M38
_Xarxa_walkforard_normalitzat_multivariate2tempmin_weekday_pres
walkforward
augment_PCA

December 21, 2019

1 Xarxa neuronal

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

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

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

```
Using TensorFlow backend.
```

1.1 Consum diari total multivariate one-step

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

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

```
4  2012-04-17                  10.01                    2.76              19

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

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

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

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

   apparentTemperatureMin  humidity  weekday  pressure  sunsetTimeHour
0                    2.18      0.93        3   1027.12              16
1                    7.01      0.89        4   1027.22              16
2                    4.84      0.79        5   1024.47              16
3                    4.69      0.81        6   1025.80              16
4                    2.94      0.72        7   1021.11              16
```

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

In [5]:
```
#Escalem dades
from sklearn.preprocessing import StandardScaler
scaler = StandardScaler()
daily_PCA_scaled=scaler.fit(daily_PCA).transform(daily_PCA)
```

```
c:\users\laura\appdata\local\programs\python\python37\lib\site-packages\sklearn\preprocessing\d
  return self.partial_fit(X, y)
c:\users\laura\appdata\local\programs\python\python37\lib\site-packages\ipykernel_launcher.py:4
  after removing the cwd from sys.path.
```

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

```
In [7]: daily_PCA_d

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```

In [8]:
```
daily_dia['presSunCloud']=daily_PCA_d
daily_dia.head(5)
```

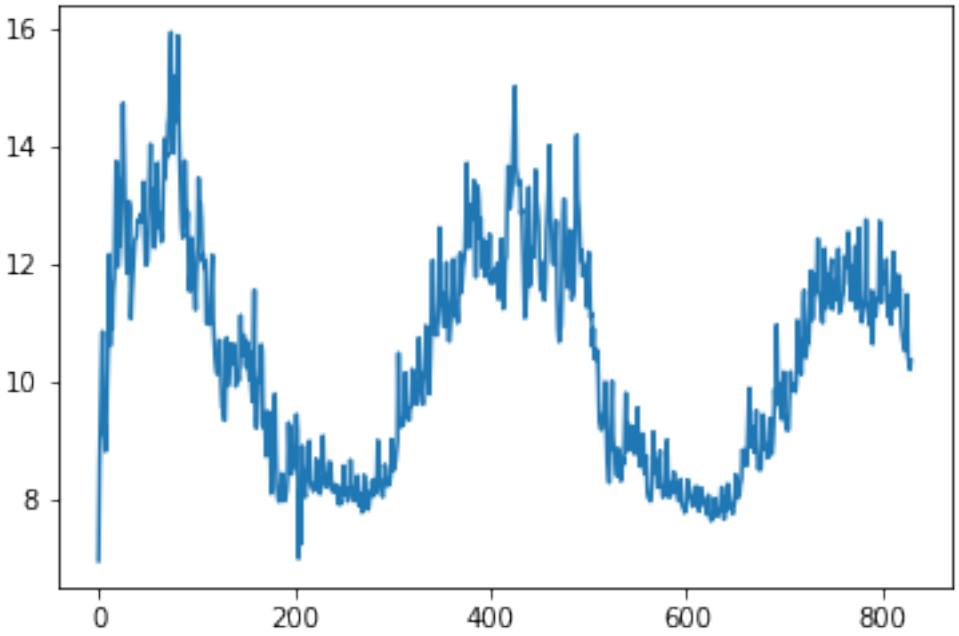
Out[8]:

	index	date	energy_sum	apparentTemperatureMax	apparentTemperatureMin	humidity	weekday	pressure	sunsetTimeHour	presSunCloud
0	735	2011-11-23	6.952692	10.36	2.18	0.93	3	1027.12	16	-0.199108
1	736	2011-11-24	8.536480	12.93	7.01	0.89	4	1027.22	16	-0.205477
2	682	2011-11-25	9.499781	13.03	4.84	0.79	5	1024.47	16	-0.030328
3	713	2011-11-26	10.267707	12.96	4.69	0.81	6	1025.80	16	-0.115037
4	609	2011-11-27	10.850805	13.54	2.94	0.72	7	1021.11	16	0.183672

In [ ]:

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

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



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

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

```
daily_dia['temp(t-12)']=daily_dia['apparentTemperatureMax'].shift(12)
daily_dia['temp(t-13)']=daily_dia['apparentTemperatureMax'].shift(13)
daily_dia['temp(t-14)']=daily_dia['apparentTemperatureMax'].shift(14)

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

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


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

```
daily_dia['weekday(t-14)']=daily_dia['weekday'].shift(14)
```

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

```
daily_dia
```

Out[9]:

	index	date	energy_sum	apparentTemperatureMax	\
0	735	2011-11-23	6.952692	10.36	
1	736	2011-11-24	8.536480	12.93	
2	682	2011-11-25	9.499781	13.03	
3	713	2011-11-26	10.267707	12.96	
4	609	2011-11-27	10.850805	13.54	
5	641	2011-11-28	9.103382	12.58	
6	265	2011-11-29	9.274873	13.47	
7	571	2011-11-30	8.813513	11.87	
8	199	2011-12-01	9.227707	12.15	
9	338	2011-12-02	10.145910	5.33	
10	131	2011-12-03	10.780273	11.42	
11	100	2011-12-04	12.163127	6.66	
12	176	2011-12-05	10.609714	3.13	
13	203	2011-12-06	11.673417	3.77	
14	240	2011-12-07	10.889362	5.14	
15	299	2011-12-08	11.525150	12.89	
16	294	2011-12-09	11.759837	3.99	
17	455	2011-12-10	12.633801	3.14	
18	215	2011-12-11	13.749174	5.72	
19	115	2011-12-12	11.951958	5.94	
20	22	2011-12-13	11.957446	12.08	
21	45	2011-12-14	12.392776	2.88	
22	59	2011-12-15	12.307079	4.38	
23	11	2011-12-16	13.376080	0.99	
24	228	2011-12-17	13.511968	1.72	
25	478	2011-12-18	14.732271	1.98	

26	412	2011-12-19	13.774471	4.02
27	433	2011-12-20	12.709106	4.98
28	524	2011-12-21	12.148570	12.14
29	689	2011-12-22	11.839403	12.14
..	...	...	...	...
800	41	2014-01-29	11.800777	2.53
801	105	2014-01-30	11.685169	5.86
802	80	2014-01-31	11.857957	5.27
803	21	2014-02-01	11.710582	6.86
804	163	2014-02-02	12.078164	6.48
805	135	2014-02-03	11.280011	4.59
806	60	2014-02-04	11.095584	5.63
807	3	2014-02-05	11.415105	5.86
808	18	2014-02-06	11.445403	7.34
809	14	2014-02-07	10.972318	8.44
810	0	2014-02-08	11.569300	5.67
811	7	2014-02-09	12.202967	3.91
812	35	2014-02-10	11.264175	7.07
813	57	2014-02-11	11.452649	4.06
814	44	2014-02-12	11.679099	4.73
815	33	2014-02-13	11.285737	3.42
816	23	2014-02-14	11.816914	12.02
817	13	2014-02-15	11.490470	5.79
818	187	2014-02-16	11.582159	7.88
819	218	2014-02-17	10.979566	10.67
820	235	2014-02-18	10.781898	10.13
821	322	2014-02-19	10.674624	10.13
822	101	2014-02-20	10.573835	12.50
823	129	2014-02-21	10.518126	10.15
824	248	2014-02-22	10.776242	11.63
825	285	2014-02-23	11.480411	11.94
826	158	2014-02-24	10.411403	14.23
827	95	2014-02-25	10.294997	11.43
828	360	2014-02-26	10.202945	11.29
829	197	2014-02-27	10.356350	10.31

	apparentTemperatureMin	humidity	weekday	pressure	sunsetTimeHour	\
0	2.18	0.93	3	1027.12	16	
1	7.01	0.89	4	1027.22	16	
2	4.84	0.79	5	1024.47	16	
3	4.69	0.81	6	1025.80	16	
4	2.94	0.72	7	1021.11	16	
5	1.31	0.86	1	1022.80	15	
6	3.39	0.82	2	1009.70	15	
7	3.34	0.78	3	1019.43	15	
8	5.29	0.82	4	1007.12	15	
9	0.46	0.87	5	1012.12	15	
10	4.71	0.79	6	1003.55	15	

11	1.03	0.82	7	1001.15	15
12	-1.69	0.77	1	1006.01	15
13	-1.61	0.83	2	1007.32	15
14	0.94	0.68	3	1008.76	15
15	0.63	0.81	4	1010.84	15
16	-1.42	0.71	5	1010.60	15
17	-3.42	0.81	6	1015.58	15
18	0.11	0.88	7	1007.71	15
19	-0.64	0.84	1	1002.47	15
20	0.22	0.75	2	990.27	15
21	0.78	0.79	3	994.48	15
22	1.07	0.77	4	996.75	15
23	-2.65	0.88	5	988.10	15
24	-3.56	0.86	6	1008.46	15
25	-4.12	0.84	7	1016.37	15
26	-3.67	0.94	1	1014.39	15
27	1.68	0.81	2	1015.09	15
28	3.84	0.94	3	1017.91	15
29	5.37	0.87	4	1024.71	15
..	...	...	...	...	...
800	0.18	0.90	3	993.99	16
801	0.61	0.91	4	1001.76	16
802	0.29	0.91	5	998.51	16
803	1.10	0.76	6	990.08	16
804	3.21	0.72	7	1005.39	16
805	1.96	0.79	1	1003.89	16
806	1.12	0.75	2	996.87	16
807	1.03	0.77	3	982.20	16
808	1.96	0.82	4	989.90	16
809	-0.86	0.79	5	988.77	17
810	2.19	0.77	6	979.25	17
811	1.38	0.66	7	984.71	17
812	0.89	0.84	1	992.84	17
813	-0.57	0.76	2	996.66	17
814	-1.20	0.75	3	994.27	17
815	0.05	0.68	4	992.43	17
816	0.45	0.81	5	990.31	17
817	1.77	0.69	6	988.63	17
818	-1.03	0.76	7	1006.70	17
819	2.84	0.83	1	1007.80	17
820	3.83	0.87	2	1008.67	17
821	2.65	0.87	3	1011.57	17
822	3.95	0.84	4	1001.54	17
823	0.19	0.72	5	1003.42	17
824	1.59	0.71	6	1009.09	17
825	5.53	0.76	7	1010.37	17
826	5.52	0.74	1	1005.19	17
827	3.89	0.78	2	1000.65	17

```
828                  1.67      0.73        3   1012.73              17
829                  1.41      0.74        4   1007.02              17

     presSunCloud  ...  presSunCloud(t-5)  presSunCloud(t-6)  \
0       -0.199108  ...                NaN                NaN
1       -0.205477  ...                NaN                NaN
2       -0.030328  ...                NaN                NaN
3       -0.115037  ...                NaN                NaN
4        0.183672  ...                NaN                NaN
5        0.508754  ...          -0.199108                NaN
6        1.343100  ...          -0.205477          -0.199108
7        0.723391  ...          -0.030328          -0.205477
8        1.507422  ...          -0.115037          -0.030328
9        1.188969  ...           0.183672          -0.115037
10       1.734797  ...           0.508754           0.183672
11       1.887654  ...           1.343100           0.508754
12       1.578118  ...           0.723391           1.343100
13       1.494684  ...           1.507422           0.723391
14       1.402969  ...           1.188969           1.507422
15       1.270493  ...           1.734797           1.188969
16       1.285778  ...           1.887654           1.734797
17       0.968599  ...           1.578118           1.887654
18       1.469844  ...           1.494684           1.578118
19       1.803583  ...           1.402969           1.494684
20       2.580608  ...           1.270493           1.402969
21       2.312470  ...           1.285778           1.270493
22       2.167893  ...           0.968599           1.285778
23       2.718816  ...           1.469844           0.968599
24       1.422076  ...           1.803583           1.469844
25       0.918284  ...           2.580608           1.803583
26       1.044391  ...           2.312470           2.580608
27       0.999808  ...           2.167893           2.312470
28       0.820200  ...           2.718816           2.167893
29       0.387105  ...           1.422076           2.718816
..            ...  ...                ...                ...
800      1.910960  ...           0.642244           0.739054
801      1.416084  ...           0.734595           0.642244
802      1.623079  ...           1.394430           0.734595
803      2.159990  ...           2.173365           1.394430
804      1.184888  ...           2.462520           2.173365
805      1.280423  ...           1.910960           2.462520
806      1.727531  ...           1.416084           1.910960
807      2.661872  ...           1.623079           1.416084
808      2.171455  ...           2.159990           1.623079
809      1.810706  ...           1.184888           2.159990
810      2.417040  ...           1.280423           1.184888
811      2.069290  ...           1.727531           1.280423
812      1.551486  ...           2.661872           1.727531
```

```
813      1.308188  ...           2.171455           2.661872
814      1.460408  ...           1.810706           2.171455
815      1.577599  ...           2.417040           1.810706
816      1.712623  ...           2.069290           2.417040
817      1.819623  ...           1.551486           2.069290
818      0.668734  ...           1.308188           1.551486
819      0.598675  ...           1.460408           1.308188
820      0.543264  ...           1.577599           1.460408
821      0.358561  ...           1.712623           1.577599
822      0.997378  ...           1.819623           1.712623
823      0.877639  ...           0.668734           1.819623
824      0.516514  ...           0.598675           0.668734
825      0.434990  ...           0.543264           0.598675
826      0.764907  ...           0.358561           0.543264
827      1.054062  ...           0.997378           0.358561
828      0.284680  ...           0.877639           0.997378
829      0.648353  ...           0.516514           0.877639

     presSunCloud(t-7)  presSunCloud(t-8)  presSunCloud(t-9)  \
0                  NaN                NaN                NaN
1                  NaN                NaN                NaN
2                  NaN                NaN                NaN
3                  NaN                NaN                NaN
4                  NaN                NaN                NaN
5                  NaN                NaN                NaN
6                  NaN                NaN                NaN
7            -0.199108                NaN                NaN
8            -0.205477          -0.199108                NaN
9            -0.030328          -0.205477          -0.199108
10           -0.115037          -0.030328          -0.205477
11            0.183672          -0.115037          -0.030328
12            0.508754           0.183672          -0.115037
13            1.343100           0.508754           0.183672
14            0.723391           1.343100           0.508754
15            1.507422           0.723391           1.343100
16            1.188969           1.507422           0.723391
17            1.734797           1.188969           1.507422
18            1.887654           1.734797           1.188969
19            1.578118           1.887654           1.734797
20            1.494684           1.578118           1.887654
21            1.402969           1.494684           1.578118
22            1.270493           1.402969           1.494684
23            1.285778           1.270493           1.402969
24            0.968599           1.285778           1.270493
25            1.469844           0.968599           1.285778
26            1.803583           1.469844           0.968599
27            2.580608           1.803583           1.469844
28            2.312470           2.580608           1.803583
```

29	2.167893	2.312470	2.580608
..	...	...	...
800	1.100816	0.882994	1.037126
801	0.739054	1.100816	0.882994
802	0.642244	0.739054	1.100816
803	0.734595	0.642244	0.739054
804	1.394430	0.734595	0.642244
805	2.173365	1.394430	0.734595
806	2.462520	2.173365	1.394430
807	1.910960	2.462520	2.173365
808	1.416084	1.910960	2.462520
809	1.623079	1.416084	1.910960
810	2.159990	1.623079	1.416084
811	1.184888	2.159990	1.623079
812	1.280423	1.184888	2.159990
813	1.727531	1.280423	1.184888
814	2.661872	1.727531	1.280423
815	2.171455	2.661872	1.727531
816	1.810706	2.171455	2.661872
817	2.417040	1.810706	2.171455
818	2.069290	2.417040	1.810706
819	1.551486	2.069290	2.417040
820	1.308188	1.551486	2.069290
821	1.460408	1.308188	1.551486
822	1.577599	1.460408	1.308188
823	1.712623	1.577599	1.460408
824	1.819623	1.712623	1.577599
825	0.668734	1.819623	1.712623
826	0.598675	0.668734	1.819623
827	0.543264	0.598675	0.668734
828	0.358561	0.543264	0.598675
829	0.997378	0.358561	0.543264

	presSunCloud(t-10)	presSunCloud(t-11)	presSunCloud(t-12)	\
0	NaN	NaN	NaN	
1	NaN	NaN	NaN	
2	NaN	NaN	NaN	
3	NaN	NaN	NaN	
4	NaN	NaN	NaN	
5	NaN	NaN	NaN	
6	NaN	NaN	NaN	
7	NaN	NaN	NaN	
8	NaN	NaN	NaN	
9	NaN	NaN	NaN	
10	-0.199108	NaN	NaN	
11	-0.205477	-0.199108	NaN	
12	-0.030328	-0.205477	-0.199108	
13	-0.115037	-0.030328	-0.205477	

14	0.183672	-0.115037	-0.030328
15	0.508754	0.183672	-0.115037
16	1.343100	0.508754	0.183672
17	0.723391	1.343100	0.508754
18	1.507422	0.723391	1.343100
19	1.188969	1.507422	0.723391
20	1.734797	1.188969	1.507422
21	1.887654	1.734797	1.188969
22	1.578118	1.887654	1.734797
23	1.494684	1.578118	1.887654
24	1.402969	1.494684	1.578118
25	1.270493	1.402969	1.494684
26	1.285778	1.270493	1.402969
27	0.968599	1.285778	1.270493
28	1.469844	0.968599	1.285778
29	1.803583	1.469844	0.968599
..	...	...	...
800	1.813514	2.062544	2.114133
801	1.037126	1.813514	2.062544
802	0.882994	1.037126	1.813514
803	1.100816	0.882994	1.037126
804	0.739054	1.100816	0.882994
805	0.642244	0.739054	1.100816
806	0.734595	0.642244	0.739054
807	1.394430	0.734595	0.642244
808	2.173365	1.394430	0.734595
809	2.462520	2.173365	1.394430
810	1.910960	2.462520	2.173365
811	1.416084	1.910960	2.462520
812	1.623079	1.416084	1.910960
813	2.159990	1.623079	1.416084
814	1.184888	2.159990	1.623079
815	1.280423	1.184888	2.159990
816	1.727531	1.280423	1.184888
817	2.661872	1.727531	1.280423
818	2.171455	2.661872	1.727531
819	1.810706	2.171455	2.661872
820	2.417040	1.810706	2.171455
821	2.069290	2.417040	1.810706
822	1.551486	2.069290	2.417040
823	1.308188	1.551486	2.069290
824	1.460408	1.308188	1.551486
825	1.577599	1.460408	1.308188
826	1.712623	1.577599	1.460408
827	1.819623	1.712623	1.577599
828	0.668734	1.819623	1.712623
829	0.598675	0.668734	1.819623

	presSunCloud(t-13)	presSunCloud(t-14)
0	NaN	NaN
1	NaN	NaN
2	NaN	NaN
3	NaN	NaN
4	NaN	NaN
5	NaN	NaN
6	NaN	NaN
7	NaN	NaN
8	NaN	NaN
9	NaN	NaN
10	NaN	NaN
11	NaN	NaN
12	NaN	NaN
13	-0.199108	NaN
14	-0.205477	-0.199108
15	-0.030328	-0.205477
16	-0.115037	-0.030328
17	0.183672	-0.115037
18	0.508754	0.183672
19	1.343100	0.508754
20	0.723391	1.343100
21	1.507422	0.723391
22	1.188969	1.507422
23	1.734797	1.188969
24	1.887654	1.734797
25	1.578118	1.887654
26	1.494684	1.578118
27	1.402969	1.494684
28	1.270493	1.402969
29	1.285778	1.270493
..	...	...
800	2.133240	1.619257
801	2.114133	2.133240
802	2.062544	2.114133
803	1.813514	2.062544
804	1.037126	1.813514
805	0.882994	1.037126
806	1.100816	0.882994
807	0.739054	1.100816
808	0.642244	0.739054
809	0.734595	0.642244
810	1.394430	0.734595
811	2.173365	1.394430
812	2.462520	2.173365
813	1.910960	2.462520
814	1.416084	1.910960
815	1.623079	1.416084

```
816            2.159990            1.623079
817            1.184888            2.159990
818            1.280423            1.184888
819            1.727531            1.280423
820            2.661872            1.727531
821            2.171455            2.661872
822            1.810706            2.171455
823            2.417040            1.810706
824            2.069290            2.417040
825            1.551486            2.069290
826            1.308188            1.551486
827            1.460408            1.308188
828            1.577599            1.460408
829            1.712623            1.577599

[830 rows x 94 columns]
```

In [10]:
```
#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','apparentTemperatur
daily_dia.head(5)
```

Out[10]:

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

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

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

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

```
4                 NaN                 NaN                 NaN

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

[5 rows x 85 columns]
```

In [11]:
```
#Eliminem les 14 primeres files ja que contenen NaN (valors buits)

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

Out[11]:

	energy_sum	t-1	t-2	t-3	t-4	t-5	\
14	10.889362	11.673417	10.609714	12.163127	10.780273	10.145910	
15	11.525150	10.889362	11.673417	10.609714	12.163127	10.780273	
16	11.759837	11.525150	10.889362	11.673417	10.609714	12.163127	
17	12.633801	11.759837	11.525150	10.889362	11.673417	10.609714	
18	13.749174	12.633801	11.759837	11.525150	10.889362	11.673417	

	t-6	t-7	t-8	t-9	...	presSunCloud(t-5)	\
14	9.227707	8.813513	9.274873	9.103382	...	1.188969	
15	10.145910	9.227707	8.813513	9.274873	...	1.734797	
16	10.780273	10.145910	9.227707	8.813513	...	1.887654	
17	12.163127	10.780273	10.145910	9.227707	...	1.578118	
18	10.609714	12.163127	10.780273	10.145910	...	1.494684	

	presSunCloud(t-6)	presSunCloud(t-7)	presSunCloud(t-8)	\
14	1.507422	0.723391	1.343100	
15	1.188969	1.507422	0.723391	
16	1.734797	1.188969	1.507422	
17	1.887654	1.734797	1.188969	
18	1.578118	1.887654	1.734797	

	presSunCloud(t-9)	presSunCloud(t-10)	presSunCloud(t-11)	\
14	0.508754	0.183672	-0.115037	
15	1.343100	0.508754	0.183672	
16	0.723391	1.343100	0.508754	
17	1.507422	0.723391	1.343100	
18	1.188969	1.507422	0.723391	

	presSunCloud(t-12)	presSunCloud(t-13)	presSunCloud(t-14)
14	-0.030328	-0.205477	-0.199108
15	-0.115037	-0.030328	-0.205477
16	0.183672	-0.115037	-0.030328

```
17            0.508754            0.183672           -0.115037
18            1.343100            0.508754            0.183672

[5 rows x 85 columns]
```

```
In [13]: len(daily_dia)
```

```
Out[13]: 816
```

```
In [12]: #normalitzem
         scaler=preprocessing.MinMaxScaler(feature_range=(0, 1))
         daily_dia_norm=scaler.fit_transform(daily_dia)
```

```
In [13]: #Seleccionem dades per test i train
         y_daily=daily_dia_norm[:,0]
         X_daily=daily_dia_norm[:,1:85]

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



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

         #Enlloc de 14 features en son 7 de una feature i 7 duna altre
         X_daily=np.reshape(X_daily, (X_daily.shape[0], 14,6))
```

```
In [14]: # definim model
         import tensorflow as tf
         model =Sequential()
         model.add(LSTM(50, activation='relu', input_shape=(14, 6)))
         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 [15]: import math
         from sklearn.metrics import mean_squared_error

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

         llista_evaluate=list()
         llista_prediccions=list()
```

```
        llista_preditrain=list()
        llista_scores=list()
        llista_scoretrain=list()
        sumScores=0

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

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

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

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

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

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


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

            sumScores=sumScores+testScore
```

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

```
In [16]: #Dividim la suma de scores de test entre el nombre de prediccions per obtenir la mitj
         sumScores/(lenght-n_train)
```

```
Out[16]: 0.0313031881721463
```

```
In [17]: llista_scores
```

```
Out[17]: [0.0030594773514218687,
          0.03982902787532594,
          0.0072583856515899825,
          0.02866189871396707,
```

0.04771194918006305,
0.031446034001464396,
0.003948293028260386,
0.013170267117984302,
0.02055693083296095,
0.012518301016493982,
0.0017666196548944413,
0.018668295053973383,
0.02100217801776827,
0.004693214595380413,
0.01648277187512348,
0.11082407732889021,
0.09608648010546839,
0.008001901591369265,
0.00600955455650265,
0.04992330618800245,
0.032732153338389525,
0.07347257717884514,
0.10433257122191697,
0.09970869149796746,
0.020755902056665443,
0.04233854784257529,
0.013958714124139515,
0.07453411105419727,
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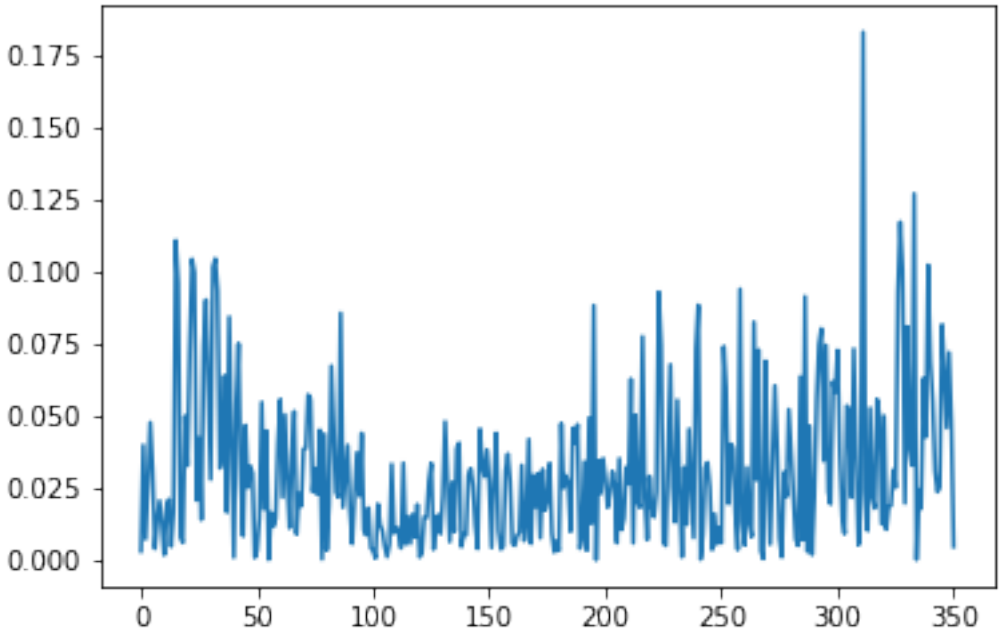
```

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

Out[18]:
```
[<matplotlib.lines.Line2D at 0x25c5f341a90>]
```



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

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

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

predis
```

```
Out[19]: array([0.511002  , 0.54077953, 0.61706805, 0.56794143, 0.53906709,
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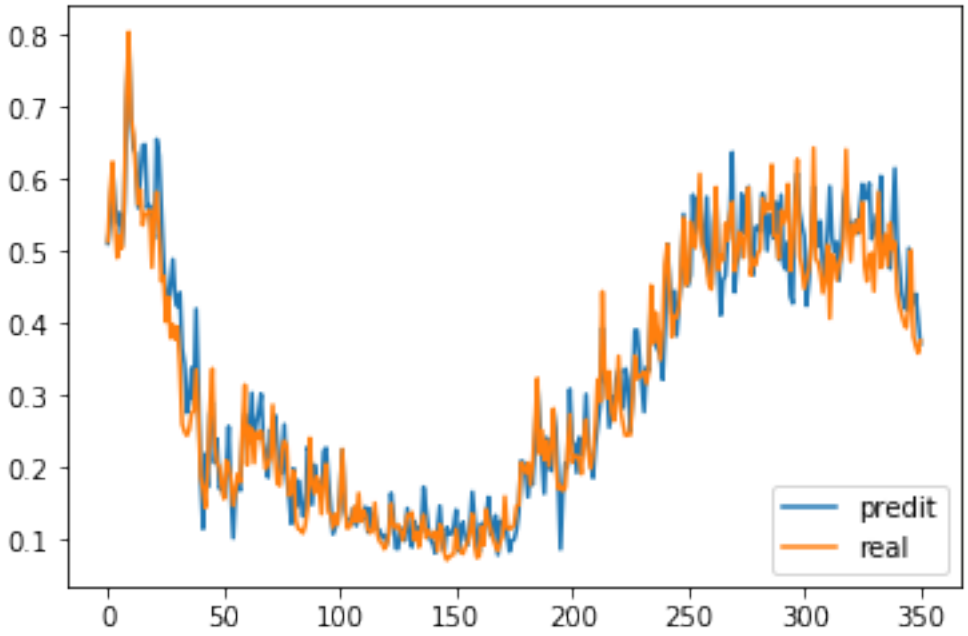
0.37148803])
```

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



In [21]:
```
#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[21]:

	predi	y	t-2	t-3	t-4	t-5	\
479	0.511002	0.514061	12.119938	12.852295	13.106773	12.823073	
480	0.540780	0.580609	11.786082	12.119938	12.852295	13.106773	
481	0.617068	0.624326	11.590859	11.786082	12.119938	12.852295	
482	0.567941	0.539280	12.186487	11.590859	11.786082	12.119938	
483	0.539067	0.491355	12.577783	12.186487	11.590859	11.786082	
484	0.553591	0.522145	11.816573	12.577783	12.186487	11.590859	
485	0.508390	0.504442	11.387627	11.816573	12.577783	12.186487	
486	0.554555	0.567725	11.663214	11.387627	11.816573	12.577783	
487	0.698903	0.719460	11.504756	11.663214	11.387627	11.816573	
488	0.792112	0.804631	12.071173	11.504756	11.663214	11.387627	
489	0.682949	0.684716	13.429271	12.071173	11.504756	11.663214	

490	0.643508	0.662177	14.191591	13.429271	12.071173	11.504756
491	0.636196	0.615194	13.118295	14.191591	13.429271	12.071173
492	0.560773	0.565466	12.916559	13.118295	14.191591	13.429271
493	0.602129	0.585646	12.496044	12.916559	13.118295	14.191591
494	0.647347	0.536523	12.050954	12.496044	12.916559	13.118295
495	0.648343	0.552256	12.231576	12.050954	12.496044	12.916559
496	0.560258	0.552256	11.791904	12.231576	12.050954	12.496044
497	0.563819	0.557809	11.932721	11.791904	12.231576	12.050954
498	0.527718	0.477794	11.932721	11.932721	11.791904	12.231576
499	0.518463	0.551195	11.982423	11.932721	11.932721	11.791904
500	0.655811	0.582339	11.266252	11.982423	11.932721	11.932721
501	0.634105	0.529772	11.923226	11.266252	11.982423	11.932721
502	0.558613	0.458904	12.201972	11.923226	11.266252	11.982423
503	0.486489	0.465733	11.731479	12.201972	11.923226	11.266252
504	0.444960	0.402622	11.097177	11.731479	12.201972	11.923226
505	0.422959	0.436918	11.158295	11.097177	11.731479	12.201972
506	0.454582	0.380048	10.593420	11.158295	11.097177	11.731479
507	0.489086	0.398860	10.900388	10.593420	11.158295	11.097177
508	0.434908	0.377916	10.391372	10.900388	10.593420	11.158295
..	...	...	...	...	...	...
800	0.526882	0.537515	11.753871	12.729659	11.620778	11.409880
801	0.543166	0.524598	11.344805	11.753871	12.729659	11.620778
802	0.525052	0.543903	11.800777	11.344805	11.753871	12.729659
803	0.558662	0.527438	11.685169	11.800777	11.344805	11.753871
804	0.593634	0.568506	11.857957	11.685169	11.800777	11.344805
805	0.572253	0.479332	11.710582	11.857957	11.685169	11.800777
806	0.575940	0.458726	12.078164	11.710582	11.857957	11.685169
807	0.594847	0.494425	11.280011	12.078164	11.710582	11.857957
808	0.517497	0.497810	11.095584	11.280011	12.078164	11.710582
809	0.525839	0.444954	11.415105	11.095584	11.280011	12.078164
810	0.550556	0.511653	11.445403	11.415105	11.095584	11.280011
811	0.549580	0.582450	10.972318	11.445403	11.415105	11.095584
812	0.604582	0.477562	11.569300	10.972318	11.445403	11.415105
813	0.498504	0.498620	12.202967	11.569300	10.972318	11.445403
814	0.499468	0.523920	11.264175	12.202967	11.569300	10.972318
815	0.497775	0.479971	11.452649	11.264175	12.202967	11.569300
816	0.476315	0.539318	11.679099	11.452649	11.264175	12.202967
817	0.545489	0.502845	11.285737	11.679099	11.452649	11.264175
818	0.615363	0.513089	11.816914	11.285737	11.679099	11.452649
819	0.514412	0.445764	11.490470	11.816914	11.285737	11.679099
820	0.478393	0.423680	11.582159	11.490470	11.816914	11.285737
821	0.442373	0.411694	10.979566	11.582159	11.490470	11.816914
822	0.424087	0.400434	10.781898	10.979566	11.582159	11.490470
823	0.419286	0.394209	10.674624	10.781898	10.979566	11.582159
824	0.504632	0.423048	10.573835	10.674624	10.781898	10.979566
825	0.436109	0.501722	10.518126	10.573835	10.674624	10.781898
826	0.428109	0.382286	10.776242	10.518126	10.573835	10.674624
827	0.441254	0.369280	11.480411	10.776242	10.518126	10.573835

```
828  0.407070  0.358995  10.411403  11.480411  10.776242  10.518126
829  0.371488  0.376135  10.294997  10.411403  11.480411  10.776242

           t-6        t-7        t-8        t-9  ...  weekday(t-5)  \
479  11.559878  10.930170  10.889469  10.675248  ...           7.0
480  12.823073  11.559878  10.930170  10.889469  ...           1.0
481  13.106773  12.823073  11.559878  10.930170  ...           2.0
482  12.852295  13.106773  12.823073  11.559878  ...           3.0
483  12.119938  12.852295  13.106773  12.823073  ...           4.0
484  11.786082  12.119938  12.852295  13.106773  ...           5.0
485  11.590859  11.786082  12.119938  12.852295  ...           6.0
486  12.186487  11.590859  11.786082  12.119938  ...           7.0
487  12.577783  12.186487  11.590859  11.786082  ...           1.0
488  11.816573  12.577783  12.186487  11.590859  ...           2.0
489  11.387627  11.816573  12.577783  12.186487  ...           3.0
490  11.663214  11.387627  11.816573  12.577783  ...           4.0
491  11.504756  11.663214  11.387627  11.816573  ...           5.0
492  12.071173  11.504756  11.663214  11.387627  ...           6.0
493  13.429271  12.071173  11.504756  11.663214  ...           7.0
494  14.191591  13.429271  12.071173  11.504756  ...           1.0
495  13.118295  14.191591  13.429271  12.071173  ...           2.0
496  12.916559  13.118295  14.191591  13.429271  ...           3.0
497  12.496044  12.916559  13.118295  14.191591  ...           4.0
498  12.050954  12.496044  12.916559  13.118295  ...           5.0
499  12.231576  12.050954  12.496044  12.916559  ...           6.0
500  11.791904  12.231576  12.050954  12.496044  ...           7.0
501  11.932721  11.791904  12.231576  12.050954  ...           7.0
502  11.932721  11.932721  11.791904  12.231576  ...           1.0
503  11.982423  11.932721  11.932721  11.791904  ...           2.0
504  11.266252  11.982423  11.932721  11.932721  ...           3.0
505  11.923226  11.266252  11.982423  11.932721  ...           4.0
506  12.201972  11.923226  11.266252  11.982423  ...           5.0
507  11.731479  12.201972  11.923226  11.266252  ...           6.0
508  11.097177  11.731479  12.201972  11.923226  ...           7.0
..         ...        ...        ...        ...  ...           ...
800  11.300414  11.109560  11.370601  11.430883  ...           5.0
801  11.409880  11.300414  11.109560  11.370601  ...           6.0
802  11.620778  11.409880  11.300414  11.109560  ...           7.0
803  12.729659  11.620778  11.409880  11.300414  ...           1.0
804  11.753871  12.729659  11.620778  11.409880  ...           2.0
805  11.344805  11.753871  12.729659  11.620778  ...           3.0
806  11.800777  11.344805  11.753871  12.729659  ...           4.0
807  11.685169  11.800777  11.344805  11.753871  ...           5.0
808  11.857957  11.685169  11.800777  11.344805  ...           6.0
809  11.710582  11.857957  11.685169  11.800777  ...           7.0
810  12.078164  11.710582  11.857957  11.685169  ...           1.0
811  11.280011  12.078164  11.710582  11.857957  ...           2.0
812  11.095584  11.280011  12.078164  11.710582  ...           3.0
```

813	11.415105	11.095584	11.280011	12.078164	...	4.0
814	11.445403	11.415105	11.095584	11.280011	...	5.0
815	10.972318	11.445403	11.415105	11.095584	...	6.0
816	11.569300	10.972318	11.445403	11.415105	...	7.0
817	12.202967	11.569300	10.972318	11.445403	...	1.0
818	11.264175	12.202967	11.569300	10.972318	...	2.0
819	11.452649	11.264175	12.202967	11.569300	...	3.0
820	11.679099	11.452649	11.264175	12.202967	...	4.0
821	11.285737	11.679099	11.452649	11.264175	...	5.0
822	11.816914	11.285737	11.679099	11.452649	...	6.0
823	11.490470	11.816914	11.285737	11.679099	...	7.0
824	11.582159	11.490470	11.816914	11.285737	...	1.0
825	10.979566	11.582159	11.490470	11.816914	...	2.0
826	10.781898	10.979566	11.582159	11.490470	...	3.0
827	10.674624	10.781898	10.979566	11.582159	...	4.0
828	10.573835	10.674624	10.781898	10.979566	...	5.0
829	10.518126	10.573835	10.674624	10.781898	...	6.0

	weekday(t-6)	weekday(t-7)	weekday(t-8)	weekday(t-9)	weekday(t-10)	\
479	6.0	5.0	4.0	3.0	2.0	
480	7.0	6.0	5.0	4.0	3.0	
481	1.0	7.0	6.0	5.0	4.0	
482	2.0	1.0	7.0	6.0	5.0	
483	3.0	2.0	1.0	7.0	6.0	
484	4.0	3.0	2.0	1.0	7.0	
485	5.0	4.0	3.0	2.0	1.0	
486	6.0	5.0	4.0	3.0	2.0	
487	7.0	6.0	5.0	4.0	3.0	
488	1.0	7.0	6.0	5.0	4.0	
489	2.0	1.0	7.0	6.0	5.0	
490	3.0	2.0	1.0	7.0	6.0	
491	4.0	3.0	2.0	1.0	7.0	
492	5.0	4.0	3.0	2.0	1.0	
493	6.0	5.0	4.0	3.0	2.0	
494	7.0	6.0	5.0	4.0	3.0	
495	1.0	7.0	6.0	5.0	4.0	
496	2.0	1.0	7.0	6.0	5.0	
497	3.0	2.0	1.0	7.0	6.0	
498	4.0	3.0	2.0	1.0	7.0	
499	5.0	4.0	3.0	2.0	1.0	
500	6.0	5.0	4.0	3.0	2.0	
501	7.0	6.0	5.0	4.0	3.0	
502	7.0	7.0	6.0	5.0	4.0	
503	1.0	7.0	7.0	6.0	5.0	
504	2.0	1.0	7.0	7.0	6.0	
505	3.0	2.0	1.0	7.0	7.0	
506	4.0	3.0	2.0	1.0	7.0	
507	5.0	4.0	3.0	2.0	1.0	

508	6.0	5.0	4.0	3.0	2.0
..	...	...	...	...	...
800	4.0	3.0	2.0	1.0	7.0
801	5.0	4.0	3.0	2.0	1.0
802	6.0	5.0	4.0	3.0	2.0
803	7.0	6.0	5.0	4.0	3.0
804	1.0	7.0	6.0	5.0	4.0
805	2.0	1.0	7.0	6.0	5.0
806	3.0	2.0	1.0	7.0	6.0
807	4.0	3.0	2.0	1.0	7.0
808	5.0	4.0	3.0	2.0	1.0
809	6.0	5.0	4.0	3.0	2.0
810	7.0	6.0	5.0	4.0	3.0
811	1.0	7.0	6.0	5.0	4.0
812	2.0	1.0	7.0	6.0	5.0
813	3.0	2.0	1.0	7.0	6.0
814	4.0	3.0	2.0	1.0	7.0
815	5.0	4.0	3.0	2.0	1.0
816	6.0	5.0	4.0	3.0	2.0
817	7.0	6.0	5.0	4.0	3.0
818	1.0	7.0	6.0	5.0	4.0
819	2.0	1.0	7.0	6.0	5.0
820	3.0	2.0	1.0	7.0	6.0
821	4.0	3.0	2.0	1.0	7.0
822	5.0	4.0	3.0	2.0	1.0
823	6.0	5.0	4.0	3.0	2.0
824	7.0	6.0	5.0	4.0	3.0
825	1.0	7.0	6.0	5.0	4.0
826	2.0	1.0	7.0	6.0	5.0
827	3.0	2.0	1.0	7.0	6.0
828	4.0	3.0	2.0	1.0	7.0
829	5.0	4.0	3.0	2.0	1.0

	weekday(t-11)	weekday(t-12)	weekday(t-13)	weekday(t-14)
479	1.0	7.0	6.0	5.0
480	2.0	1.0	7.0	6.0
481	3.0	2.0	1.0	7.0
482	4.0	3.0	2.0	1.0
483	5.0	4.0	3.0	2.0
484	6.0	5.0	4.0	3.0
485	7.0	6.0	5.0	4.0
486	1.0	7.0	6.0	5.0
487	2.0	1.0	7.0	6.0
488	3.0	2.0	1.0	7.0
489	4.0	3.0	2.0	1.0
490	5.0	4.0	3.0	2.0
491	6.0	5.0	4.0	3.0
492	7.0	6.0	5.0	4.0

493	1.0	7.0	6.0	5.0
494	2.0	1.0	7.0	6.0
495	3.0	2.0	1.0	7.0
496	4.0	3.0	2.0	1.0
497	5.0	4.0	3.0	2.0
498	6.0	5.0	4.0	3.0
499	7.0	6.0	5.0	4.0
500	1.0	7.0	6.0	5.0
501	2.0	1.0	7.0	6.0
502	3.0	2.0	1.0	7.0
503	4.0	3.0	2.0	1.0
504	5.0	4.0	3.0	2.0
505	6.0	5.0	4.0	3.0
506	7.0	6.0	5.0	4.0
507	7.0	7.0	6.0	5.0
508	1.0	7.0	7.0	6.0
..	...	...	...	...
800	6.0	5.0	4.0	3.0
801	7.0	6.0	5.0	4.0
802	1.0	7.0	6.0	5.0
803	2.0	1.0	7.0	6.0
804	3.0	2.0	1.0	7.0
805	4.0	3.0	2.0	1.0
806	5.0	4.0	3.0	2.0
807	6.0	5.0	4.0	3.0
808	7.0	6.0	5.0	4.0
809	1.0	7.0	6.0	5.0
810	2.0	1.0	7.0	6.0
811	3.0	2.0	1.0	7.0
812	4.0	3.0	2.0	1.0
813	5.0	4.0	3.0	2.0
814	6.0	5.0	4.0	3.0
815	7.0	6.0	5.0	4.0
816	1.0	7.0	6.0	5.0
817	2.0	1.0	7.0	6.0
818	3.0	2.0	1.0	7.0
819	4.0	3.0	2.0	1.0
820	5.0	4.0	3.0	2.0
821	6.0	5.0	4.0	3.0
822	7.0	6.0	5.0	4.0
823	1.0	7.0	6.0	5.0
824	2.0	1.0	7.0	6.0
825	3.0	2.0	1.0	7.0
826	4.0	3.0	2.0	1.0
827	5.0	4.0	3.0	2.0
828	6.0	5.0	4.0	3.0
829	7.0	6.0	5.0	4.0

```
[351 rows x 85 columns]
```

In [22]:
```
# Convert predictions back to normal values

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

#Les variables en posició 0 i 1 són predicció i y respectivament
```

```
[[ 11.5634754   11.59085917 115.46893021 ...  36.55394171  31.00583163
   25.45772156]
 [ 11.82999832  12.18648691 112.48075791 ...   3.26528127  36.55394171
   31.00583163]
 [ 12.51281658  12.57778255 110.7334244  ...   8.81339134   3.26528127
   36.55394171]
 ...
 [ 10.9391943   10.2949966  109.74485905 ...  19.90961149  14.36150142
    8.81339134]
 [ 10.63323583  10.20294532 100.17673598 ...  25.45772156  19.90961149
   14.36150142]
 [ 10.31475956  10.3563499   99.13484299 ...  31.00583163  25.45772156
   19.90961149]]
11.563475404985617
11.590859170709699
```

In [23]:
```
#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[23]:
```
[11.590859170709699,
 12.186486909458,
 12.5777825527296,
 11.816572589134799,
 11.3876267050719,
 11.6632140210701,
 11.5047561338867,
 12.071172692490801,
 13.4292708131623,
```

```
14.1915913964734,
13.1182948122023,
12.916559451200099,
12.4960441531868,
12.050954318124699,
12.231575736212301,
11.7919036962847,
11.9327208888355,
11.9327208888355,
11.9824229419611,
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11.923225859637402,
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10.391371941845799,
10.5597506942169,
10.3722930491566,
10.531617352131999,
10.0442564420545,
9.3196743918969,
9.22987664514932,
9.17927174876646,
9.25026850964928,
9.44901226100687,
9.48570009257196,
9.99667631842984,
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8.28206681505197,
8.77842514832838,
9.525847240364241,
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8.645489666170171,
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8.7022052143203,
```

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9.256266530545721,
8.838438955880711,
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9.15104978517621,
9.23372603556509,
9.019062861238579,
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8.90278416695295,
9.55757398660198,
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8.58491657200448,
8.55665845403136,
8.995475080044802,
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9.05063902911298,
8.43245865167071,
8.47592064981329,
8.73745320429666,
8.11301942072829,
8.01897889462084,
8.0122647113768,
7.96687892296338,
8.05955094284913,
8.26964678339566,
9.14705667833895,
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8.666901835294121,
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8.20428627614679,
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8.20618845934807,
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8.413209815998501,
9.008410871902528,
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8.03627886081334,

8.103375796384409,
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8.46244179996251,
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8.01432251371482,
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```
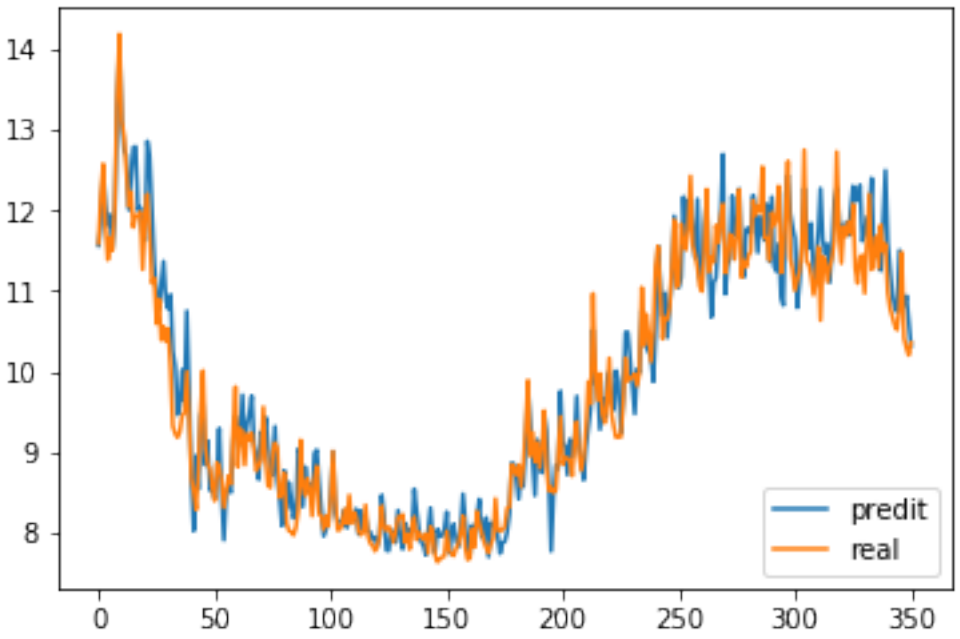

```
In [24]: ##Mostrem
         plt.plot(listpredi, label="predit")
         plt.plot(listy, label="real")
         plt.legend(loc="lower right")
         plt.show()
```

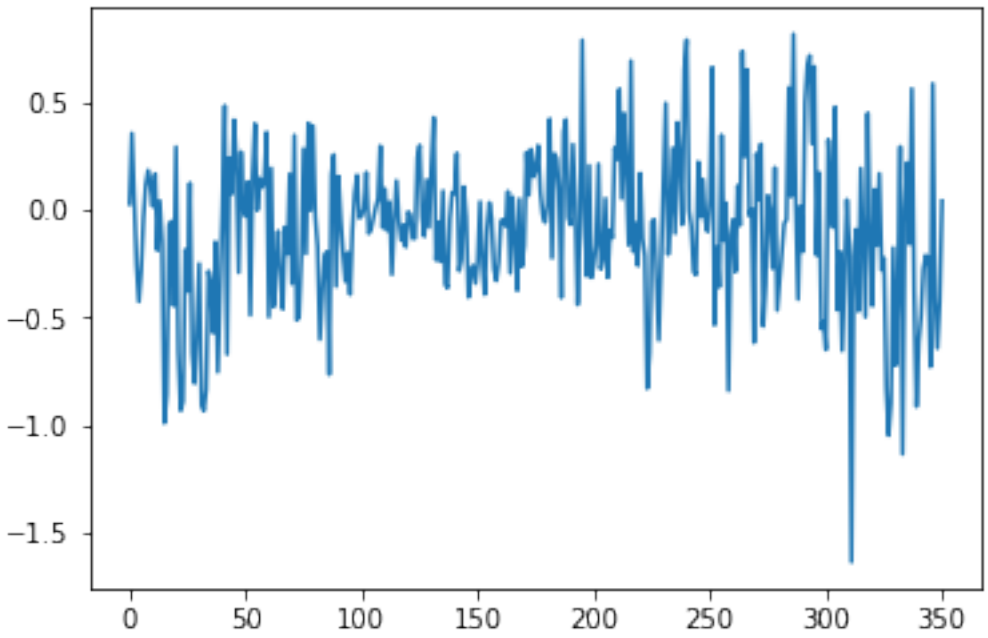



```
In [25]: print(listy[300])
         print(listpredi[300])

         print(listy[300]-listpredi[300])
         (listy[300]-listpredi[300])/listy[300]
```

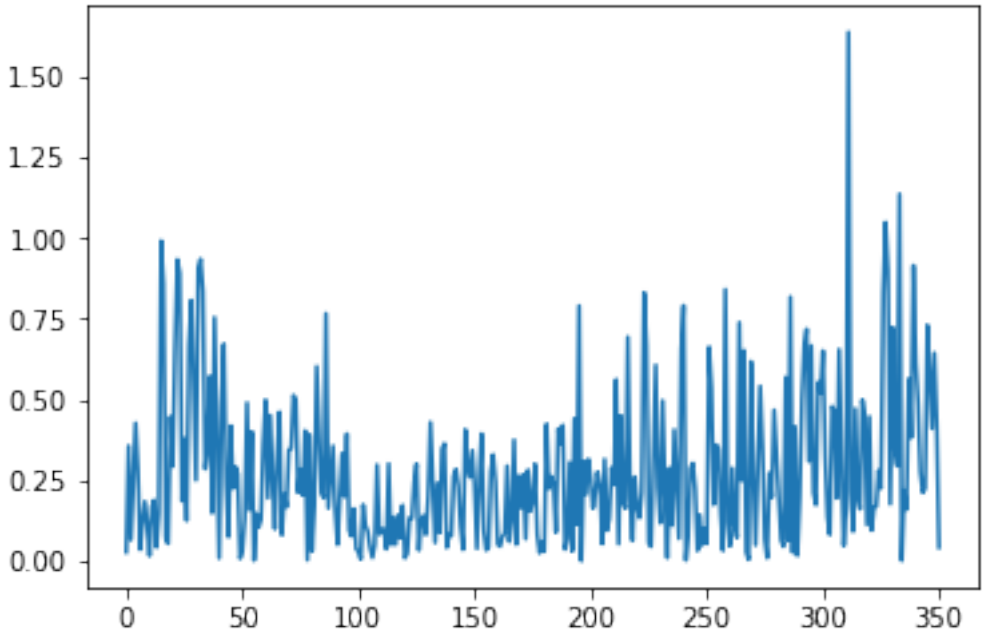
```
11.0061509800784
11.657157795295586
-0.6510068152171851
```

```
Out[25]: -0.059149362606013216
```

```
In [26]: llista_errors=list()
         llista_errorsabs=list()
         llista_errorsres=list()


         for i in range(len(listpredi)):
             valor=listy[i]-listpredi[i]
             valorabs=math.fabs(valor)
             valorrespecte=valorabs/listy[i]
             llista_errors.append(valor)
             llista_errorsabs.append(valorabs)
             llista_errorsres.append(valorrespecte)

In [27]: plt.plot(llista_errors)

Out[27]: [<matplotlib.lines.Line2D at 0x25c5f47ddd8>]
```

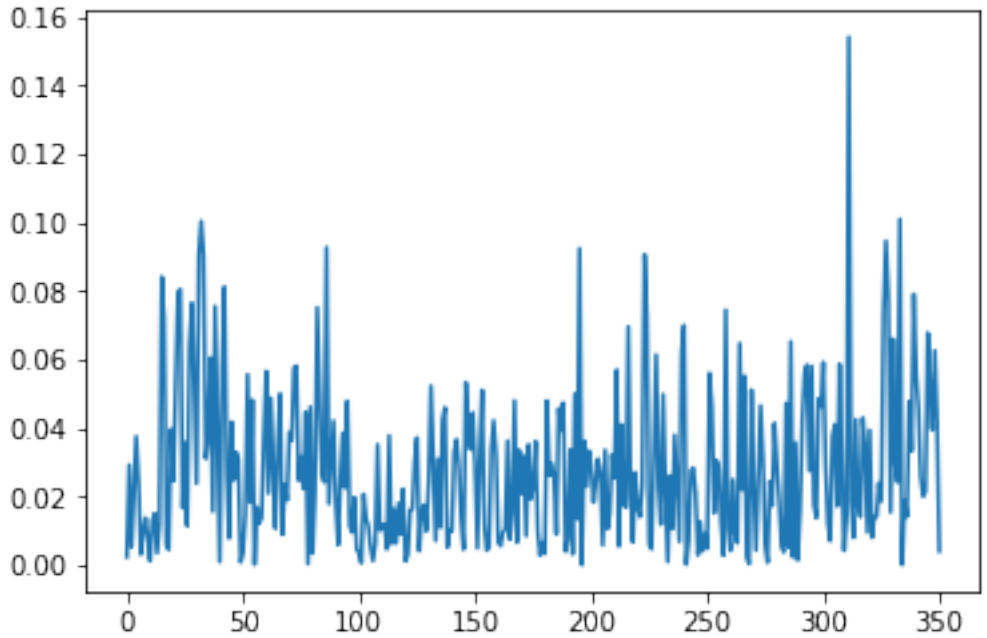



```
In [28]: plt.plot(llista_errorsabs)

Out[28]: [<matplotlib.lines.Line2D at 0x25c5f4d4be0>]
```



In [29]: plt.plot(llista_errorsres)

Out[29]: [<matplotlib.lines.Line2D at 0x25c5f5357f0>]



```
In [30]: sum(llista_errorsres)/(len(llista_errorsres))

Out[30]: 0.028204769207490172

In [ ]:
```