M03 _Xarxa_walkforward_normalitzat_multivariate2

December 21, 2019

1 Xarxa neuronal

```
In [15]: import pandas as pd
         import numpy as np
         from pandas import datetime
         from matplotlib import pyplot as plt

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

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

1.1 Consum diari total multivariate one-step

```
In [16]: daily=pd.read_csv('C:/Users/Laura/Desktop/Smart meters London/workspace R/Dades netes/
         daily.head(5)
```

Out[16]:

	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

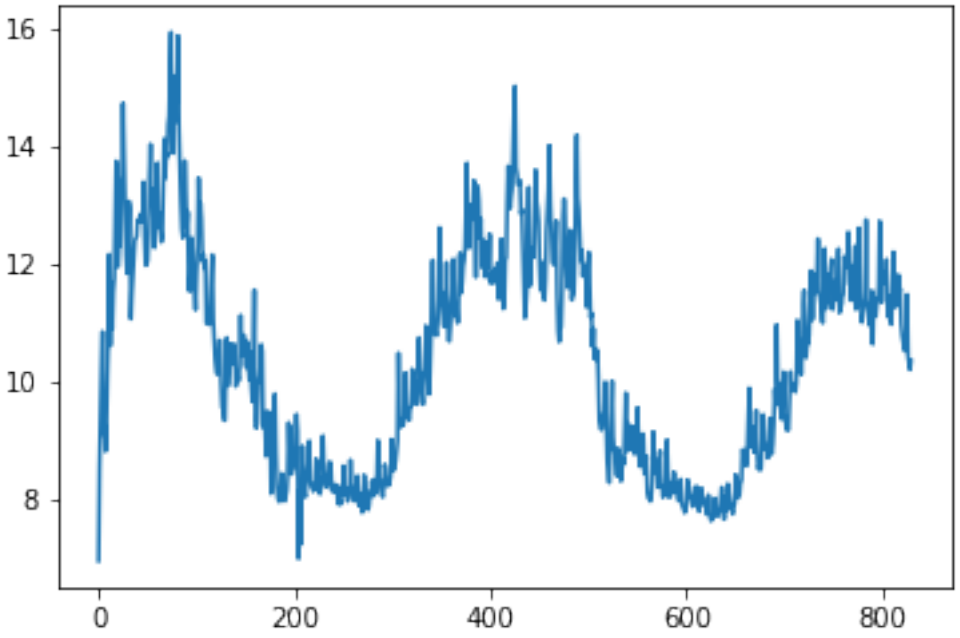
In [17]:
```
#Ens quedem amb date i energy_sum, ordenem valors per data i resetejem index
daily_dia=daily[['date','energy_sum','apparentTemperatureMax','humidity']].sort_values
daily_dia.head(5)
```

Out[17]:

	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 [19]:
```
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['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['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
```

Out[19]:

	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	...	temp(t-7)	\
0	NaN	NaN	NaN	NaN	NaN	...	NaN	
1	6.952692	NaN	NaN	NaN	NaN	...	NaN	
2	8.536480	6.952692	NaN	NaN	NaN	...	NaN	
3	9.499781	8.536480	6.952692	NaN	NaN	...	NaN	
4	10.267707	9.499781	8.536480	6.952692	NaN	...	NaN	
5	10.850805	10.267707	9.499781	8.536480	6.952692	...	NaN	
6	9.103382	10.850805	10.267707	9.499781	8.536480	...	NaN	
7	9.274873	9.103382	10.850805	10.267707	9.499781	...	10.36	
8	8.813513	9.274873	9.103382	10.850805	10.267707	...	12.93	
9	9.227707	8.813513	9.274873	9.103382	10.850805	...	13.03	
10	10.145910	9.227707	8.813513	9.274873	9.103382	...	12.96	
11	10.780273	10.145910	9.227707	8.813513	9.274873	...	13.54	
12	12.163127	10.780273	10.145910	9.227707	8.813513	...	12.58	
13	10.609714	12.163127	10.780273	10.145910	9.227707	...	13.47	

14	11.673417	10.609714	12.163127	10.780273	10.145910	...	11.87
15	10.889362	11.673417	10.609714	12.163127	10.780273	...	12.15
16	11.525150	10.889362	11.673417	10.609714	12.163127	...	5.33
17	11.759837	11.525150	10.889362	11.673417	10.609714	...	11.42
18	12.633801	11.759837	11.525150	10.889362	11.673417	...	6.66
19	13.749174	12.633801	11.759837	11.525150	10.889362	...	3.13
20	11.951958	13.749174	12.633801	11.759837	11.525150	...	3.77
21	11.957446	11.951958	13.749174	12.633801	11.759837	...	5.14
22	12.392776	11.957446	11.951958	13.749174	12.633801	...	12.89
23	12.307079	12.392776	11.957446	11.951958	13.749174	...	3.99
24	13.376080	12.307079	12.392776	11.957446	11.951958	...	3.14
25	13.511968	13.376080	12.307079	12.392776	11.957446	...	5.72
26	14.732271	13.511968	13.376080	12.307079	12.392776	...	5.94
27	13.774471	14.732271	13.511968	13.376080	12.307079	...	12.08
28	12.709106	13.774471	14.732271	13.511968	13.376080	...	2.88
29	12.148570	12.709106	13.774471	14.732271	13.511968	...	4.38
..	...	...	...	...	...	...	...
800	11.344805	11.753871	12.729659	11.620778	11.409880	...	10.02
801	11.800777	11.344805	11.753871	12.729659	11.620778	...	4.93
802	11.685169	11.800777	11.344805	11.753871	12.729659	...	5.72
803	11.857957	11.685169	11.800777	11.344805	11.753871	...	11.77
804	11.710582	11.857957	11.685169	11.800777	11.344805	...	5.99
805	12.078164	11.710582	11.857957	11.685169	11.800777	...	4.34
806	11.280011	12.078164	11.710582	11.857957	11.685169	...	6.34
807	11.095584	11.280011	12.078164	11.710582	11.857957	...	2.53
808	11.415105	11.095584	11.280011	12.078164	11.710582	...	5.86
809	11.445403	11.415105	11.095584	11.280011	12.078164	...	5.27
810	10.972318	11.445403	11.415105	11.095584	11.280011	...	6.86
811	11.569300	10.972318	11.445403	11.415105	11.095584	...	6.48
812	12.202967	11.569300	10.972318	11.445403	11.415105	...	4.59
813	11.264175	12.202967	11.569300	10.972318	11.445403	...	5.63
814	11.452649	11.264175	12.202967	11.569300	10.972318	...	5.86
815	11.679099	11.452649	11.264175	12.202967	11.569300	...	7.34
816	11.285737	11.679099	11.452649	11.264175	12.202967	...	8.44
817	11.816914	11.285737	11.679099	11.452649	11.264175	...	5.67
818	11.490470	11.816914	11.285737	11.679099	11.452649	...	3.91
819	11.582159	11.490470	11.816914	11.285737	11.679099	...	7.07
820	10.979566	11.582159	11.490470	11.816914	11.285737	...	4.06
821	10.781898	10.979566	11.582159	11.490470	11.816914	...	4.73
822	10.674624	10.781898	10.979566	11.582159	11.490470	...	3.42
823	10.573835	10.674624	10.781898	10.979566	11.582159	...	12.02
824	10.518126	10.573835	10.674624	10.781898	10.979566	...	5.79
825	10.776242	10.518126	10.573835	10.674624	10.781898	...	7.88
826	11.480411	10.776242	10.518126	10.573835	10.674624	...	10.67
827	10.411403	11.480411	10.776242	10.518126	10.573835	...	10.13
828	10.294997	10.411403	11.480411	10.776242	10.518126	...	10.13
829	10.202945	10.294997	10.411403	11.480411	10.776242	...	12.50

	temp(t-8)	humidity(t-1)	humidity(t-2)	humidity(t-3)	humidity(t-4)	\
0	NaN	NaN	NaN	NaN	NaN	
1	NaN	0.93	NaN	NaN	NaN	
2	NaN	0.89	0.93	NaN	NaN	
3	NaN	0.79	0.89	0.93	NaN	
4	NaN	0.81	0.79	0.89	0.93	
5	NaN	0.72	0.81	0.79	0.89	
6	NaN	0.86	0.72	0.81	0.79	
7	NaN	0.82	0.86	0.72	0.81	
8	10.36	0.78	0.82	0.86	0.72	
9	12.93	0.82	0.78	0.82	0.86	
10	13.03	0.87	0.82	0.78	0.82	
11	12.96	0.79	0.87	0.82	0.78	
12	13.54	0.82	0.79	0.87	0.82	
13	12.58	0.77	0.82	0.79	0.87	
14	13.47	0.83	0.77	0.82	0.79	
15	11.87	0.68	0.83	0.77	0.82	
16	12.15	0.81	0.68	0.83	0.77	
17	5.33	0.71	0.81	0.68	0.83	
18	11.42	0.81	0.71	0.81	0.68	
19	6.66	0.88	0.81	0.71	0.81	
20	3.13	0.84	0.88	0.81	0.71	
21	3.77	0.75	0.84	0.88	0.81	
22	5.14	0.79	0.75	0.84	0.88	
23	12.89	0.77	0.79	0.75	0.84	
24	3.99	0.88	0.77	0.79	0.75	
25	3.14	0.86	0.88	0.77	0.79	
26	5.72	0.84	0.86	0.88	0.77	
27	5.94	0.94	0.84	0.86	0.88	
28	12.08	0.81	0.94	0.84	0.86	
29	2.88	0.94	0.81	0.94	0.84	
..	...	...	...	...	...	
800	6.26	0.83	0.79	0.79	0.83	
801	10.02	0.90	0.83	0.79	0.79	
802	4.93	0.91	0.90	0.83	0.79	
803	5.72	0.91	0.91	0.90	0.83	
804	11.77	0.76	0.91	0.91	0.90	
805	5.99	0.72	0.76	0.91	0.91	
806	4.34	0.79	0.72	0.76	0.91	
807	6.34	0.75	0.79	0.72	0.76	
808	2.53	0.77	0.75	0.79	0.72	
809	5.86	0.82	0.77	0.75	0.79	
810	5.27	0.79	0.82	0.77	0.75	
811	6.86	0.77	0.79	0.82	0.77	
812	6.48	0.66	0.77	0.79	0.82	
813	4.59	0.84	0.66	0.77	0.79	
814	5.63	0.76	0.84	0.66	0.77	
815	5.86	0.75	0.76	0.84	0.66	

816	7.34	0.68	0.75	0.76	0.84
817	8.44	0.81	0.68	0.75	0.76
818	5.67	0.69	0.81	0.68	0.75
819	3.91	0.76	0.69	0.81	0.68
820	7.07	0.83	0.76	0.69	0.81
821	4.06	0.87	0.83	0.76	0.69
822	4.73	0.87	0.87	0.83	0.76
823	3.42	0.84	0.87	0.87	0.83
824	12.02	0.72	0.84	0.87	0.87
825	5.79	0.71	0.72	0.84	0.87
826	7.88	0.76	0.71	0.72	0.84
827	10.67	0.74	0.76	0.71	0.72
828	10.13	0.78	0.74	0.76	0.71
829	10.13	0.73	0.78	0.74	0.76

	humidity(t-5)	humidity(t-6)	humidity(t-7)	humidity(t-8)
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	0.93	NaN	NaN	NaN
6	0.89	0.93	NaN	NaN
7	0.79	0.89	0.93	NaN
8	0.81	0.79	0.89	0.93
9	0.72	0.81	0.79	0.89
10	0.86	0.72	0.81	0.79
11	0.82	0.86	0.72	0.81
12	0.78	0.82	0.86	0.72
13	0.82	0.78	0.82	0.86
14	0.87	0.82	0.78	0.82
15	0.79	0.87	0.82	0.78
16	0.82	0.79	0.87	0.82
17	0.77	0.82	0.79	0.87
18	0.83	0.77	0.82	0.79
19	0.68	0.83	0.77	0.82
20	0.81	0.68	0.83	0.77
21	0.71	0.81	0.68	0.83
22	0.81	0.71	0.81	0.68
23	0.88	0.81	0.71	0.81
24	0.84	0.88	0.81	0.71
25	0.75	0.84	0.88	0.81
26	0.79	0.75	0.84	0.88
27	0.77	0.79	0.75	0.84
28	0.88	0.77	0.79	0.75
29	0.86	0.88	0.77	0.79
..	...	...	...	...
800	0.83	0.82	0.87	0.89

```
801          0.83          0.83          0.82          0.87
802          0.79          0.83          0.83          0.82
803          0.79          0.79          0.83          0.83
804          0.83          0.79          0.79          0.83
805          0.90          0.83          0.79          0.79
806          0.91          0.90          0.83          0.79
807          0.91          0.91          0.90          0.83
808          0.76          0.91          0.91          0.90
809          0.72          0.76          0.91          0.91
810          0.79          0.72          0.76          0.91
811          0.75          0.79          0.72          0.76
812          0.77          0.75          0.79          0.72
813          0.82          0.77          0.75          0.79
814          0.79          0.82          0.77          0.75
815          0.77          0.79          0.82          0.77
816          0.66          0.77          0.79          0.82
817          0.84          0.66          0.77          0.79
818          0.76          0.84          0.66          0.77
819          0.75          0.76          0.84          0.66
820          0.68          0.75          0.76          0.84
821          0.81          0.68          0.75          0.76
822          0.69          0.81          0.68          0.75
823          0.76          0.69          0.81          0.68
824          0.83          0.76          0.69          0.81
825          0.87          0.83          0.76          0.69
826          0.87          0.87          0.83          0.76
827          0.84          0.87          0.87          0.83
828          0.72          0.84          0.87          0.87
829          0.71          0.72          0.84          0.87

[830 rows x 29 columns]
```

In [20]:
```
#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[['energy_sum','t-1','t-2','t-3','t-4','t-5','t-6','t-7','t-8','te
daily_dia.head(5)
```

Out[20]:
```
   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

   temp(t-1)  ...  temp(t-7)  temp(t-8)  humidity(t-1)  humidity(t-2)  \
0        NaN  ...        NaN        NaN            NaN            NaN
1      10.36  ...        NaN        NaN           0.93            NaN
2      12.93  ...        NaN        NaN           0.89           0.93
```

```
3      13.03  ...        NaN        NaN           0.79           0.89
4      12.96  ...        NaN        NaN           0.81           0.79

   humidity(t-3)  humidity(t-4)  humidity(t-5)  humidity(t-6)  humidity(t-7)  \
0            NaN            NaN            NaN            NaN            NaN
1            NaN            NaN            NaN            NaN            NaN
2            NaN            NaN            NaN            NaN            NaN
3           0.93            NaN            NaN            NaN            NaN
4           0.89           0.93            NaN            NaN            NaN

   humidity(t-8)
0            NaN
1            NaN
2            NaN
3            NaN
4            NaN

[5 rows x 25 columns]
```

In [21]:
```
#Eliminem les 8 primeres files ja que contenen NaN (valors buits)

daily_dia=daily_dia.drop([0,1,2,3,4,5,6,7])
daily_dia.head(5)
```

Out[21]:
```
    energy_sum        t-1        t-2        t-3        t-4        t-5  \
8     9.227707   8.813513   9.274873   9.103382  10.850805  10.267707
9    10.145910   9.227707   8.813513   9.274873   9.103382  10.850805
10   10.780273  10.145910   9.227707   8.813513   9.274873   9.103382
11   12.163127  10.780273  10.145910   9.227707   8.813513   9.274873
12   10.609714  12.163127  10.780273  10.145910   9.227707   8.813513

          t-6        t-7        t-8  temp(t-1)  ...  temp(t-7)  temp(t-8)  \
8    9.499781   8.536480   6.952692      11.87  ...      12.93      10.36
9   10.267707   9.499781   8.536480      12.15  ...      13.03      12.93
10  10.850805  10.267707   9.499781       5.33  ...      12.96      13.03
11   9.103382  10.850805  10.267707      11.42  ...      13.54      12.96
12   9.274873   9.103382  10.850805       6.66  ...      12.58      13.54

    humidity(t-1)  humidity(t-2)  humidity(t-3)  humidity(t-4)  humidity(t-5)  \
8            0.78           0.82           0.86           0.72           0.81
9            0.82           0.78           0.82           0.86           0.72
10           0.87           0.82           0.78           0.82           0.86
11           0.79           0.87           0.82           0.78           0.82
12           0.82           0.79           0.87           0.82           0.78

    humidity(t-6)  humidity(t-7)  humidity(t-8)
8            0.79           0.89           0.93
9            0.81           0.79           0.89
```

```
10          0.72          0.81          0.79
11          0.86          0.72          0.81
12          0.82          0.86          0.72

[5 rows x 25 columns]
```

In [10]:
```
len(daily_dia)
```

Out[10]:
```
822
```

In [22]:
```
#normalitzem
scaler=preprocessing.MinMaxScaler(feature_range=(0, 1))
daily_dia_norm=scaler.fit_transform(daily_dia)
```

In [23]:
```
#Seleccionem dades per test i train
y_daily=daily_dia_norm[:,0]
X_daily=daily_dia_norm[:,1:25]

#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], 8,3))
```

In [24]:
```
# definim model
import tensorflow as tf
model =Sequential()
model.add(LSTM(50, activation='relu', input_shape=(8, 3)))
model.add(Dense(1))
model.compile(optimizer='adam', loss='mse', metrics=['accuracy'])
```

In [25]:
```
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
```

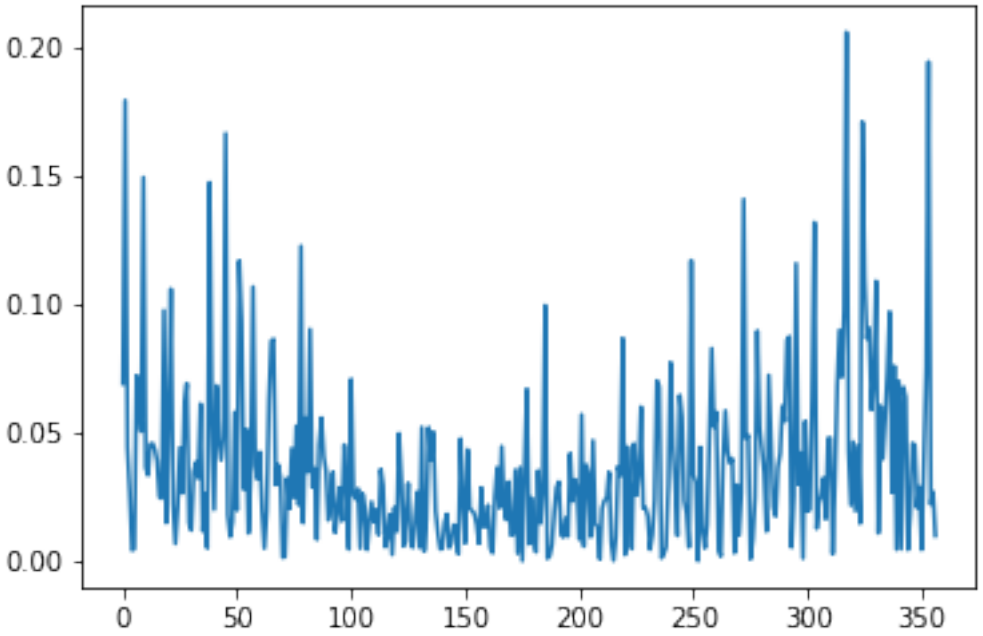
```
        for i in range(n_train,lenght):
            minim=minim+1
            X_train,X_test= X_daily[minim:i],X_daily[i:i+1]
            y_train,y_test= y_daily[minim:i],y_daily[i:i+1]

            #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
```

In [26]:
```
#Dividim la suma de scores de test entre el nombre de prediccions per obtenir la mitj
sumScores/(lenght-n_train)
```

Out[26]:
```
0.03636622864770906
```

In [45]:
```
plt.plot(llista_scores)
```

Out[45]:
```
[<matplotlib.lines.Line2D at 0x1d48f664588>]
```




```
In [44]: llista_scores

Out[44]: [0.06895875674755869,
          0.17898296058782903,
          0.044220855033577644,
          0.026701032202708364,
          0.004244846745404374,
          0.0047676219843471035,
          0.07211717889476343,
          0.06413234494533326,
          0.05039742565822447,
          0.14910071287717508,
          0.036429564784463686,
          0.03339440198028609,
          0.045394919214631235,
          0.0457363972792697,
          0.043346409134962904,
          0.0387965583864891,
          0.02481454851984921,
          0.024401067586407477,
          0.0974198029681772,
          0.014908973872724163,
          0.05694442844225933,
          0.10572412510797347,
          0.022259928668090456,
          0.006784536326476687,
```

```
0.021218335322036097,
0.04405022211970411,
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0.01202575850012777,
0.034473774569107274,
0.038352749463494984,
0.03220459106709095,
0.06110249459816153,
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0.06820462576496111,
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0.047654999790332164,
0.16615471921255143,
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0.019485705540674636,
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0.0014697498031011058,
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```

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```
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0.0027577371655516103,
```

```
          0.031083001317993464,
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          0.09723089797270368,
          0.20550489002047012,
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          0.04489204580588968,
          0.014642374665750024,
          0.1706460616398353,
          0.11013626878531957,
          0.08650323166097662,
          0.09056902876063555,
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          0.07093954215321374,
          0.10876316435273647,
          0.010882798282363826,
          0.06031013014598097,
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          0.09684895246552472,
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          0.004531619407804444,
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          0.03876327370902222,
          0.07514568828178558,
          0.19400814150800394,
          0.022118609585442872,
          0.026908918908718382,
          0.009867551069260738]
```
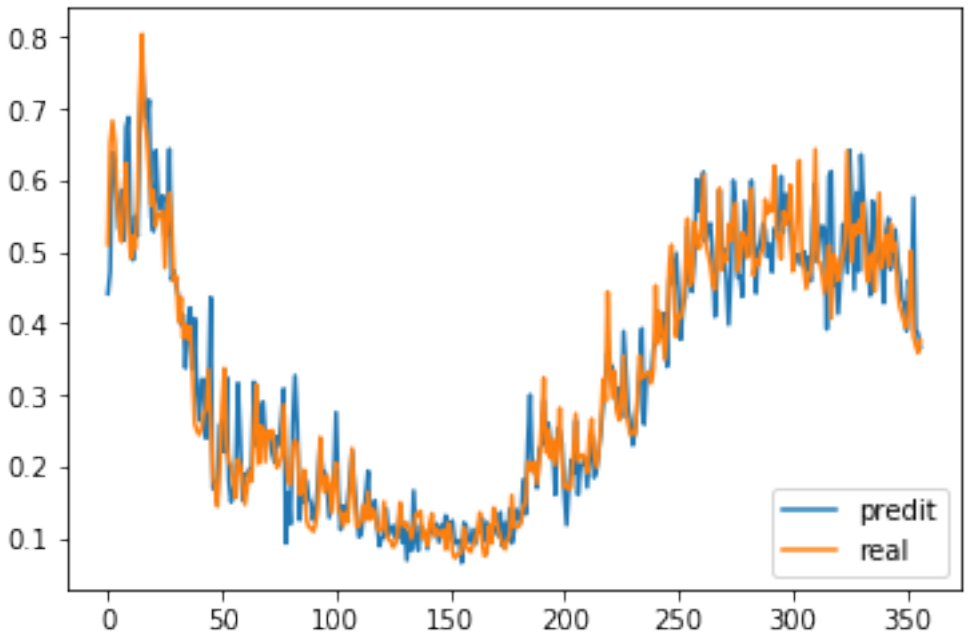

In [28]:
```
predis=list()
```

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

predis=np.reshape(predis, (357)  )

predis
```

Out[28]:
```
array([0.44164133, 0.47274876, 0.63920754, 0.6282956 , 0.56892848,
       0.53110528, 0.58617866, 0.51647621, 0.67472386, 0.68838024,
       0.52778471, 0.48875099, 0.54983646, 0.52198857, 0.67611337,
       0.76583421, 0.70953023, 0.68657768, 0.71261394, 0.55055708,
       0.52870172, 0.6422475 , 0.57451624, 0.55904084, 0.57902765,
       0.52184463, 0.52478862, 0.64400488, 0.46073186, 0.47356236,
       0.4537071 , 0.43709546, 0.39856517, 0.41225222, 0.33775741,
       0.38958281, 0.42194033, 0.33618611, 0.40737942, 0.30772221,
       0.26465398, 0.32076138, 0.32216018, 0.23962232, 0.28829488,
       0.43672782, 0.16926722, 0.17887534, 0.15980101, 0.25766841,
       0.26356691, 0.22068635, 0.32494193, 0.17926258, 0.15027808,
       0.16427714, 0.19008805, 0.31649497, 0.23980707, 0.15305093,
       0.18956825, 0.18863484, 0.19631296, 0.19935936, 0.31822261,
       0.22939023, 0.28999364, 0.22739929, 0.29066569, 0.23916763,
       0.24839942, 0.23975921, 0.21848398, 0.20629266, 0.24202426,
       0.22977251, 0.26621959, 0.30873543, 0.09286777, 0.16335636,
       0.1193634 , 0.25867584, 0.32723379, 0.25901884, 0.12515312,
       0.17446202, 0.15002628, 0.18114124, 0.15548319, 0.14934374,
       0.12511757, 0.14148565, 0.17759016, 0.2299367 , 0.1960457 ,
       0.19265415, 0.17179161, 0.12841703, 0.16626997, 0.18110014,
       0.27586627, 0.16402316, 0.11168104, 0.14457832, 0.13021038,
       0.14827852, 0.17999028, 0.22109437, 0.17508945, 0.13893446,
       0.10162933, 0.10445949, 0.13513978, 0.16060309, 0.19382302,
       0.13131282, 0.13073075, 0.15273607, 0.11697979, 0.08875631,
       0.10101658, 0.1012631 , 0.14075702, 0.10363502, 0.11303693,
       0.11756112, 0.09994368, 0.10116136, 0.13245022, 0.0934348 ,
       0.12081781, 0.06900035, 0.10907958, 0.08290373, 0.16633192,
       0.09504104, 0.08266725, 0.11819074, 0.1106874 , 0.10524867,
       0.08471233, 0.10598048, 0.11604318, 0.10771035, 0.1200963 ,
       0.09436519, 0.11688479, 0.11378025, 0.1314939 , 0.09722356,
       0.11997698, 0.12424386, 0.09215821, 0.09524909, 0.0970021 ,
       0.0653775 , 0.12170754, 0.1170639 , 0.09668973, 0.09405725,
       0.11231682, 0.09157751, 0.11057177, 0.11051849, 0.12791969,
       0.0956375 , 0.12172636, 0.09593632, 0.10883454, 0.11141931,
       0.11602036, 0.10267644, 0.13595894, 0.08870848, 0.12106526,
       0.09654715, 0.14057343, 0.09293902, 0.10908269, 0.13988993,
       0.12748793, 0.12436304, 0.18173495, 0.13320531, 0.23328999,
       0.30032638, 0.19416283, 0.20463538, 0.1698319 , 0.22472051,
       0.22874051, 0.29322249, 0.22959222, 0.26101136, 0.22775552,
       0.22798567, 0.16047105, 0.25296584, 0.25021517, 0.23219319,
```

```
0.16225612, 0.11827918, 0.17382531, 0.20906287, 0.19049752,
0.26445413, 0.16049173, 0.20096616, 0.20348187, 0.21048731,
0.1708757 , 0.21800885, 0.24238041, 0.18434028, 0.19154657,
0.21823989, 0.24826169, 0.28542858, 0.32460719, 0.35787511,
0.33728659, 0.34076276, 0.3062768 , 0.28200495, 0.31050622,
0.26832744, 0.3890377 , 0.33734271, 0.27998567, 0.26505604,
0.22974923, 0.24944597, 0.28310806, 0.33111918, 0.39312613,
0.25903723, 0.32722875, 0.33012986, 0.32182607, 0.36342555,
0.3758316 , 0.4169451 , 0.3856746 , 0.37990397, 0.41411585,
0.33964518, 0.45896062, 0.49126047, 0.45431834, 0.49837413,
0.44462031, 0.37772661, 0.42447665, 0.43684989, 0.53492659,
0.45806324, 0.44453517, 0.49193847, 0.60154939, 0.55722553,
0.59203178, 0.61168772, 0.51334697, 0.53692138, 0.53998435,
0.49647418, 0.40962565, 0.46752766, 0.58593631, 0.50437552,
0.50432271, 0.46123156, 0.39851576, 0.46794426, 0.60018843,
0.56792521, 0.46456861, 0.46569222, 0.43768001, 0.5715456 ,
0.53526175, 0.49599022, 0.60013825, 0.53928834, 0.44243401,
0.50250363, 0.51515812, 0.53918922, 0.53186798, 0.49304509,
0.51061386, 0.47192621, 0.53319955, 0.52670002, 0.54732859,
0.60601509, 0.52693033, 0.58104366, 0.54905391, 0.53921813,
0.49238288, 0.48267895, 0.49620989, 0.49649754, 0.4810302 ,
0.50104344, 0.47425413, 0.49372399, 0.45923826, 0.55601966,
0.5959419 , 0.48601955, 0.51640218, 0.53680569, 0.53221989,
0.39203036, 0.60634416, 0.61281818, 0.45339739, 0.46775064,
0.41392624, 0.46210462, 0.53873348, 0.50276184, 0.47064888,
0.6424104 , 0.57307404, 0.44694567, 0.58341455, 0.47296369,
0.63620079, 0.57938892, 0.53964186, 0.49841666, 0.43909943,
0.57140398, 0.54180336, 0.4849788 , 0.50663269, 0.48209402,
0.42870611, 0.52858514, 0.54757673, 0.47573406, 0.49840343,
0.53156865, 0.4915489 , 0.46875846, 0.4324649 , 0.42930007,
0.38973853, 0.46181089, 0.42657584, 0.57629377, 0.39139861,
0.3859044 , 0.3662672 ])
```

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



In [40]:
```
#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','temp(t-1)','temp(
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[40]:

	predi	y	t-2	t-3	t-4	t-5
473	0.441641	0.510600	10.889469	10.675248	10.860481	11.481859
474	0.472749	0.651732	10.930170	10.889469	10.675248	10.860481
475	0.639208	0.683428	11.559878	10.930170	10.889469	10.675248
476	0.628296	0.654997	12.823073	11.559878	10.930170	10.889469
477	0.568928	0.573173	13.106773	12.823073	11.559878	10.930170
478	0.531105	0.535873	12.852295	13.106773	12.823073	11.559878
479	0.586179	0.514061	12.119938	12.852295	13.106773	12.823073
480	0.516476	0.580609	11.786082	12.119938	12.852295	13.106773
481	0.674724	0.624326	11.590859	11.786082	12.119938	12.852295
482	0.688380	0.539280	12.186487	11.590859	11.786082	12.119938
483	0.527785	0.491355	12.577783	12.186487	11.590859	11.786082
484	0.488751	0.522145	11.816573	12.577783	12.186487	11.590859
485	0.549836	0.504442	11.387627	11.816573	12.577783	12.186487
486	0.521989	0.567725	11.663214	11.387627	11.816573	12.577783
487	0.676113	0.719460	11.504756	11.663214	11.387627	11.816573
488	0.765834	0.804631	12.071173	11.504756	11.663214	11.387627
489	0.709530	0.684716	13.429271	12.071173	11.504756	11.663214
490	0.686578	0.662177	14.191591	13.429271	12.071173	11.504756
491	0.712614	0.615194	13.118295	14.191591	13.429271	12.071173
492	0.550557	0.565466	12.916559	13.118295	14.191591	13.429271
493	0.528702	0.585646	12.496044	12.916559	13.118295	14.191591
494	0.642247	0.536523	12.050954	12.496044	12.916559	13.118295
495	0.574516	0.552256	12.231576	12.050954	12.496044	12.916559
496	0.559041	0.552256	11.791904	12.231576	12.050954	12.496044
497	0.579028	0.557809	11.932721	11.791904	12.231576	12.050954
498	0.521845	0.477794	11.932721	11.932721	11.791904	12.231576
499	0.524789	0.551195	11.982423	11.932721	11.932721	11.791904
500	0.644005	0.582339	11.266252	11.982423	11.932721	11.932721
501	0.460732	0.529772	11.923226	11.266252	11.982423	11.932721
502	0.473562	0.458904	12.201972	11.923226	11.266252	11.982423
..	...	...	...	...	...	...
800	0.446946	0.537515	11.753871	12.729659	11.620778	11.409880
801	0.583415	0.524598	11.344805	11.753871	12.729659	11.620778
802	0.472964	0.543903	11.800777	11.344805	11.753871	12.729659
803	0.636201	0.527438	11.685169	11.800777	11.344805	11.753871
804	0.579389	0.568506	11.857957	11.685169	11.800777	11.344805
805	0.539642	0.479332	11.710582	11.857957	11.685169	11.800777
806	0.498417	0.458726	12.078164	11.710582	11.857957	11.685169
807	0.439099	0.494425	11.280011	12.078164	11.710582	11.857957
808	0.571404	0.497810	11.095584	11.280011	12.078164	11.710582

```
809  0.541803  0.444954  11.415105  11.095584  11.280011  12.078164
810  0.484979  0.511653  11.445403  11.415105  11.095584  11.280011
811  0.506633  0.582450  10.972318  11.445403  11.415105  11.095584
812  0.482094  0.477562  11.569300  10.972318  11.445403  11.415105
813  0.428706  0.498620  12.202967  11.569300  10.972318  11.445403
814  0.528585  0.523920  11.264175  12.202967  11.569300  10.972318
815  0.547577  0.479971  11.452649  11.264175  12.202967  11.569300
816  0.475734  0.539318  11.679099  11.452649  11.264175  12.202967
817  0.498403  0.502845  11.285737  11.679099  11.452649  11.264175
818  0.531569  0.513089  11.816914  11.285737  11.679099  11.452649
819  0.491549  0.445764  11.490470  11.816914  11.285737  11.679099
820  0.468758  0.423680  11.582159  11.490470  11.816914  11.285737
821  0.432465  0.411694  10.979566  11.582159  11.490470  11.816914
822  0.429300  0.400434  10.781898  10.979566  11.582159  11.490470
823  0.389739  0.394209  10.674624  10.781898  10.979566  11.582159
824  0.461811  0.423048  10.573835  10.674624  10.781898  10.979566
825  0.426576  0.501722  10.518126  10.573835  10.674624  10.781898
826  0.576294  0.382286  10.776242  10.518126  10.573835  10.674624
827  0.391399  0.369280  11.480411  10.776242  10.518126  10.573835
828  0.385904  0.358995  10.411403  11.480411  10.776242  10.518126
829  0.366267  0.376135  10.294997  10.411403  11.480411  10.776242

           t-6        t-7        t-8  temp(t-1)  ...  temp(t-7)  temp(t-8)  \
473  12.735907  12.308851  12.048499       9.04  ...       3.13       3.28
474  11.481859  12.735907  12.308851       7.53  ...       5.04       3.13
475  10.860481  11.481859  12.735907       0.33  ...       6.17       5.04
476  10.675248  10.860481  11.481859      -4.11  ...      16.06       6.17
477  10.889469  10.675248  10.860481      -0.56  ...      13.14      16.06
478  10.930170  10.889469  10.675248       3.01  ...       7.99      13.14
479  11.559878  10.930170  10.889469       5.17  ...       9.04       7.99
480  12.823073  11.559878  10.930170       4.56  ...       7.53       9.04
481  13.106773  12.823073  11.559878       3.91  ...       0.33       7.53
482  12.852295  13.106773  12.823073       5.13  ...      -4.11       0.33
483  12.119938  12.852295  13.106773       7.06  ...      -0.56      -4.11
484  11.786082  12.119938  12.852295       5.81  ...       3.01      -0.56
485  11.590859  11.786082  12.119938       3.49  ...       5.17       3.01
486  12.186487  11.590859  11.786082       2.57  ...       4.56       5.17
487  12.577783  12.186487  11.590859       0.07  ...       3.91       4.56
488  11.816573  12.577783  12.186487      -2.27  ...       5.13       3.91
489  11.387627  11.816573  12.577783      -2.86  ...       7.06       5.13
490  11.663214  11.387627  11.816573      -2.89  ...       5.81       7.06
491  11.504756  11.663214  11.387627      -2.29  ...       3.49       5.81
492  12.071173  11.504756  11.663214      -0.19  ...       2.57       3.49
493  13.429271  12.071173  11.504756       0.31  ...       0.07       2.57
494  14.191591  13.429271  12.071173       1.71  ...      -2.27       0.07
495  13.118295  14.191591  13.429271       1.53  ...      -2.86      -2.27
496  12.916559  13.118295  14.191591       1.29  ...      -2.89      -2.86
497  12.496044  12.916559  13.118295       1.64  ...      -2.29      -2.89
```

498	12.050954	12.496044	12.916559	3.74	...	-0.19	-2.29
499	12.231576	12.050954	12.496044	-0.57	...	0.31	-0.19
500	11.791904	12.231576	12.050954	-1.57	...	1.71	0.31
501	11.932721	11.791904	12.231576	3.68	...	1.53	1.71
502	11.932721	11.932721	11.791904	8.53	...	1.29	1.53
..	...	...	...	...	...	...	...
800	11.300414	11.109560	11.370601	6.34	...	10.02	6.26
801	11.409880	11.300414	11.109560	2.53	...	4.93	10.02
802	11.620778	11.409880	11.300414	5.86	...	5.72	4.93
803	12.729659	11.620778	11.409880	5.27	...	11.77	5.72
804	11.753871	12.729659	11.620778	6.86	...	5.99	11.77
805	11.344805	11.753871	12.729659	6.48	...	4.34	5.99
806	11.800777	11.344805	11.753871	4.59	...	6.34	4.34
807	11.685169	11.800777	11.344805	5.63	...	2.53	6.34
808	11.857957	11.685169	11.800777	5.86	...	5.86	2.53
809	11.710582	11.857957	11.685169	7.34	...	5.27	5.86
810	12.078164	11.710582	11.857957	8.44	...	6.86	5.27
811	11.280011	12.078164	11.710582	5.67	...	6.48	6.86
812	11.095584	11.280011	12.078164	3.91	...	4.59	6.48
813	11.415105	11.095584	11.280011	7.07	...	5.63	4.59
814	11.445403	11.415105	11.095584	4.06	...	5.86	5.63
815	10.972318	11.445403	11.415105	4.73	...	7.34	5.86
816	11.569300	10.972318	11.445403	3.42	...	8.44	7.34
817	12.202967	11.569300	10.972318	12.02	...	5.67	8.44
818	11.264175	12.202967	11.569300	5.79	...	3.91	5.67
819	11.452649	11.264175	12.202967	7.88	...	7.07	3.91
820	11.679099	11.452649	11.264175	10.67	...	4.06	7.07
821	11.285737	11.679099	11.452649	10.13	...	4.73	4.06
822	11.816914	11.285737	11.679099	10.13	...	3.42	4.73
823	11.490470	11.816914	11.285737	12.50	...	12.02	3.42
824	11.582159	11.490470	11.816914	10.15	...	5.79	12.02
825	10.979566	11.582159	11.490470	11.63	...	7.88	5.79
826	10.781898	10.979566	11.582159	11.94	...	10.67	7.88
827	10.674624	10.781898	10.979566	14.23	...	10.13	10.67
828	10.573835	10.674624	10.781898	11.43	...	10.13	10.13
829	10.518126	10.573835	10.674624	11.29	...	12.50	10.13

	humidity(t-1)	humidity(t-2)	humidity(t-3)	humidity(t-4)	\
473	0.96	0.93	0.72	0.74	
474	0.90	0.96	0.93	0.72	
475	0.82	0.90	0.96	0.93	
476	0.73	0.82	0.90	0.96	
477	0.63	0.73	0.82	0.90	
478	0.73	0.63	0.73	0.82	
479	0.67	0.73	0.63	0.73	
480	0.81	0.67	0.73	0.63	
481	0.85	0.81	0.67	0.73	
482	0.88	0.85	0.81	0.67	

483	0.91	0.88	0.85	0.81
484	0.83	0.91	0.88	0.85
485	0.86	0.83	0.91	0.88
486	0.75	0.86	0.83	0.91
487	0.79	0.75	0.86	0.83
488	0.92	0.79	0.75	0.86
489	0.78	0.92	0.79	0.75
490	0.65	0.78	0.92	0.79
491	0.65	0.65	0.78	0.92
492	0.64	0.65	0.65	0.78
493	0.66	0.64	0.65	0.65
494	0.63	0.66	0.64	0.65
495	0.69	0.63	0.66	0.64
496	0.64	0.69	0.63	0.66
497	0.68	0.64	0.69	0.63
498	0.57	0.68	0.64	0.69
499	0.64	0.57	0.68	0.64
500	0.74	0.64	0.57	0.68
501	0.61	0.74	0.64	0.57
502	0.63	0.61	0.74	0.64
..	...	...	...	...
800	0.83	0.79	0.79	0.83
801	0.90	0.83	0.79	0.79
802	0.91	0.90	0.83	0.79
803	0.91	0.91	0.90	0.83
804	0.76	0.91	0.91	0.90
805	0.72	0.76	0.91	0.91
806	0.79	0.72	0.76	0.91
807	0.75	0.79	0.72	0.76
808	0.77	0.75	0.79	0.72
809	0.82	0.77	0.75	0.79
810	0.79	0.82	0.77	0.75
811	0.77	0.79	0.82	0.77
812	0.66	0.77	0.79	0.82
813	0.84	0.66	0.77	0.79
814	0.76	0.84	0.66	0.77
815	0.75	0.76	0.84	0.66
816	0.68	0.75	0.76	0.84
817	0.81	0.68	0.75	0.76
818	0.69	0.81	0.68	0.75
819	0.76	0.69	0.81	0.68
820	0.83	0.76	0.69	0.81
821	0.87	0.83	0.76	0.69
822	0.87	0.87	0.83	0.76
823	0.84	0.87	0.87	0.83
824	0.72	0.84	0.87	0.87
825	0.71	0.72	0.84	0.87
826	0.76	0.71	0.72	0.84

827	0.74	0.76	0.71	0.72
828	0.78	0.74	0.76	0.71
829	0.73	0.78	0.74	0.76

	humidity(t-5)	humidity(t-6)	humidity(t-7)	humidity(t-8)
473	0.78	0.80	0.72	0.78
474	0.74	0.78	0.80	0.72
475	0.72	0.74	0.78	0.80
476	0.93	0.72	0.74	0.78
477	0.96	0.93	0.72	0.74
478	0.90	0.96	0.93	0.72
479	0.82	0.90	0.96	0.93
480	0.73	0.82	0.90	0.96
481	0.63	0.73	0.82	0.90
482	0.73	0.63	0.73	0.82
483	0.67	0.73	0.63	0.73
484	0.81	0.67	0.73	0.63
485	0.85	0.81	0.67	0.73
486	0.88	0.85	0.81	0.67
487	0.91	0.88	0.85	0.81
488	0.83	0.91	0.88	0.85
489	0.86	0.83	0.91	0.88
490	0.75	0.86	0.83	0.91
491	0.79	0.75	0.86	0.83
492	0.92	0.79	0.75	0.86
493	0.78	0.92	0.79	0.75
494	0.65	0.78	0.92	0.79
495	0.65	0.65	0.78	0.92
496	0.64	0.65	0.65	0.78
497	0.66	0.64	0.65	0.65
498	0.63	0.66	0.64	0.65
499	0.69	0.63	0.66	0.64
500	0.64	0.69	0.63	0.66
501	0.68	0.64	0.69	0.63
502	0.57	0.68	0.64	0.69
..	...	...	...	...
800	0.83	0.82	0.87	0.89
801	0.83	0.83	0.82	0.87
802	0.79	0.83	0.83	0.82
803	0.79	0.79	0.83	0.83
804	0.83	0.79	0.79	0.83
805	0.90	0.83	0.79	0.79
806	0.91	0.90	0.83	0.79
807	0.91	0.91	0.90	0.83
808	0.76	0.91	0.91	0.90
809	0.72	0.76	0.91	0.91
810	0.79	0.72	0.76	0.91
811	0.75	0.79	0.72	0.76

```
812          0.77          0.75          0.79          0.72
813          0.82          0.77          0.75          0.79
814          0.79          0.82          0.77          0.75
815          0.77          0.79          0.82          0.77
816          0.66          0.77          0.79          0.82
817          0.84          0.66          0.77          0.79
818          0.76          0.84          0.66          0.77
819          0.75          0.76          0.84          0.66
820          0.68          0.75          0.76          0.84
821          0.81          0.68          0.75          0.76
822          0.69          0.81          0.68          0.75
823          0.76          0.69          0.81          0.68
824          0.83          0.76          0.69          0.81
825          0.87          0.83          0.76          0.69
826          0.87          0.87          0.83          0.76
827          0.84          0.87          0.87          0.83
828          0.72          0.84          0.87          0.87
829          0.71          0.72          0.84          0.87

[357 rows x 25 columns]
```

In [41]:
```
# 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
```

```
[[ 10.94266465  11.55987806 104.45565387 ...   0.87         0.826
    0.859     ]
 [ 11.22109079  12.82307273 104.81994666 ...   0.859        0.87
    0.826     ]
 [ 12.71097545  13.10677297 110.45612886 ...   0.837        0.859
    0.87      ]
 ...
 [ 10.49296859  10.2949966  109.74485905 ...   0.9085       0.9085
    0.8865    ]
 [ 10.44379284  10.20294532 100.17673598 ...   0.892        0.9085
    0.9085    ]
 [ 10.26803066  10.3563499   99.13484299 ...   0.826        0.892
    0.9085    ]]
10.942664654181172
11.559878061079399
```

In [42]:
```
#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[42]:
```
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```

```
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 10.202945322371301,
 10.3563498993587]
```
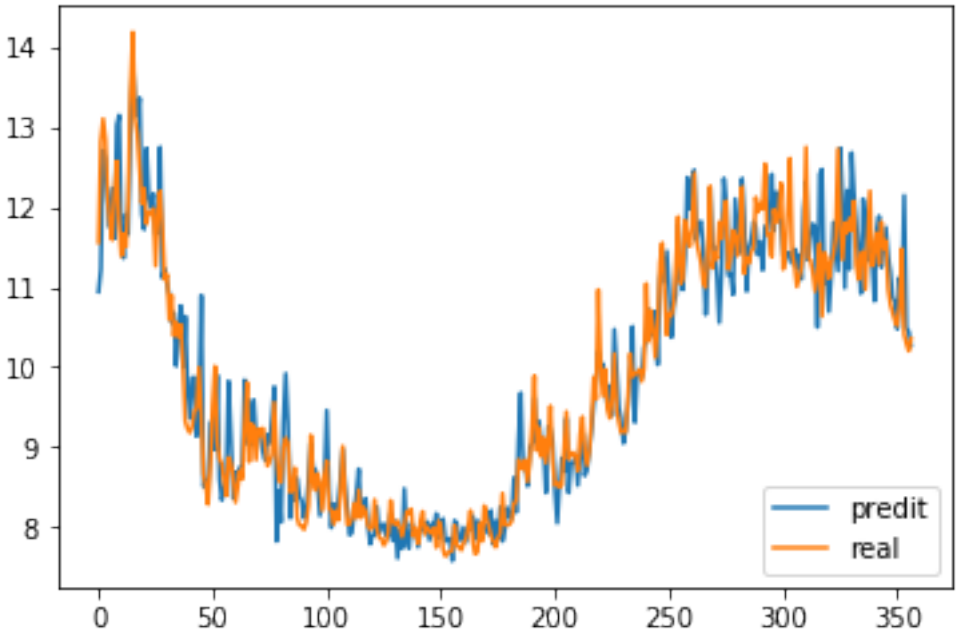

In [43]:
```
##Mostrem
plt.plot(listpredi, label="predit")
plt.plot(listy, label="real")
plt.legend(loc="lower right")
plt.show()
```



In [ ]: