M06 _Xarxa_walkforard_normalitzat_multivariate2_28dies

December 21, 2019

1 Xarxa neuronal

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

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

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

```
Using TensorFlow backend.
```

1.1 Consum diari total multivariate one-step

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

```
Out[2]:          date  apparentTemperatureMax  sunsetTimeHour  weekday  season  \
        0  2013-01-16                   -0.15              16        3  winter
        1  2013-01-20                   -0.46              16        7  winter
        2  2013-01-10                    2.36              16        4  winter
        3  2013-01-06                    6.98              16        7  winter
        4  2012-01-31                    1.13              16        2  winter

           cloudCover  humidity  visibility  month  energy_sum
        0        0.48      0.91        4.12      1   13.147536
        1        0.85      0.91        5.10      1   15.021900
        2        0.70      0.94        5.21      1   12.066789
```

```
3         0.67       0.96         5.50       1    12.422263
4         0.55       0.84         5.62       1    13.890518
```

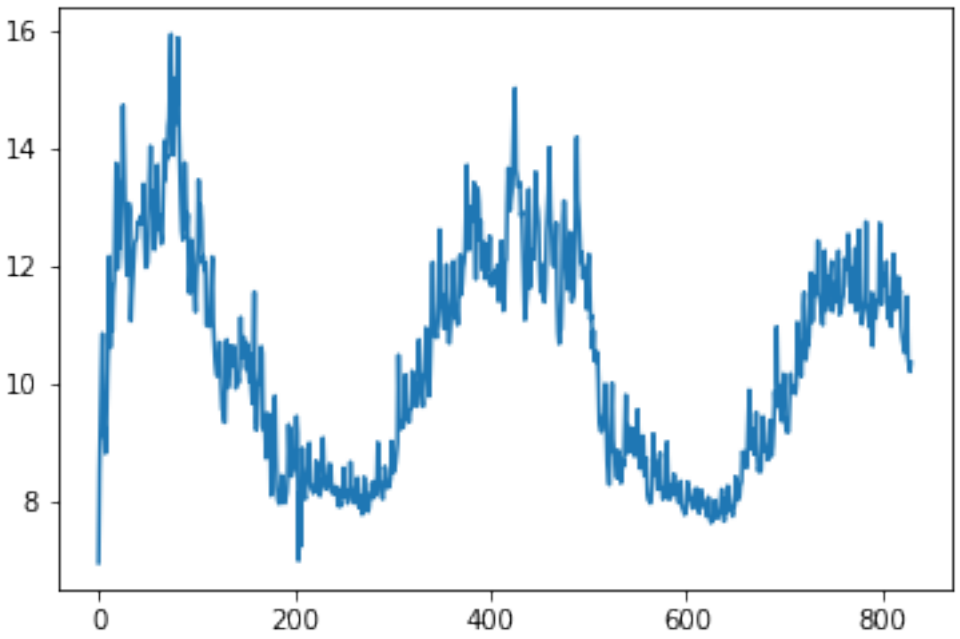
```
In [3]: #Ens quedem amb date i energy_sum, ordenem valors per data i resetejem index
        daily_dia=daily[['date','energy_sum','apparentTemperatureMax','humidity']].sort_values
        daily_dia.head(5)
```

Out[3]:

	index	date	energy_sum	apparentTemperatureMax	humidity
0	677	2011-11-23	6.952692	10.36	0.93
1	691	2011-11-24	8.536480	12.93	0.89
2	713	2011-11-25	9.499781	13.03	0.79
3	728	2011-11-26	10.267707	12.96	0.81
4	729	2011-11-27	10.850805	13.54	0.72

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

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




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

```
daily_dia['t-9']=daily_dia['energy_sum'].shift(9)
daily_dia['t-10']=daily_dia['energy_sum'].shift(10)
daily_dia['t-11']=daily_dia['energy_sum'].shift(11)
daily_dia['t-12']=daily_dia['energy_sum'].shift(12)
daily_dia['t-13']=daily_dia['energy_sum'].shift(13)
daily_dia['t-14']=daily_dia['energy_sum'].shift(14)
daily_dia['t-15']=daily_dia['energy_sum'].shift(15)
daily_dia['t-16']=daily_dia['energy_sum'].shift(16)
daily_dia['t-17']=daily_dia['energy_sum'].shift(17)
daily_dia['t-18']=daily_dia['energy_sum'].shift(18)
daily_dia['t-19']=daily_dia['energy_sum'].shift(19)
daily_dia['t-20']=daily_dia['energy_sum'].shift(20)
daily_dia['t-21']=daily_dia['energy_sum'].shift(21)
daily_dia['t-22']=daily_dia['energy_sum'].shift(22)
daily_dia['t-23']=daily_dia['energy_sum'].shift(23)
daily_dia['t-24']=daily_dia['energy_sum'].shift(24)
daily_dia['t-25']=daily_dia['energy_sum'].shift(25)
daily_dia['t-26']=daily_dia['energy_sum'].shift(26)
daily_dia['t-27']=daily_dia['energy_sum'].shift(27)
daily_dia['t-28']=daily_dia['energy_sum'].shift(28)
```

```
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['temp(t-15)']=daily_dia['apparentTemperatureMax'].shift(15)
daily_dia['temp(t-16)']=daily_dia['apparentTemperatureMax'].shift(16)
daily_dia['temp(t-17)']=daily_dia['apparentTemperatureMax'].shift(17)
daily_dia['temp(t-18)']=daily_dia['apparentTemperatureMax'].shift(18)
daily_dia['temp(t-19)']=daily_dia['apparentTemperatureMax'].shift(19)
daily_dia['temp(t-20)']=daily_dia['apparentTemperatureMax'].shift(20)
daily_dia['temp(t-21)']=daily_dia['apparentTemperatureMax'].shift(21)
daily_dia['temp(t-22)']=daily_dia['apparentTemperatureMax'].shift(22)
daily_dia['temp(t-23)']=daily_dia['apparentTemperatureMax'].shift(23)
daily_dia['temp(t-24)']=daily_dia['apparentTemperatureMax'].shift(24)
daily_dia['temp(t-25)']=daily_dia['apparentTemperatureMax'].shift(25)
```

```
daily_dia['temp(t-26)']=daily_dia['apparentTemperatureMax'].shift(26)
daily_dia['temp(t-27)']=daily_dia['apparentTemperatureMax'].shift(27)
daily_dia['temp(t-28)']=daily_dia['apparentTemperatureMax'].shift(28)
```

```
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['humidity(t-15)']=daily_dia['humidity'].shift(15)
daily_dia['humidity(t-16)']=daily_dia['humidity'].shift(16)
daily_dia['humidity(t-17)']=daily_dia['humidity'].shift(17)
daily_dia['humidity(t-18)']=daily_dia['humidity'].shift(18)
daily_dia['humidity(t-19)']=daily_dia['humidity'].shift(19)
daily_dia['humidity(t-20)']=daily_dia['humidity'].shift(20)
daily_dia['humidity(t-21)']=daily_dia['humidity'].shift(21)
daily_dia['humidity(t-22)']=daily_dia['humidity'].shift(22)
daily_dia['humidity(t-23)']=daily_dia['humidity'].shift(23)
daily_dia['humidity(t-24)']=daily_dia['humidity'].shift(24)
daily_dia['humidity(t-25)']=daily_dia['humidity'].shift(25)
daily_dia['humidity(t-26)']=daily_dia['humidity'].shift(26)
daily_dia['humidity(t-27)']=daily_dia['humidity'].shift(27)
daily_dia['humidity(t-28)']=daily_dia['humidity'].shift(28)
```

```
daily_dia
```

Out[4]:

	index	date	energy_sum	apparentTemperatureMax	humidity	\
0	677	2011-11-23	6.952692	10.36	0.93	
1	691	2011-11-24	8.536480	12.93	0.89	
2	713	2011-11-25	9.499781	13.03	0.79	
3	728	2011-11-26	10.267707	12.96	0.81	
4	729	2011-11-27	10.850805	13.54	0.72	
5	704	2011-11-28	9.103382	12.58	0.86	
6	718	2011-11-29	9.274873	13.47	0.82	
7	727	2011-11-30	8.813513	11.87	0.78	
8	778	2011-12-01	9.227707	12.15	0.82	
9	773	2011-12-02	10.145910	5.33	0.87	
10	791	2011-12-03	10.780273	11.42	0.79	

11	822	2011-12-04	12.163127	6.66	0.82
12	807	2011-12-05	10.609714	3.13	0.77
13	813	2011-12-06	11.673417	3.77	0.83
14	810	2011-12-07	10.889362	5.14	0.68
15	788	2011-12-08	11.525150	12.89	0.81
16	797	2011-12-09	11.759837	3.99	0.71
17	799	2011-12-10	12.633801	3.14	0.81
18	776	2011-12-11	13.749174	5.72	0.88
19	775	2011-12-12	11.951958	5.94	0.84
20	786	2011-12-13	11.957446	12.08	0.75
21	818	2011-12-14	12.392776	2.88	0.79
22	795	2011-12-15	12.307079	4.38	0.77
23	763	2011-12-16	13.376080	0.99	0.88
24	770	2011-12-17	13.511968	1.72	0.86
25	808	2011-12-18	14.732271	1.98	0.84
26	757	2011-12-19	13.774471	4.02	0.94
27	803	2011-12-20	12.709106	4.98	0.81
28	748	2011-12-21	12.148570	12.14	0.94
29	806	2011-12-22	11.839403	12.14	0.87
..	...	...	...	...	...
800	21	2014-01-29	11.800777	2.53	0.90
801	10	2014-01-30	11.685169	5.86	0.91
802	12	2014-01-31	11.857957	5.27	0.91
803	129	2014-02-01	11.710582	6.86	0.76
804	155	2014-02-02	12.078164	6.48	0.72
805	145	2014-02-03	11.280011	4.59	0.79
806	134	2014-02-04	11.095584	5.63	0.75
807	123	2014-02-05	11.415105	5.86	0.77
808	118	2014-02-06	11.445403	7.34	0.82
809	122	2014-02-07	10.972318	8.44	0.79
810	126	2014-02-08	11.569300	5.67	0.77
811	149	2014-02-09	12.202967	3.91	0.66
812	132	2014-02-10	11.264175	7.07	0.84
813	143	2014-02-11	11.452649	4.06	0.76
814	131	2014-02-12	11.679099	4.73	0.75
815	164	2014-02-13	11.285737	3.42	0.68
816	125	2014-02-14	11.816914	12.02	0.81
817	141	2014-02-15	11.490470	5.79	0.69
818	151	2014-02-16	11.582159	7.88	0.76
819	116	2014-02-17	10.979566	10.67	0.83
820	128	2014-02-18	10.781898	10.13	0.87
821	115	2014-02-19	10.674624	10.13	0.87
822	121	2014-02-20	10.573835	12.50	0.84
823	174	2014-02-21	10.518126	10.15	0.72
824	167	2014-02-22	10.776242	11.63	0.71
825	139	2014-02-23	11.480411	11.94	0.76
826	162	2014-02-24	10.411403	14.23	0.74
827	136	2014-02-25	10.294997	11.43	0.78

```
828    161  2014-02-26   10.202945                  11.29      0.73
829    133  2014-02-27   10.356350                  10.31      0.74

          t-1        t-2        t-3        t-4        t-5  ...  \
0         NaN        NaN        NaN        NaN        NaN  ...
1    6.952692        NaN        NaN        NaN        NaN  ...
2    8.536480   6.952692        NaN        NaN        NaN  ...
3    9.499781   8.536480   6.952692        NaN        NaN  ...
4   10.267707   9.499781   8.536480   6.952692        NaN  ...
5   10.850805  10.267707   9.499781   8.536480   6.952692  ...
6    9.103382  10.850805  10.267707   9.499781   8.536480  ...
7    9.274873   9.103382  10.850805  10.267707   9.499781  ...
8    8.813513   9.274873   9.103382  10.850805  10.267707  ...
9    9.227707   8.813513   9.274873   9.103382  10.850805  ...
10  10.145910   9.227707   8.813513   9.274873   9.103382  ...
11  10.780273  10.145910   9.227707   8.813513   9.274873  ...
12  12.163127  10.780273  10.145910   9.227707   8.813513  ...
13  10.609714  12.163127  10.780273  10.145910   9.227707  ...
14  11.673417  10.609714  12.163127  10.780273  10.145910  ...
15  10.889362  11.673417  10.609714  12.163127  10.780273  ...
16  11.525150  10.889362  11.673417  10.609714  12.163127  ...
17  11.759837  11.525150  10.889362  11.673417  10.609714  ...
18  12.633801  11.759837  11.525150  10.889362  11.673417  ...
19  13.749174  12.633801  11.759837  11.525150  10.889362  ...
20  11.951958  13.749174  12.633801  11.759837  11.525150  ...
21  11.957446  11.951958  13.749174  12.633801  11.759837  ...
22  12.392776  11.957446  11.951958  13.749174  12.633801  ...
23  12.307079  12.392776  11.957446  11.951958  13.749174  ...
24  13.376080  12.307079  12.392776  11.957446  11.951958  ...
25  13.511968  13.376080  12.307079  12.392776  11.957446  ...
26  14.732271  13.511968  13.376080  12.307079  12.392776  ...
27  13.774471  14.732271  13.511968  13.376080  12.307079  ...
28  12.709106  13.774471  14.732271  13.511968  13.376080  ...
29  12.148570  12.709106  13.774471  14.732271  13.511968  ...
..        ...        ...        ...        ...        ...  ...
800 11.344805  11.753871  12.729659  11.620778  11.409880  ...
801 11.800777  11.344805  11.753871  12.729659  11.620778  ...
802 11.685169  11.800777  11.344805  11.753871  12.729659  ...
803 11.857957  11.685169  11.800777  11.344805  11.753871  ...
804 11.710582  11.857957  11.685169  11.800777  11.344805  ...
805 12.078164  11.710582  11.857957  11.685169  11.800777  ...
806 11.280011  12.078164  11.710582  11.857957  11.685169  ...
807 11.095584  11.280011  12.078164  11.710582  11.857957  ...
808 11.415105  11.095584  11.280011  12.078164  11.710582  ...
809 11.445403  11.415105  11.095584  11.280011  12.078164  ...
810 10.972318  11.445403  11.415105  11.095584  11.280011  ...
811 11.569300  10.972318  11.445403  11.415105  11.095584  ...
812 12.202967  11.569300  10.972318  11.445403  11.415105  ...
```

```
813  11.264175  12.202967  11.569300  10.972318  11.445403  ...
814  11.452649  11.264175  12.202967  11.569300  10.972318  ...
815  11.679099  11.452649  11.264175  12.202967  11.569300  ...
816  11.285737  11.679099  11.452649  11.264175  12.202967  ...
817  11.816914  11.285737  11.679099  11.452649  11.264175  ...
818  11.490470  11.816914  11.285737  11.679099  11.452649  ...
819  11.582159  11.490470  11.816914  11.285737  11.679099  ...
820  10.979566  11.582159  11.490470  11.816914  11.285737  ...
821  10.781898  10.979566  11.582159  11.490470  11.816914  ...
822  10.674624  10.781898  10.979566  11.582159  11.490470  ...
823  10.573835  10.674624  10.781898  10.979566  11.582159  ...
824  10.518126  10.573835  10.674624  10.781898  10.979566  ...
825  10.776242  10.518126  10.573835  10.674624  10.781898  ...
826  11.480411  10.776242  10.518126  10.573835  10.674624  ...
827  10.411403  11.480411  10.776242  10.518126  10.573835  ...
828  10.294997  10.411403  11.480411  10.776242  10.518126  ...
829  10.202945  10.294997  10.411403  11.480411  10.776242  ...

     humidity(t-19)  humidity(t-20)  humidity(t-21)  humidity(t-22)  \
0               NaN             NaN             NaN             NaN
1               NaN             NaN             NaN             NaN
2               NaN             NaN             NaN             NaN
3               NaN             NaN             NaN             NaN
4               NaN             NaN             NaN             NaN
5               NaN             NaN             NaN             NaN
6               NaN             NaN             NaN             NaN
7               NaN             NaN             NaN             NaN
8               NaN             NaN             NaN             NaN
9               NaN             NaN             NaN             NaN
10              NaN             NaN             NaN             NaN
11              NaN             NaN             NaN             NaN
12              NaN             NaN             NaN             NaN
13              NaN             NaN             NaN             NaN
14              NaN             NaN             NaN             NaN
15              NaN             NaN             NaN             NaN
16              NaN             NaN             NaN             NaN
17              NaN             NaN             NaN             NaN
18              NaN             NaN             NaN             NaN
19             0.93             NaN             NaN             NaN
20             0.89            0.93             NaN             NaN
21             0.79            0.89            0.93             NaN
22             0.81            0.79            0.89            0.93
23             0.72            0.81            0.79            0.89
24             0.86            0.72            0.81            0.79
25             0.82            0.86            0.72            0.81
26             0.78            0.82            0.86            0.72
27             0.82            0.78            0.82            0.86
28             0.87            0.82            0.78            0.82
```

29	0.79	0.87	0.82	0.78
..	...	...	...	...
800	0.85	0.77	0.85	0.78
801	0.81	0.85	0.77	0.85
802	0.90	0.81	0.85	0.77
803	0.83	0.90	0.81	0.85
804	0.81	0.83	0.90	0.81
805	0.90	0.81	0.83	0.90
806	0.83	0.90	0.81	0.83
807	0.87	0.83	0.90	0.81
808	0.83	0.87	0.83	0.90
809	0.80	0.83	0.87	0.83
810	0.89	0.80	0.83	0.87
811	0.89	0.89	0.80	0.83
812	0.87	0.89	0.89	0.80
813	0.82	0.87	0.89	0.89
814	0.83	0.82	0.87	0.89
815	0.83	0.83	0.82	0.87
816	0.79	0.83	0.83	0.82
817	0.79	0.79	0.83	0.83
818	0.83	0.79	0.79	0.83
819	0.90	0.83	0.79	0.79
820	0.91	0.90	0.83	0.79
821	0.91	0.91	0.90	0.83
822	0.76	0.91	0.91	0.90
823	0.72	0.76	0.91	0.91
824	0.79	0.72	0.76	0.91
825	0.75	0.79	0.72	0.76
826	0.77	0.75	0.79	0.72
827	0.82	0.77	0.75	0.79
828	0.79	0.82	0.77	0.75
829	0.77	0.79	0.82	0.77

	humidity(t-23)	humidity(t-24)	humidity(t-25)	humidity(t-26)	\
0	NaN	NaN	NaN	NaN	
1	NaN	NaN	NaN	NaN	
2	NaN	NaN	NaN	NaN	
3	NaN	NaN	NaN	NaN	
4	NaN	NaN	NaN	NaN	
5	NaN	NaN	NaN	NaN	
6	NaN	NaN	NaN	NaN	
7	NaN	NaN	NaN	NaN	
8	NaN	NaN	NaN	NaN	
9	NaN	NaN	NaN	NaN	
10	NaN	NaN	NaN	NaN	
11	NaN	NaN	NaN	NaN	
12	NaN	NaN	NaN	NaN	
13	NaN	NaN	NaN	NaN	

14	NaN	NaN	NaN	NaN
15	NaN	NaN	NaN	NaN
16	NaN	NaN	NaN	NaN
17	NaN	NaN	NaN	NaN
18	NaN	NaN	NaN	NaN
19	NaN	NaN	NaN	NaN
20	NaN	NaN	NaN	NaN
21	NaN	NaN	NaN	NaN
22	NaN	NaN	NaN	NaN
23	0.93	NaN	NaN	NaN
24	0.89	0.93	NaN	NaN
25	0.79	0.89	0.93	NaN
26	0.81	0.79	0.89	0.93
27	0.72	0.81	0.79	0.89
28	0.86	0.72	0.81	0.79
29	0.82	0.86	0.72	0.81
..	...	...	...	...
800	0.78	0.87	0.84	0.78
801	0.78	0.78	0.87	0.84
802	0.85	0.78	0.78	0.87
803	0.77	0.85	0.78	0.78
804	0.85	0.77	0.85	0.78
805	0.81	0.85	0.77	0.85
806	0.90	0.81	0.85	0.77
807	0.83	0.90	0.81	0.85
808	0.81	0.83	0.90	0.81
809	0.90	0.81	0.83	0.90
810	0.83	0.90	0.81	0.83
811	0.87	0.83	0.90	0.81
812	0.83	0.87	0.83	0.90
813	0.80	0.83	0.87	0.83
814	0.89	0.80	0.83	0.87
815	0.89	0.89	0.80	0.83
816	0.87	0.89	0.89	0.80
817	0.82	0.87	0.89	0.89
818	0.83	0.82	0.87	0.89
819	0.83	0.83	0.82	0.87
820	0.79	0.83	0.83	0.82
821	0.79	0.79	0.83	0.83
822	0.83	0.79	0.79	0.83
823	0.90	0.83	0.79	0.79
824	0.91	0.90	0.83	0.79
825	0.91	0.91	0.90	0.83
826	0.76	0.91	0.91	0.90
827	0.72	0.76	0.91	0.91
828	0.79	0.72	0.76	0.91
829	0.75	0.79	0.72	0.76

	humidity(t-27)	humidity(t-28)
0	NaN	NaN
1	NaN	NaN
2	NaN	NaN
3	NaN	NaN
4	NaN	NaN
5	NaN	NaN
6	NaN	NaN
7	NaN	NaN
8	NaN	NaN
9	NaN	NaN
10	NaN	NaN
11	NaN	NaN
12	NaN	NaN
13	NaN	NaN
14	NaN	NaN
15	NaN	NaN
16	NaN	NaN
17	NaN	NaN
18	NaN	NaN
19	NaN	NaN
20	NaN	NaN
21	NaN	NaN
22	NaN	NaN
23	NaN	NaN
24	NaN	NaN
25	NaN	NaN
26	NaN	NaN
27	0.93	NaN
28	0.89	0.93
29	0.79	0.89
..	...	...
800	0.82	0.86
801	0.78	0.82
802	0.84	0.78
803	0.87	0.84
804	0.78	0.87
805	0.78	0.78
806	0.85	0.78
807	0.77	0.85
808	0.85	0.77
809	0.81	0.85
810	0.90	0.81
811	0.83	0.90
812	0.81	0.83
813	0.90	0.81
814	0.83	0.90
815	0.87	0.83

```
816            0.83            0.87
817            0.80            0.83
818            0.89            0.80
819            0.89            0.89
820            0.87            0.89
821            0.82            0.87
822            0.83            0.82
823            0.83            0.83
824            0.79            0.83
825            0.79            0.79
826            0.83            0.79
827            0.90            0.83
828            0.91            0.90
829            0.91            0.91

[830 rows x 89 columns]
```

In [5]:
```
#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', 'humidity'], axis=1)
daily_dia.head(5)
```

Out[5]:
```
   energy_sum        t-1       t-2       t-3       t-4  t-5  t-6  t-7  t-8  \
0    6.952692        NaN       NaN       NaN       NaN  NaN  NaN  NaN  NaN
1    8.536480   6.952692       NaN       NaN       NaN  NaN  NaN  NaN  NaN
2    9.499781   8.536480  6.952692       NaN       NaN  NaN  NaN  NaN  NaN
3   10.267707   9.499781  8.536480  6.952692       NaN  NaN  NaN  NaN  NaN
4   10.850805  10.267707  9.499781  8.536480  6.952692  NaN  NaN  NaN  NaN

   t-9  ...  humidity(t-19)  humidity(t-20)  humidity(t-21)  humidity(t-22)  \
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

   humidity(t-23)  humidity(t-24)  humidity(t-25)  humidity(t-26)  \
0             NaN             NaN             NaN             NaN
1             NaN             NaN             NaN             NaN
2             NaN             NaN             NaN             NaN
3             NaN             NaN             NaN             NaN
4             NaN             NaN             NaN             NaN

   humidity(t-27)  humidity(t-28)
0             NaN             NaN
1             NaN             NaN
2             NaN             NaN
3             NaN             NaN
```

```
4             NaN             NaN

[5 rows x 85 columns]
```

In [6]:
```
#Eliminem les 8 primeres files ja que contenen NaN (valors buits)

daily_dia=daily_dia.drop([0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23
daily_dia.head(5)
```

Out[6]:

	energy_sum	t-1	t-2	t-3	t-4	t-5	\
28	12.148570	12.709106	13.774471	14.732271	13.511968	13.376080	
29	11.839403	12.148570	12.709106	13.774471	14.732271	13.511968	
30	12.254989	11.839403	12.148570	12.709106	13.774471	14.732271	
31	13.065317	12.254989	11.839403	12.148570	12.709106	13.774471	
32	12.949429	13.065317	12.254989	11.839403	12.148570	12.709106	

	t-6	t-7	t-8	t-9	...	humidity(t-19)	\
28	12.307079	12.392776	11.957446	11.951958	...	0.87	
29	13.376080	12.307079	12.392776	11.957446	...	0.79	
30	13.511968	13.376080	12.307079	12.392776	...	0.82	
31	14.732271	13.511968	13.376080	12.307079	...	0.77	
32	13.774471	14.732271	13.511968	13.376080	...	0.83	

	humidity(t-20)	humidity(t-21)	humidity(t-22)	humidity(t-23)	\
28	0.82	0.78	0.82	0.86	
29	0.87	0.82	0.78	0.82	
30	0.79	0.87	0.82	0.78	
31	0.82	0.79	0.87	0.82	
32	0.77	0.82	0.79	0.87	

	humidity(t-24)	humidity(t-25)	humidity(t-26)	humidity(t-27)	\
28	0.72	0.81	0.79	0.89	
29	0.86	0.72	0.81	0.79	
30	0.82	0.86	0.72	0.81	
31	0.78	0.82	0.86	0.72	
32	0.82	0.78	0.82	0.86	

	humidity(t-28)
28	0.93
29	0.89
30	0.79
31	0.81
32	0.72

[5 rows x 85 columns]

In [7]:
```
len(daily_dia)
```

Out[7]:
```
802
```

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

In [9]:
```
#Seleccionem dades per test i train
y_daily=daily_dia_norm[:,0]
X_daily=daily_dia_norm[:,1:86]

#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], 28,3))
```

In [10]:
```
# definim model
import tensorflow as tf
model =Sequential()
model.add(LSTM(50, activation='relu', input_shape=(28, 3)))
model.add(Dense(1))
model.compile(optimizer='adam', loss='mse', metrics=['accuracy'])
```

```
WARNING:tensorflow:From c:\users\laura\appdata\local\programs\python\python37\lib\site-packages
Instructions for updating:
Colocations handled automatically by placer.
```

In [11]:
```
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
```

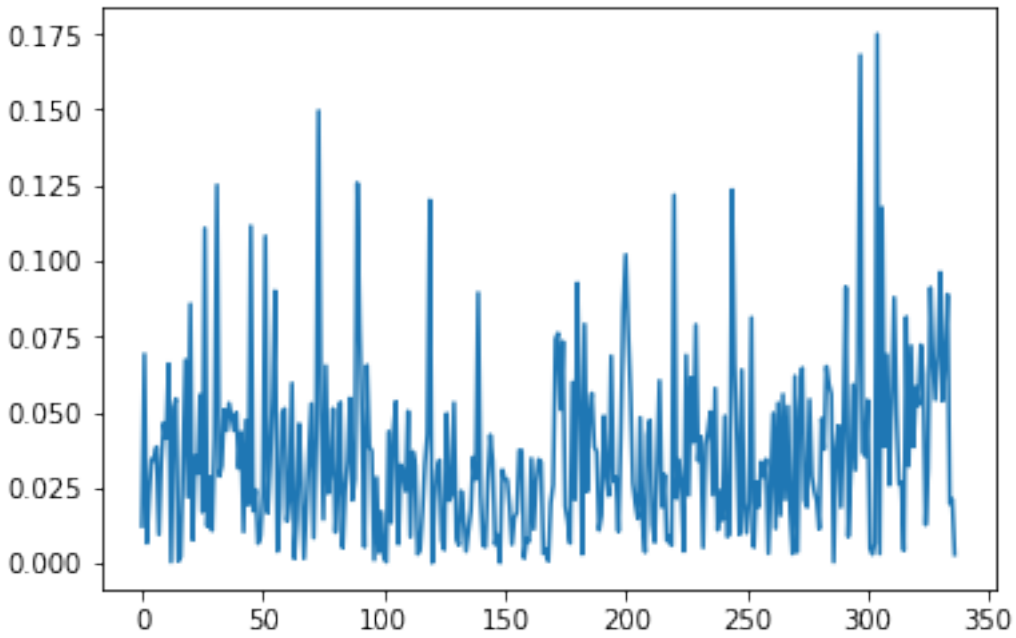
```
WARNING:tensorflow:From c:\users\laura\appdata\local\programs\python\python37\lib\site-packages
Instructions for updating:
Use tf.cast instead.
```

```
In [12]: #Dividim la suma de scores de test entre el nombre de prediccions per obtenir la mitj
         sumScores/(lenght-n_train)
```

```
Out[12]: 0.03634171205971859
```

```
In [18]: plt.plot(llista_scores)
```

```
Out[18]: [<matplotlib.lines.Line2D at 0x2473e75a0f0>]
```




```
In [13]: llista_scores

Out[13]: [0.012344302179078559,
          0.06917807360574568,
          0.006778277838775271,
          0.02259234377200281,
          0.034578645535813024,
          0.03406346388758741,
          0.03847512046714319,
          0.00952909604274299,
          0.0335702349677971,
          0.04645951118104241,
          0.0413610784960079,
          0.06589028014428733,
          0.0005125187669432485,
          0.051453344853177985,
          0.05439908802436655,
          0.0007521617543007064,
          0.002212304241489438,
          0.0336212331190513,
          0.06729122105023477,
          0.021912233742173104,
          0.08574656546404791,
          0.007765277544135918,
          0.035454426903898995,
          0.02972035996740585,
```

0.05571622997297987,
0.016940467736224818,
0.11078225899600003,
0.012284469350308025,
0.02861890819638524,
0.010892197710513862,
0.04152664190786837,
0.12503048918239035,
0.028912751620044475,
0.0323088382502148,
0.0507904971278037,
0.04390575394272078,
0.052966630206464194,
0.048231120055873156,
0.043926260078061,
0.04982973471466268,
0.031387632385333264,
0.043408119128244826,
0.010453448475862714,
0.047311034054451806,
0.019368777050056574,
0.11150922930871099,
0.017352088532017196,
0.02438898974592374,
0.006639733648571511,
0.00892182212314685,
0.023700472121680694,
0.10816772716043466,
0.01668399352530492,
0.032857255556430376,
0.054499395593497924,
0.09003655195293103,
0.004038174384064841,
0.018633863016692898,
0.04981328229542836,
0.051114574849308037,
0.013936970868351883,
0.020817986068452754,
0.05955578664771144,
0.0016226208870953052,
0.01454923709992939,
0.046147432562569146,
0.02675985540129322,
0.001595397070034421,
0.019374110046718074,
0.03533819514273384,
0.052797041379360476,
0.008447016213644853,

```
0.04172528318154567,
0.14960478521798737,
0.049115234209870295,
0.014599162783508812,
0.06530908213987552,
0.023155568948650562,
0.030391864284768033,
0.051171019374672166,
0.010301239874524692,
0.023921305417909267,
0.053261320378560684,
0.005187771660070117,
0.02390379562907241,
0.033969176957512226,
0.054598647087785945,
0.020955628157102835,
0.027871679761556467,
0.1257359535124033,
0.07836287912142881,
0.04410116776092621,
0.005417348260665422,
0.06551079456610742,
0.03862323580343885,
0.0371022315341516,
0.0011957187030140481,
0.02841138129035281,
0.0036174824483482526,
0.017096075736655836,
0.0022618949936084043,
0.0005247993343177049,
0.043638141412414067,
0.01347312513117982,
0.04428305371688601,
0.053488042413566084,
0.006403456987453704,
0.03258763726664349,
0.03032003236943348,
0.02391909143541615,
0.05031465530007462,
0.008703052777800035,
0.036967240630849885,
0.03249060643505253,
0.0031066294089594493,
0.004393332122447413,
0.017320277782737148,
0.032976448133641645,
0.04282261362400641,
0.12007483712793265,
```

```
0.00019807544227190554,
0.02021518878195805,
0.03096201310605895,
0.03415084028570292,
0.007666520395140486,
0.004506052189456544,
0.0495670943327331,
0.020795362111848625,
0.022673648462148477,
0.05308720325314997,
0.007950297724898525,
0.006037021226114048,
0.023940056508240937,
0.015745461607107214,
0.004018853090608232,
0.01066904800725521,
0.017371873501979773,
0.035098915171497436,
0.02770816961556033,
0.08945259988779142,
0.02281903608356739,
0.00598551860447416,
0.00547029333690674,
0.027281634523932285,
0.042467678693920874,
0.03394573112996091,
0.00633541256646597,
0.009503057382511226,
0.00024617649973723843,
0.03094233081023312,
0.027882528013193797,
0.02763591784835273,
0.018812398292085808,
0.006265860948846069,
0.015416519036543397,
0.016748215909062725,
0.037405339207189026,
0.037352462163542155,
0.0017316982865310804,
0.00792431648062164,
0.00727528201754879,
0.034674721312585755,
0.01132697245322345,
0.027399899725189858,
0.03433544432692248,
0.03347735060860335,
0.0031997088104291915,
0.004525046714187519 5,
```

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0.019847984593104995,
0.025910544514365252,
0.07418473033702822,
0.07608716204545862,
0.050895443048949884,
0.0733853340464885,
0.018772892413065012,
0.014218420153573108,
0.0066992407365855655,
0.05986458081725665,
0.021161128815741503,
0.09267019916856134,
0.05261920565171907,
0.0030809203801824836,
0.0790522252659056,
0.023689598752160146,
0.05004310901641573,
0.056249035832957484,
0.03850552509282723,
0.036946651008681,
0.011003300752042255,
0.016023343681958013,
0.04875859560709661,
0.028930226866880293,
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0.06855831285717762,
0.02705990183991458,
0.028387208475406878,
0.010565223458721684,
0.04277638239159498,
0.08412559655650043,
0.10205133121705123,
0.07728686294487774,
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0.0481976541675726,
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0.04734867783992924,
0.012818514957648741,
0.0070274755849597526,
0.03332184392837134,
0.06044277004626242,
0.018706550236338604,

0.029379286570464735,
0.007480247981900501,
0.009167476097730498,
0.005959745031278718,
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0.025343676902816137,
0.0040936638287141225,
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0.02250738911596284,
0.06146718550086416,
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0.043470589366573,
0.050076499353314485,
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0.05787614401011587,
0.011056499900262029,
0.023941958174992672,
0.014330084332343507,
0.04871635652684625,
0.008844552968997998,
0.009630528417169382,
0.12345780803230899,
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0.009501840573317821,
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0.010081735765606448,
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0.005357336433415849,
0.026882443572836534,
0.01861699887369639,
0.033586869831145005,
0.028693231870720703,
0.03444834954146714,
0.0033022899369552494,
0.026246818020490226,
0.049669687234004556,
0.01154085354947787,
0.0530169417948847,

0.015903362690889544,
0.05587359591182617,
0.021123445141947972,
0.05195032988414572,
0.01711145363710509,
0.0031877557683896995,
0.061917363238945144,
0.0037932406492717785,
0.05118456179505837,
0.06461521603102427,
0.02099602974091397,
0.018597514740878784,
0.05414058457876192,
0.028806251539617245,
0.023841015099707707,
0.02061122230672585,
0.011374235317247239,
0.04785131797461828,
0.03773778514047321,
0.06508563059158345,
0.059275986984265394,
0.05588132099032217,
0.000498889270173386,
0.037869283209282845,
0.045525554916687305,
0.018596664528665263,
0.04632982893047277,
0.09137426900281387,
0.008829845609680476,
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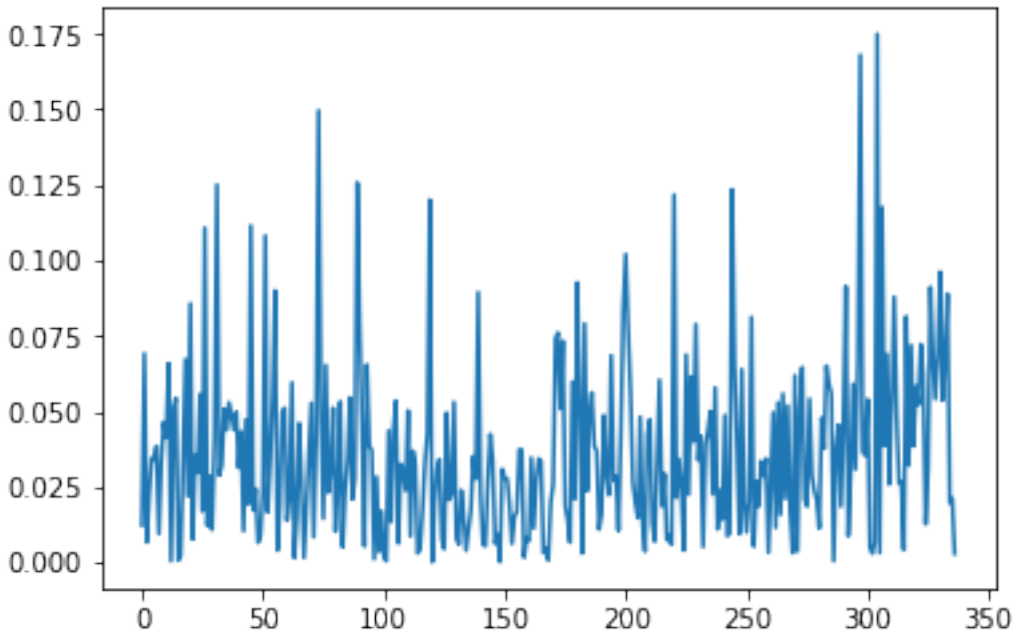
0.05913262268710029,
0.030889740847786173,
0.06664942366850446,
0.16801201873598526,
0.03679203213500992,
0.035450808871999806,
0.054046319648611396,
0.004910487283476206,
0.003028777291339324,
0.006737487466348169,
0.17493157599454112,
0.0031961816045424918,
0.11764147295202276,
0.03874308815165728,
0.06895510104771252,
0.025879620215560672,
0.05311703078810215,
0.08788967475102227,

```
 0.04952419283671583,
 0.02615508091892238,
 0.026725341807665837,
 0.004242017944697585,
 0.08147798746155743,
 0.032174335119458775,
 0.07189481707016143,
 0.0385881339093761,
 0.05838239087834918,
 0.05221124990314285,
 0.0722392436203867,
 0.06227381315340108,
 0.012754961046325564,
 0.031116934032087817,
 0.09118117554929617,
 0.06860567117504646,
 0.05412368023436431,
 0.06924528912819983,
 0.09623752495821059,
 0.053716529362403564,
 0.06850179694725189,
 0.08893036817540811,
 0.01974179204495874,
 0.02120627493512317,
 0.002952488403321407]
```

In [17]: `plt.plot(llista_scores)`

Out[17]: `[<matplotlib.lines.Line2D at 0x2473e6e9c88>]`

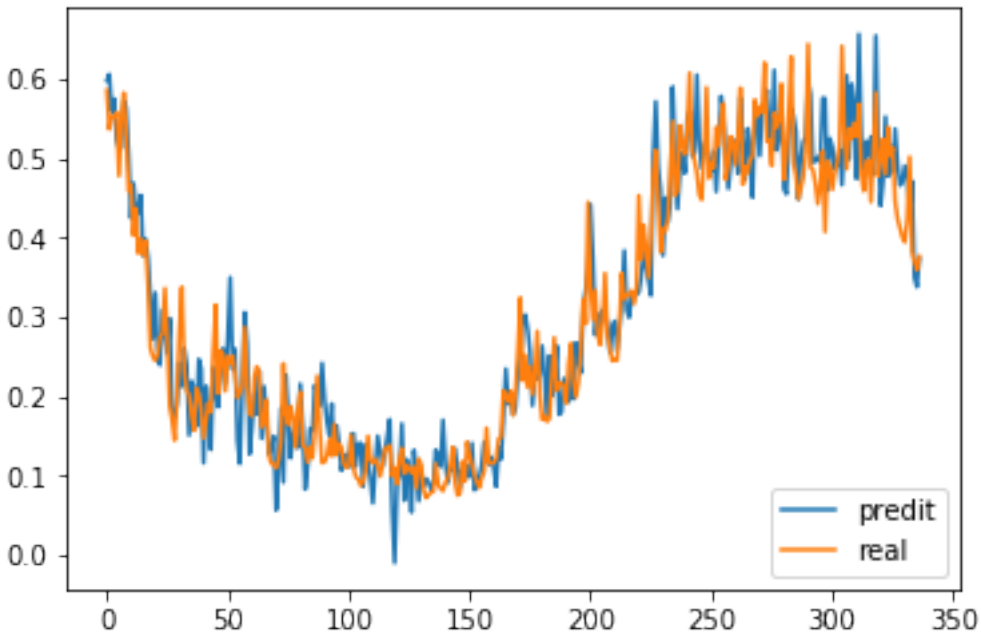


```
In [15]: predis=list()

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

         predis=np.reshape(predis, (337)  )

         predis
```

```
Out[15]: array([ 0.59799045,  0.60570145,  0.55903459,  0.57484865,  0.52323067,
                 0.51185787,  0.51272035,  0.57280958,  0.56334263,  0.50536388,
                 0.42437178,  0.46851197,  0.43743044,  0.43150097,  0.45325899,
                 0.37716386,  0.39792898,  0.37488705,  0.32760242,  0.27219069,
                 0.33037114,  0.26032203,  0.23930717,  0.30858094,  0.28023365,
                 0.25363263,  0.29797876,  0.18169817,  0.17300241,  0.18894741,
                 0.24181941,  0.21238835,  0.2605511 ,  0.23951307,  0.15073369,
                 0.2190496 ,  0.20965719,  0.16169515,  0.24645978,  0.234817  ,
                 0.11578111,  0.21255726,  0.18087041,  0.13261959,  0.23608963,
                 0.20339952,  0.18641642,  0.23265254,  0.25986663,  0.21546653,
                 0.27356964,  0.34963918,  0.23402454,  0.25958234,  0.14377314,
                 0.11495429,  0.20969556,  0.30552462,  0.2650975 ,  0.1271051 ,
                 0.16112554,  0.20327173,  0.17759112,  0.23187558,  0.14663693,
                 0.21218944,  0.16850212,  0.12709191,  0.13436386,  0.1495778 ,
                 0.05637179,  0.11107568,  0.18472114,  0.09142053,  0.22636026,
                 0.17873053,  0.12207048,  0.15047516,  0.16608526,  0.13456212,
                 0.21544303,  0.16187565,  0.0826446 ,  0.11126644,  0.15908   ,
                 0.15601842,  0.21363422,  0.20457935,  0.1876502 ,  0.24164304,
                 0.19528548,  0.16852024,  0.15080088,  0.19045353,  0.12591283,
                 0.16287699,  0.14177686,  0.10624969,  0.11808699,  0.12664485,
                 0.11032917,  0.15137327,  0.15299004,  0.11126532,  0.14008559,
                 0.14076358,  0.08590107,  0.13907513,  0.11941649,  0.09638644,
                 0.0651722 ,  0.11230967,  0.14985028,  0.13159269,  0.11127811,
                 0.13012551,  0.15017053,  0.17064416,  0.05660754, -0.01011687,
                 0.08939832,  0.10087255,  0.16526693,  0.06838985,  0.12051541,
                 0.10386924,  0.05360711,  0.13178213,  0.10662295,  0.06795861,
                 0.10501775,  0.08695396,  0.09581193,  0.09142195,  0.08267152,
                 0.09039018,  0.132221  ,  0.12366062,  0.11110754,  0.16998401,
                 0.1134185 ,  0.09075599,  0.10828123,  0.10825767,  0.13403749,
                 0.10890434,  0.08351654,  0.10826471,  0.09303051,  0.11131274,
                 0.09813677,  0.14073613,  0.08175278,  0.08542073,  0.10010724,
                 0.11342284,  0.14181691,  0.12238405,  0.11396432,  0.12316383,
                 0.10896488,  0.0861305 ,  0.13521241,  0.12053289,  0.17240772,
                 0.23449561,  0.18992811,  0.20209955,  0.17688163,  0.18568729,
                 0.23130676,  0.2498419 ,  0.29538673,  0.30257633,  0.28446025,
```

```
       0.25643653,  0.18806699,  0.23641597,  0.22201356,  0.22547877,
       0.26339057,  0.22785348,  0.17113551,  0.25071895,  0.20049798,
       0.22380684,  0.26360211,  0.17703372,  0.17978185,  0.22228971,
       0.20742294,  0.19285414,  0.23776472,  0.19647041,  0.26734096,
       0.24504569,  0.22917368,  0.31164846,  0.33407471,  0.3602913 ,
       0.44182017,  0.37364927,  0.27719629,  0.30379099,  0.28469184,
       0.30878127,  0.30664051,  0.29026946,  0.25570038,  0.28677925,
       0.29449564,  0.2577301 ,  0.28637093,  0.32170087,  0.3835178 ,
       0.30805212,  0.29910064,  0.32552314,  0.32557705,  0.32787108,
       0.33121642,  0.35081792,  0.38144964,  0.3644397 ,  0.34556168,
       0.3268739 ,  0.50484556,  0.57139945,  0.48900634,  0.46041292,
       0.37722847,  0.45021799,  0.41912097,  0.44179553,  0.59001744,
       0.50307   ,  0.43605405,  0.48333502,  0.50785697,  0.48108333,
       0.54851305,  0.55878431,  0.50261176,  0.50720227,  0.60501432,
       0.51982856,  0.48739278,  0.5167802 ,  0.52513844,  0.49486607,
       0.48422068,  0.50830281,  0.45785993,  0.51030362,  0.57819366,
       0.55015469,  0.5066247 ,  0.4616344 ,  0.49266851,  0.52299714,
       0.51810449,  0.48068094,  0.57700694,  0.52006435,  0.47349668,
       0.53742999,  0.51881039,  0.4507663 ,  0.55651546,  0.55648255,
       0.50303149,  0.56151861,  0.56923866,  0.58593881,  0.54300338,
       0.50899172,  0.61096334,  0.51014233,  0.52631444,  0.57296866,
       0.46162662,  0.454835  ,  0.52148747,  0.56298268,  0.55296504,
       0.53389716,  0.44823551,  0.49927571,  0.52116805,  0.52686167,
       0.59749889,  0.58015156,  0.49414903,  0.49770784,  0.50162786,
       0.49443734,  0.57576269,  0.57532531,  0.45939595,  0.52490377,
       0.5143342 ,  0.48652169,  0.49081266,  0.51066673,  0.46636337,
       0.52907795,  0.60421228,  0.49877161,  0.59355342,  0.56978285,
       0.47432059,  0.65639579,  0.52885592,  0.48488152,  0.52115047,
       0.50205231,  0.52643239,  0.47947848,  0.65434468,  0.51615053,
       0.44023746,  0.47170895,  0.55221063,  0.4770439 ,  0.51560032,
       0.48197252,  0.53694534,  0.49228519,  0.46581787,  0.46967882,
       0.49044693,  0.47676414,  0.43321973,  0.47121599,  0.34953821,
       0.33778921,  0.37318227])
```

In [16]:
```
##Mostrem
plt.plot(predis, label="predit")
plt.plot(y_daily[n_train:lenght], label="real")
plt.legend(loc="lower right")
plt.show()
```



In [19]:
```
#Creem un dataset amb format (nombre prediccions,17) per tornar les prediccions i els
#El necessitem d'questa mida encara que només volguem passar 2 variables ja que al fe
#per fer la inversa necessitem 17 variables
#Com que només en tenim 2, les ajuntem al dataset inicial i ens quedem amb 15 variabl
#Obtenint un dataset amb 15 variables aleatories i les 2 variables que ens interessen


prova=daily_dia.iloc[n_train:lenght]
prova
#len(predis)
#lenght-n_train
prova['predi']=predis
prova['y']=y_daily[n_train:lenght]
prova=prova.drop(['energy_sum','t-1'], axis=1)
prova

prova=prova[['predi','y','t-2','t-3','t-4','t-5','t-6','t-7','t-8','t-9','t-10','t-11
prova
```

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

See the caveats in the documentation: http://pandas.pydata.org/pandas-docs/stable/indexing.html
  if sys.path[0] == '':
c:\users\laura\appdata\local\programs\python\python37\lib\site-packages\ipykernel_launcher.py:
```

```
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: http://pandas.pydata.org/pandas-docs/stable/indexing.html
  del sys.path[0]
```

Out[19]:

	predi	y	t-2	t-3	t-4	t-5
479	0.529546	0.514061	12.119938	12.852295	13.106773	12.823073
480	0.556904	0.580609	11.786082	12.119938	12.852295	13.106773
481	0.628773	0.624326	11.590859	11.786082	12.119938	12.852295
482	0.553919	0.539280	12.186487	11.590859	11.786082	12.119938
483	0.573320	0.491355	12.577783	12.186487	11.590859	11.786082
484	0.509410	0.522145	11.816573	12.577783	12.186487	11.590859
485	0.557084	0.504442	11.387627	11.816573	12.577783	12.186487
486	0.525658	0.567725	11.663214	11.387627	11.816573	12.577783
487	0.592144	0.719460	11.504756	11.663214	11.387627	11.816573
488	0.720566	0.804631	12.071173	11.504756	11.663214	11.387627
489	0.693899	0.684716	13.429271	12.071173	11.504756	11.663214
490	0.735772	0.662177	14.191591	13.429271	12.071173	11.504756
491	0.684602	0.615194	13.118295	14.191591	13.429271	12.071173
492	0.590577	0.565466	12.916559	13.118295	14.191591	13.429271
493	0.530255	0.585646	12.496044	12.916559	13.118295	14.191591
494	0.665617	0.536523	12.050954	12.496044	12.916559	13.118295
495	0.631939	0.552256	12.231576	12.050954	12.496044	12.916559
496	0.486627	0.552256	11.791904	12.231576	12.050954	12.496044
497	0.514497	0.557809	11.932721	11.791904	12.231576	12.050954
498	0.514154	0.477794	11.932721	11.932721	11.791904	12.231576
499	0.480223	0.551195	11.982423	11.932721	11.932721	11.791904
500	0.579452	0.582339	11.266252	11.982423	11.932721	11.932721
501	0.545345	0.529772	11.923226	11.266252	11.982423	11.932721
502	0.416866	0.458904	12.201972	11.923226	11.266252	11.982423
503	0.420126	0.465733	11.731479	12.201972	11.923226	11.266252
504	0.439561	0.402622	11.097177	11.731479	12.201972	11.923226
505	0.423758	0.436918	11.158295	11.097177	11.731479	12.201972
506	0.459120	0.380048	10.593420	11.158295	11.097177	11.731479
507	0.403084	0.398860	10.900388	10.593420	11.158295	11.097177
508	0.413794	0.377916	10.391372	10.900388	10.593420	11.158295
..	...	...	...	...	...	...
800	0.473601	0.537515	11.753871	12.729659	11.620778	11.409880
801	0.595646	0.524598	11.344805	11.753871	12.729659	11.620778
802	0.539444	0.543903	11.800777	11.344805	11.753871	12.729659
803	0.590063	0.527438	11.685169	11.800777	11.344805	11.753871
804	0.642736	0.568506	11.857957	11.685169	11.800777	11.344805
805	0.560221	0.479332	11.710582	11.857957	11.685169	11.800777
806	0.585041	0.458726	12.078164	11.710582	11.857957	11.685169
807	0.484185	0.494425	11.280011	12.078164	11.710582	11.857957
808	0.510028	0.497810	11.095584	11.280011	12.078164	11.710582

809	0.501732	0.444954	11.415105	11.095584	11.280011	12.078164
810	0.463635	0.511653	11.445403	11.415105	11.095584	11.280011
811	0.623959	0.582450	10.972318	11.445403	11.415105	11.095584
812	0.578880	0.477562	11.569300	10.972318	11.445403	11.415105
813	0.500029	0.498620	12.202967	11.569300	10.972318	11.445403
814	0.592172	0.523920	11.264175	12.202967	11.569300	10.972318
815	0.524051	0.479971	11.452649	11.264175	12.202967	11.569300
816	0.549256	0.539318	11.679099	11.452649	11.264175	12.202967
817	0.505450	0.502845	11.285737	11.679099	11.452649	11.264175
818	0.535345	0.513089	11.816914	11.285737	11.679099	11.452649
819	0.515518	0.445764	11.490470	11.816914	11.285737	11.679099
820	0.464176	0.423680	11.582159	11.490470	11.816914	11.285737
821	0.489654	0.411694	10.979566	11.582159	11.490470	11.816914
822	0.402256	0.400434	10.781898	10.979566	11.582159	11.490470
823	0.404844	0.394209	10.674624	10.781898	10.979566	11.582159
824	0.443601	0.423048	10.573835	10.674624	10.781898	10.979566
825	0.407013	0.501722	10.518126	10.573835	10.674624	10.781898
826	0.412853	0.382286	10.776242	10.518126	10.573835	10.674624
827	0.413712	0.369280	11.480411	10.776242	10.518126	10.573835
828	0.314042	0.358995	10.411403	11.480411	10.776242	10.518126
829	0.387921	0.376135	10.294997	10.411403	11.480411	10.776242

	t-6	t-7	t-8	t-9	...	humidity(t-5)	\
479	11.559878	10.930170	10.889469	10.675248	...	0.82	
480	12.823073	11.559878	10.930170	10.889469	...	0.73	
481	13.106773	12.823073	11.559878	10.930170	...	0.63	
482	12.852295	13.106773	12.823073	11.559878	...	0.73	
483	12.119938	12.852295	13.106773	12.823073	...	0.67	
484	11.786082	12.119938	12.852295	13.106773	...	0.81	
485	11.590859	11.786082	12.119938	12.852295	...	0.85	
486	12.186487	11.590859	11.786082	12.119938	...	0.88	
487	12.577783	12.186487	11.590859	11.786082	...	0.91	
488	11.816573	12.577783	12.186487	11.590859	...	0.83	
489	11.387627	11.816573	12.577783	12.186487	...	0.86	
490	11.663214	11.387627	11.816573	12.577783	...	0.75	
491	11.504756	11.663214	11.387627	11.816573	...	0.79	
492	12.071173	11.504756	11.663214	11.387627	...	0.92	
493	13.429271	12.071173	11.504756	11.663214	...	0.78	
494	14.191591	13.429271	12.071173	11.504756	...	0.65	
495	13.118295	14.191591	13.429271	12.071173	...	0.65	
496	12.916559	13.118295	14.191591	13.429271	...	0.64	
497	12.496044	12.916559	13.118295	14.191591	...	0.66	
498	12.050954	12.496044	12.916559	13.118295	...	0.63	
499	12.231576	12.050954	12.496044	12.916559	...	0.69	
500	11.791904	12.231576	12.050954	12.496044	...	0.64	
501	11.932721	11.791904	12.231576	12.050954	...	0.68	
502	11.932721	11.932721	11.791904	12.231576	...	0.57	
503	11.982423	11.932721	11.932721	11.791904	...	0.64	

504	11.266252	11.982423	11.932721	11.932721	...	0.74
505	11.923226	11.266252	11.982423	11.932721	...	0.61
506	12.201972	11.923226	11.266252	11.982423	...	0.63
507	11.731479	12.201972	11.923226	11.266252	...	0.62
508	11.097177	11.731479	12.201972	11.923226	...	0.65
..	...	...	...	...	...	...
800	11.300414	11.109560	11.370601	11.430883	...	0.83
801	11.409880	11.300414	11.109560	11.370601	...	0.83
802	11.620778	11.409880	11.300414	11.109560	...	0.79
803	12.729659	11.620778	11.409880	11.300414	...	0.79
804	11.753871	12.729659	11.620778	11.409880	...	0.83
805	11.344805	11.753871	12.729659	11.620778	...	0.90
806	11.800777	11.344805	11.753871	12.729659	...	0.91
807	11.685169	11.800777	11.344805	11.753871	...	0.91
808	11.857957	11.685169	11.800777	11.344805	...	0.76
809	11.710582	11.857957	11.685169	11.800777	...	0.72
810	12.078164	11.710582	11.857957	11.685169	...	0.79
811	11.280011	12.078164	11.710582	11.857957	...	0.75
812	11.095584	11.280011	12.078164	11.710582	...	0.77
813	11.415105	11.095584	11.280011	12.078164	...	0.82
814	11.445403	11.415105	11.095584	11.280011	...	0.79
815	10.972318	11.445403	11.415105	11.095584	...	0.77
816	11.569300	10.972318	11.445403	11.415105	...	0.66
817	12.202967	11.569300	10.972318	11.445403	...	0.84
818	11.264175	12.202967	11.569300	10.972318	...	0.76
819	11.452649	11.264175	12.202967	11.569300	...	0.75
820	11.679099	11.452649	11.264175	12.202967	...	0.68
821	11.285737	11.679099	11.452649	11.264175	...	0.81
822	11.816914	11.285737	11.679099	11.452649	...	0.69
823	11.490470	11.816914	11.285737	11.679099	...	0.76
824	11.582159	11.490470	11.816914	11.285737	...	0.83
825	10.979566	11.582159	11.490470	11.816914	...	0.87
826	10.781898	10.979566	11.582159	11.490470	...	0.87
827	10.674624	10.781898	10.979566	11.582159	...	0.84
828	10.573835	10.674624	10.781898	10.979566	...	0.72
829	10.518126	10.573835	10.674624	10.781898	...	0.71

	humidity(t-6)	humidity(t-7)	humidity(t-8)	humidity(t-9)	\
479	0.90	0.96	0.93	0.72	
480	0.82	0.90	0.96	0.93	
481	0.73	0.82	0.90	0.96	
482	0.63	0.73	0.82	0.90	
483	0.73	0.63	0.73	0.82	
484	0.67	0.73	0.63	0.73	
485	0.81	0.67	0.73	0.63	
486	0.85	0.81	0.67	0.73	
487	0.88	0.85	0.81	0.67	
488	0.91	0.88	0.85	0.81	

489	0.83	0.91	0.88	0.85
490	0.86	0.83	0.91	0.88
491	0.75	0.86	0.83	0.91
492	0.79	0.75	0.86	0.83
493	0.92	0.79	0.75	0.86
494	0.78	0.92	0.79	0.75
495	0.65	0.78	0.92	0.79
496	0.65	0.65	0.78	0.92
497	0.64	0.65	0.65	0.78
498	0.66	0.64	0.65	0.65
499	0.63	0.66	0.64	0.65
500	0.69	0.63	0.66	0.64
501	0.64	0.69	0.63	0.66
502	0.68	0.64	0.69	0.63
503	0.57	0.68	0.64	0.69
504	0.64	0.57	0.68	0.64
505	0.74	0.64	0.57	0.68
506	0.61	0.74	0.64	0.57
507	0.63	0.61	0.74	0.64
508	0.62	0.63	0.61	0.74
..	...	...	...	...
800	0.82	0.87	0.89	0.89
801	0.83	0.82	0.87	0.89
802	0.83	0.83	0.82	0.87
803	0.79	0.83	0.83	0.82
804	0.79	0.79	0.83	0.83
805	0.83	0.79	0.79	0.83
806	0.90	0.83	0.79	0.79
807	0.91	0.90	0.83	0.79
808	0.91	0.91	0.90	0.83
809	0.76	0.91	0.91	0.90
810	0.72	0.76	0.91	0.91
811	0.79	0.72	0.76	0.91
812	0.75	0.79	0.72	0.76
813	0.77	0.75	0.79	0.72
814	0.82	0.77	0.75	0.79
815	0.79	0.82	0.77	0.75
816	0.77	0.79	0.82	0.77
817	0.66	0.77	0.79	0.82
818	0.84	0.66	0.77	0.79
819	0.76	0.84	0.66	0.77
820	0.75	0.76	0.84	0.66
821	0.68	0.75	0.76	0.84
822	0.81	0.68	0.75	0.76
823	0.69	0.81	0.68	0.75
824	0.76	0.69	0.81	0.68
825	0.83	0.76	0.69	0.81
826	0.87	0.83	0.76	0.69

```
827           0.87           0.87           0.83           0.76
828           0.84           0.87           0.87           0.83
829           0.72           0.84           0.87           0.87

     humidity(t-10)  humidity(t-11)  humidity(t-12)  humidity(t-13)  \
479            0.74            0.78            0.80            0.72
480            0.72            0.74            0.78            0.80
481            0.93            0.72            0.74            0.78
482            0.96            0.93            0.72            0.74
483            0.90            0.96            0.93            0.72
484            0.82            0.90            0.96            0.93
485            0.73            0.82            0.90            0.96
486            0.63            0.73            0.82            0.90
487            0.73            0.63            0.73            0.82
488            0.67            0.73            0.63            0.73
489            0.81            0.67            0.73            0.63
490            0.85            0.81            0.67            0.73
491            0.88            0.85            0.81            0.67
492            0.91            0.88            0.85            0.81
493            0.83            0.91            0.88            0.85
494            0.86            0.83            0.91            0.88
495            0.75            0.86            0.83            0.91
496            0.79            0.75            0.86            0.83
497            0.92            0.79            0.75            0.86
498            0.78            0.92            0.79            0.75
499            0.65            0.78            0.92            0.79
500            0.65            0.65            0.78            0.92
501            0.64            0.65            0.65            0.78
502            0.66            0.64            0.65            0.65
503            0.63            0.66            0.64            0.65
504            0.69            0.63            0.66            0.64
505            0.64            0.69            0.63            0.66
506            0.68            0.64            0.69            0.63
507            0.57            0.68            0.64            0.69
508            0.64            0.57            0.68            0.64
..              ...             ...             ...             ...
800            0.80            0.83            0.87            0.83
801            0.89            0.80            0.83            0.87
802            0.89            0.89            0.80            0.83
803            0.87            0.89            0.89            0.80
804            0.82            0.87            0.89            0.89
805            0.83            0.82            0.87            0.89
806            0.83            0.83            0.82            0.87
807            0.79            0.83            0.83            0.82
808            0.79            0.79            0.83            0.83
809            0.83            0.79            0.79            0.83
810            0.90            0.83            0.79            0.79
811            0.91            0.90            0.83            0.79
```

812	0.91	0.91	0.90	0.83
813	0.76	0.91	0.91	0.90
814	0.72	0.76	0.91	0.91
815	0.79	0.72	0.76	0.91
816	0.75	0.79	0.72	0.76
817	0.77	0.75	0.79	0.72
818	0.82	0.77	0.75	0.79
819	0.79	0.82	0.77	0.75
820	0.77	0.79	0.82	0.77
821	0.66	0.77	0.79	0.82
822	0.84	0.66	0.77	0.79
823	0.76	0.84	0.66	0.77
824	0.75	0.76	0.84	0.66
825	0.68	0.75	0.76	0.84
826	0.81	0.68	0.75	0.76
827	0.69	0.81	0.68	0.75
828	0.76	0.69	0.81	0.68
829	0.83	0.76	0.69	0.81

	humidity(t-14)
479	0.78
480	0.72
481	0.80
482	0.78
483	0.74
484	0.72
485	0.93
486	0.96
487	0.90
488	0.82
489	0.73
490	0.63
491	0.73
492	0.67
493	0.81
494	0.85
495	0.88
496	0.91
497	0.83
498	0.86
499	0.75
500	0.79
501	0.92
502	0.78
503	0.65
504	0.65
505	0.64
506	0.66

```
507            0.63
508            0.69
..              ...
800            0.90
801            0.83
802            0.87
803            0.83
804            0.80
805            0.89
806            0.89
807            0.87
808            0.82
809            0.83
810            0.83
811            0.79
812            0.79
813            0.83
814            0.90
815            0.91
816            0.91
817            0.76
818            0.72
819            0.79
820            0.75
821            0.77
822            0.82
823            0.79
824            0.77
825            0.66
826            0.84
827            0.76
828            0.75
829            0.68

[351 rows x 43 columns]
```

```
In [20]: # Convert predictions back to normal values

         predi = scaler.inverse_transform(prova)
         print(predi)
         print(predi[0][0])
         print(predi[0][1])

         #Les variables en posició 15 i 16 són predicció i y respectivament
```

```
[[ 11.72945365  11.59085917 115.46893021 ...   0.87         0.826
    0.859     ]
 [ 11.97432062  12.18648691 112.48075791 ...   0.859        0.87
```

```
    0.826     ]
 [ 12.61757848  12.57778255 110.7334244  ...   0.837       0.859
    0.87      ]
 ...
 [ 10.69268739  10.2949966  109.74485905 ...   0.804       0.8425
    0.848     ]
 [  9.80059313  10.20294532 100.17673598 ...   0.8755      0.804
    0.8425    ]
 [ 10.46184053  10.3563499   99.13484299 ...   0.8095      0.8755
    0.804     ]]
11.72945365084962
11.590859170709699
```

In [21]:
```
#Fem una llista amb les prediccions i una llista amb y(valor real)

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

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

Out[21]:
```
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 11.9327208888355,
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```
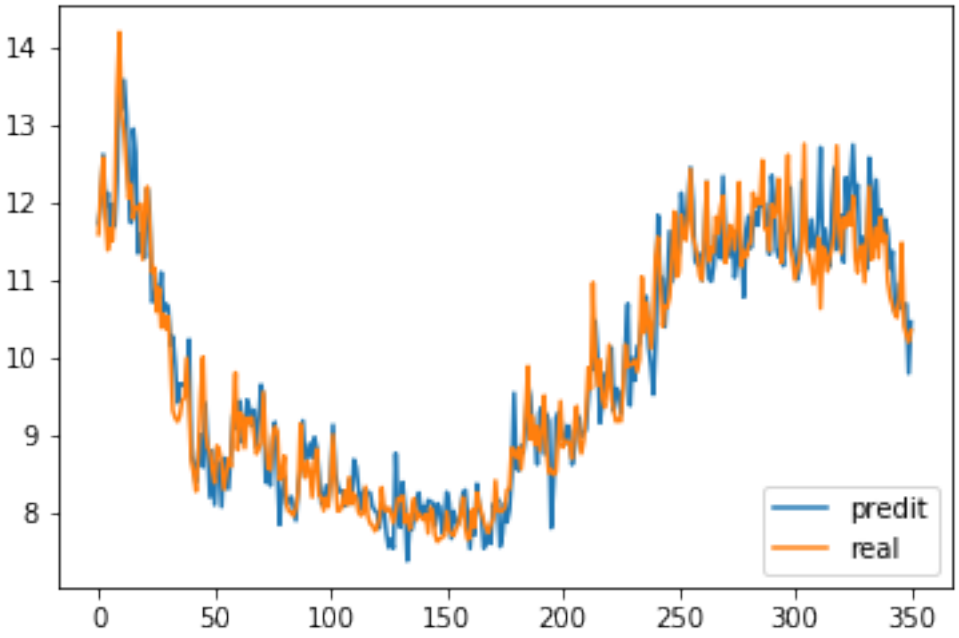

In [22]:
```
##Mostrem
plt.plot(listpredi, label="predit")
plt.plot(listy, label="real")
plt.legend(loc="lower right")
plt.show()
```



In [ ]: