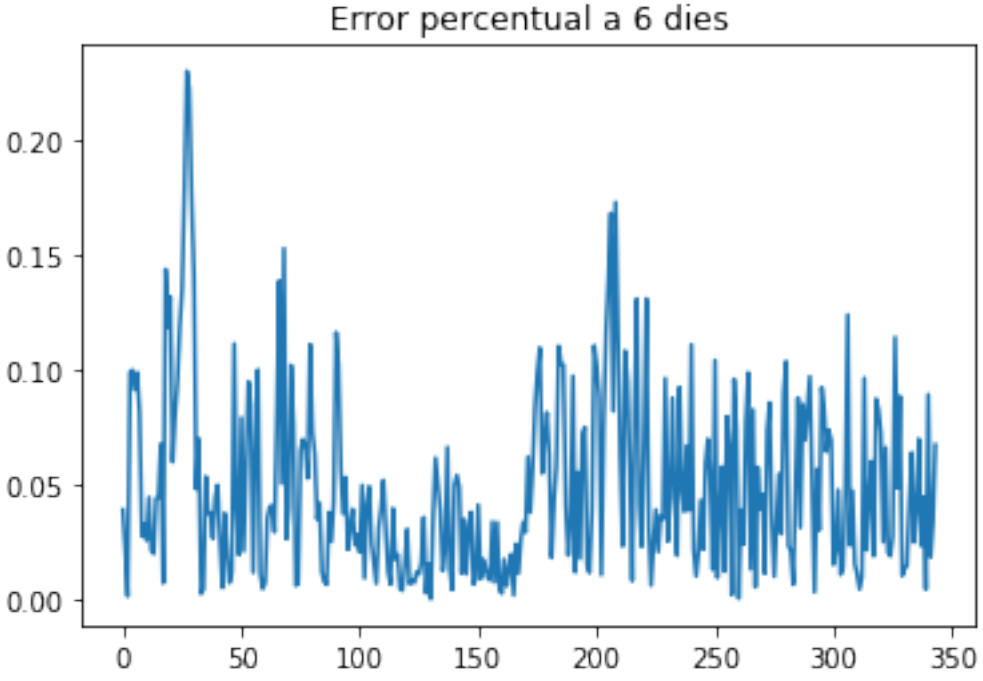

Error percentual a 1 dia
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
0
50
100
150
200
250
300
350

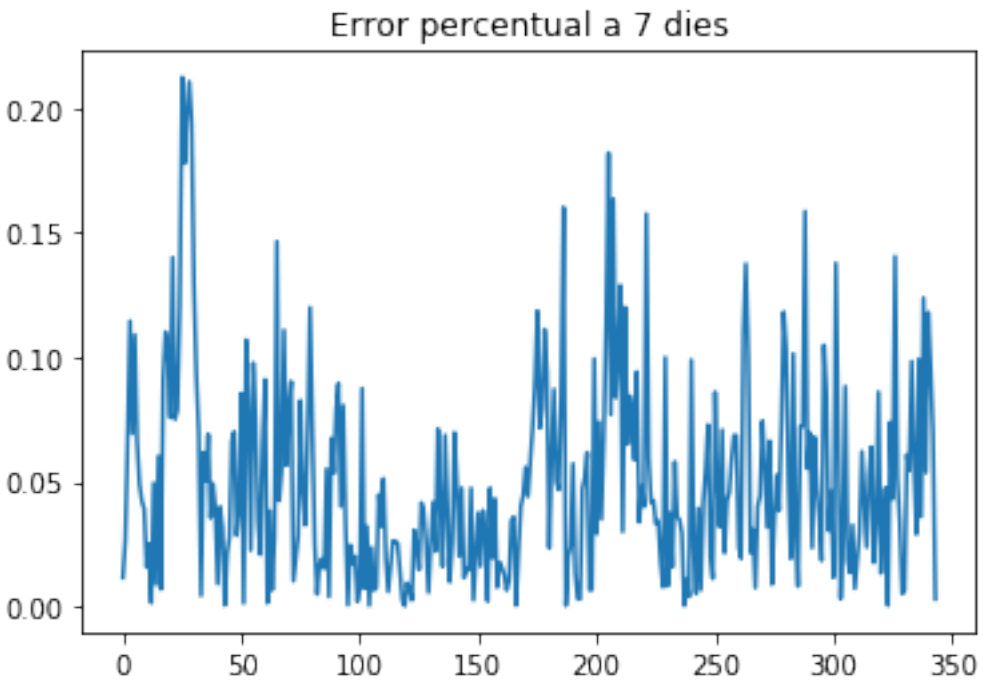

Error percentual a 2 dies
0.200
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
0
50
100
150
200
250
300
350


Error percentual a 3 dies
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
0
50
100
150
200
250
300
350


Error percentual a 4 dies
0.20
0.15
0.10
0.05
0.00
0
50
100
150
200
250
300
350


Error percentual a 5 dies
0.25
0.20
0.15
0.10
0.05
0.00
0
50
100
150
200
250
300
350


Error percentual a 6 dies
0.20
0.15
0.10
0.05
0.00
0
50
100
150
200
250
300
350




```
L'error mitjà a 1 dia és de 3.1109857795752553 %
L'error mitjà a 2 dies és de 3.5156806482526712 %
L'error mitjà a 3 dies és de 3.9584861329651986 %
L'error mitjà a 4 dies és de 4.37295518682416 %
L'error mitjà a 5 dies és de 4.590828068433436 %
L'error mitjà a 6 dies és de 4.9181066806700455 %
L'error mitjà a 7 dies és de 5.021845306397759 %
```

```
In [28]: (error_mitja1+error_mitja2+error_mitja3+error_mitja4+error_mitja5+error_mitja6+error_
```

```
Out[28]: 4.21269825758836
```

```
In [ ]:
```