preprocessing

January 25, 2023

1 import libraries

[110]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import random
from sklearn.metrics import classification_report, confusion_matrix, roc_curve,␣
 ↪mean_squared_error, accuracy_score, recall_score, precision_score, f1_score
from sklearn.metrics import roc_auc_score, mean_absolute_error, make_scorer
from sklearn.model_selection import cross_val_score, train_test_split, KFold,␣
 ↪RandomizedSearchCV, GridSearchCV
from sklearn.linear_model import Lasso
from sklearn.tree import DecisionTreeClassifier
from sklearn.preprocessing import OneHotEncoder
from sklearn.compose import make_column_transformer
from sklearn.ensemble import GradientBoostingClassifier
from pipetorch import DFrame
from sklearn.svm import SVC, SVR, LinearSVC
from sklearn.linear_model import LinearRegression, LogisticRegression
from sklearn.neighbors import KNeighborsClassifier
from math import sqrt
from scipy import stats
from seaborn import load_dataset, pairplot
from sklearn import tree
from sklearn.ensemble import RandomForestRegressor, RandomForestClassifier
from pipetorch.evaluate.study import Study, optuna
import time
from datetime import datetime, timezone
from sklearn.linear_model import Ridge
```

2 data inladen

[111]:
```
!ls /data/energie
```

```
001.xlsx  019.xlsx  037.xlsx  055.xlsx  073.xlsx  091.xlsx  109.xlsx
002.xlsx  020.xlsx  038.xlsx  056.xlsx  074.xlsx  092.xlsx  110.xlsx
003.xlsx  021.xlsx  039.xlsx  057.xlsx  075.xlsx  093.xlsx  111.xlsx
004.xlsx  022.xlsx  040.xlsx  058.xlsx  076.xlsx  094.xlsx  112.xlsx
005.xlsx  023.xlsx  041.xlsx  059.xlsx  077.xlsx  095.xlsx  113.xlsx
006.xlsx  024.xlsx  042.xlsx  060.xlsx  078.xlsx  096.xlsx  114.xlsx
007.xlsx  025.xlsx  043.xlsx  061.xlsx  079.xlsx  097.xlsx  115.xlsx
008.xlsx  026.xlsx  044.xlsx  062.xlsx  080.xlsx  098.xlsx  116.xlsx
009.xlsx  027.xlsx  045.xlsx  063.xlsx  081.xlsx  099.xlsx  117.xlsx
010.xlsx  028.xlsx  046.xlsx  064.xlsx  082.xlsx  100.xlsx  118.xlsx
011.xlsx  029.xlsx  047.xlsx  065.xlsx  083.xlsx  101.xlsx  119.xlsx
012.xlsx  030.xlsx  048.xlsx  066.xlsx  084.xlsx  102.xlsx  120.xlsx
013.xlsx  031.xlsx  049.xlsx  067.xlsx  085.xlsx  103.xlsx  unit_list.xlsx
014.xlsx  032.xlsx  050.xlsx  068.xlsx  086.xlsx  104.xlsx
015.xlsx  033.xlsx  051.xlsx  069.xlsx  087.xlsx  105.xlsx
016.xlsx  034.xlsx  052.xlsx  070.xlsx  088.xlsx  106.xlsx
017.xlsx  035.xlsx  053.xlsx  071.xlsx  089.xlsx  107.xlsx
018.xlsx  036.xlsx  054.xlsx  072.xlsx  090.xlsx  108.xlsx
```

Wij willen de data van smartmeter en solar hebben. In elke dataset zijn er verschillende tabbladen. Wij moeten de sheetname bepalen tijdens het inladen van de huisjes.

[162]:
```
data1= pd.read_excel('/data/energie/001.xlsx', sheet_name='smartMeter')
data2= pd.read_excel('/data/energie/001.xlsx', sheet_name='solar')
```

van timestamp een datum maken

[163]:
```
data1['datum'] = [datetime.fromtimestamp(i) for i in data1['Timestamp']]
data1['datum'] = pd.to_datetime(data1['datum']).dt.date
data1= data1.drop_duplicates(subset='datum')
data1=data1.set_index('datum')
data1
```

[163]:

datum	Timestamp	energy_in_low	energy_in_norm	energy_out_low	\
2019-01-01	1546297473	911.438	1493.562	31.925	
2019-01-02	1546383873	936.478	1493.562	32.134	
2019-01-03	1546470271	938.160	1508.769	32.134	
2019-01-04	1546556671	939.824	1531.635	32.134	
2019-01-05	1546643070	941.385	1556.682	32.134	
…	…	…	…	…	
2019-12-28	1577487600	3191.204	4121.441	2019.177	
2019-12-29	1577574000	3210.485	4121.441	2019.632	
2019-12-30	1577660401	3221.510	4121.441	2021.206	
2019-12-31	1577746800	3227.592	4126.196	2021.206	
2020-01-01	1577833200	3230.907	4132.383	2021.206	

	energy_out_norm	power	total_energy_in	total_energy_out

```
datum
2019-01-01           91.057  1573.5         2405.000           122.982
2019-01-02           91.057    95.1         2430.040           123.191
2019-01-03           91.504    92.7         2446.929           123.638
2019-01-04           92.988    92.3         2471.459           125.122
2019-01-05           92.989    91.7         2498.067           125.123
…                       …      …               …                 …
2019-12-28         4464.864  2433.0         7312.645          6484.041
2019-12-29         4464.864   960.0         7331.926          6484.496
2019-12-30         4464.864   166.0         7342.951          6486.070
2019-12-31         4470.696   650.0         7353.788          6491.902
2020-01-01         4475.114   162.0         7363.290          6496.320

[366 rows x 8 columns]
```

[164]:
```
data2['datum'] = [datetime.fromtimestamp(i) for i in data2['Timestamp']]
data2['datum'] = pd.to_datetime(data2['datum']).dt.date
data2= data2.drop_duplicates(subset='datum')
data2=data2.set_index('datum')
data2
```

[164]:
```
             Timestamp  power  total_energy_in  total_energy_out
datum
2019-01-01  1546297471  2.385             3.37            329.83
2019-01-02  1546383871  2.390             3.42            332.67
2019-01-03  1546470270  2.427             3.48            335.54
2019-01-04  1546556671  2.411             3.54            341.00
2019-01-05  1546643070  2.331             3.61            341.73
…                  …      …                …                 …
2019-12-27  1577401200  2.540            19.44           8554.42
2019-12-28  1577487601  2.400            19.49           8562.04
2019-12-29  1577574000  2.420            19.55           8567.71
2019-12-30  1577660401  2.590            19.60           8572.12
2019-12-31  1577746802  2.390            19.66           8580.73

[365 rows x 4 columns]
```

wij hebben een verslag van vorig jaar gekregen. Daarin stond hoe je het energieverbruik van een huis kunt berekenen. De formule is als volgt: energieverbruik= smart_in + solar_out - smart_out

om het energieverbruik te berekenen heb ik de koloomnamen veranderen en vervolgens smartmeter met solar gemergt

[165]:
```
data1= data1[['total_energy_in', 'total_energy_out']]
data2= data2[['total_energy_in', 'total_energy_out']]
data1.columns = ['smart_in', 'smart_out']
data2.columns= ['solar_in', 'solar_out']
```

[166]:
```
huis1= data1.merge(data2, on='datum', how='inner')
```

[167]:
```
huis1['energie_verbruik']= huis1['smart_in'] + huis1['solar_out'] -␣
↪huis1['smart_out']
```

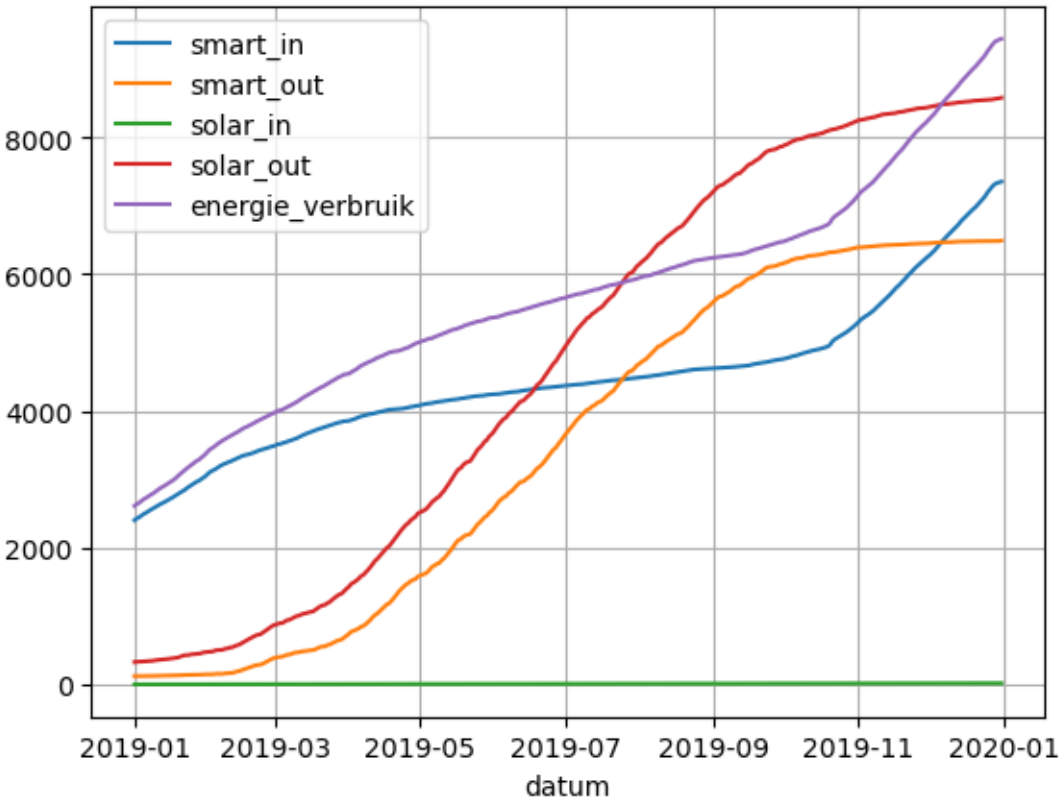
[168]:
```
huis1.isna().sum()
```

[168]:
```
smart_in            0
smart_out           0
solar_in            0
solar_out           0
energie_verbruik    0
dtype: int64
```

3 visualisatie huis1

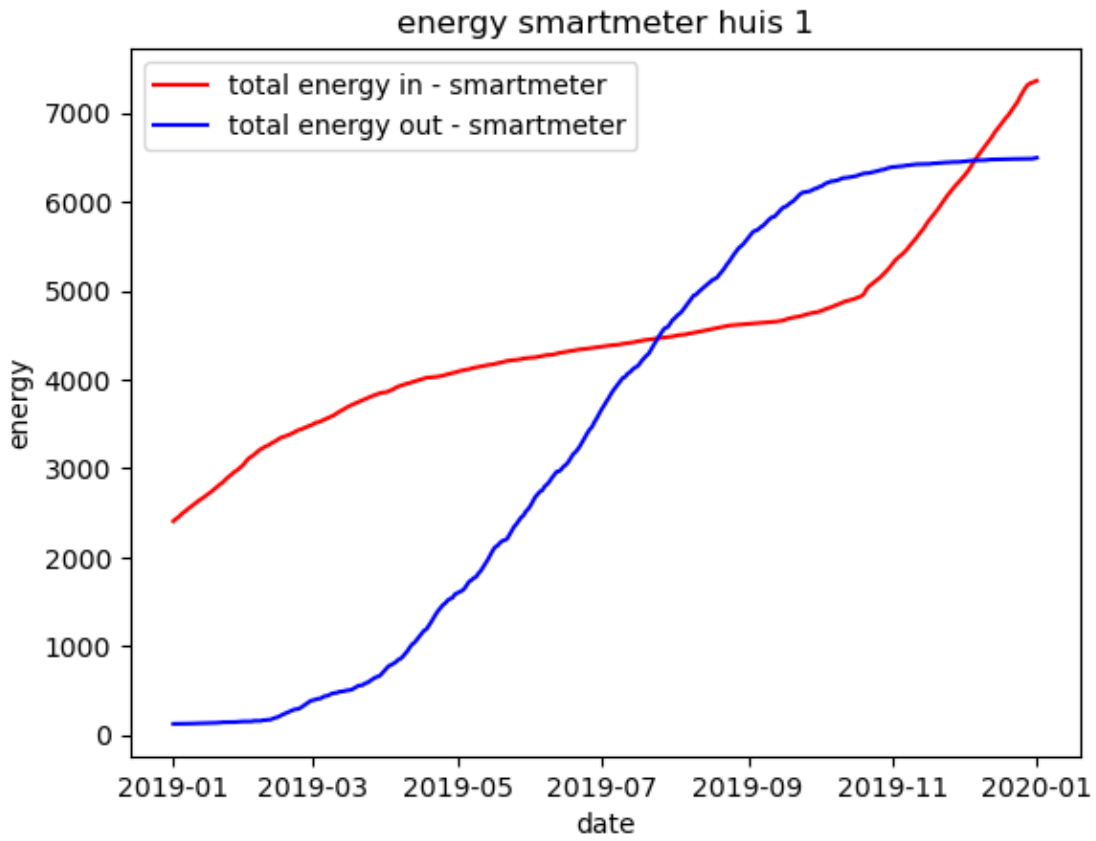
[119]:
```
huis1.plot(grid=True)
```

[119]:
```
<AxesSubplot:xlabel='datum'>
```



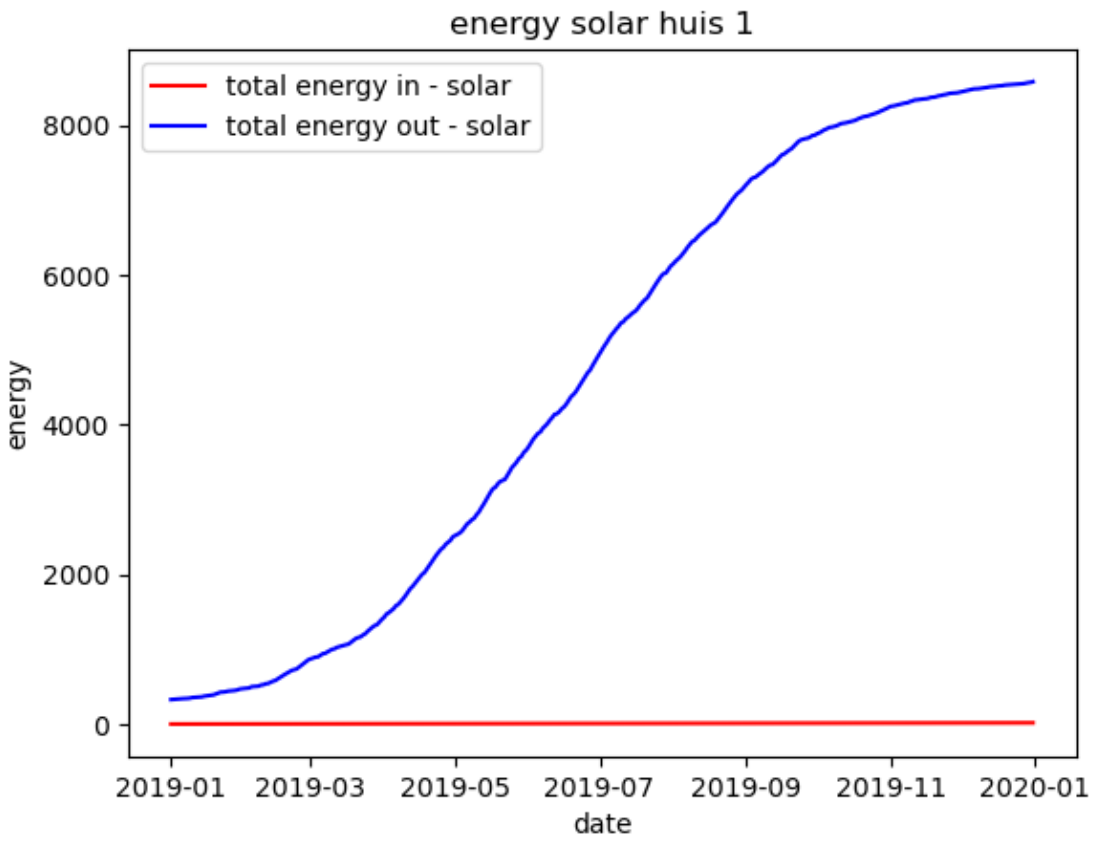
[120]:
```
plt.plot(data1['smart_in'], color='r', label='total energy in - smartmeter')
plt.plot(data1['smart_out'], color='b', label='total energy out - smartmeter')
plt.xlabel('date')
plt.ylabel('energy')
plt.title('energy smartmeter huis 1')
plt.legend()
```

[120]: <matplotlib.legend.Legend at 0x7fd820723160>



[121]:
```
plt.plot(data2['solar_in'], color='r', label='total energy in - solar')
plt.plot(data2['solar_out'], color='b', label='total energy out - solar')
plt.xlabel('date')
plt.ylabel('energy')
plt.title('energy solar huis 1')
plt.legend()
```

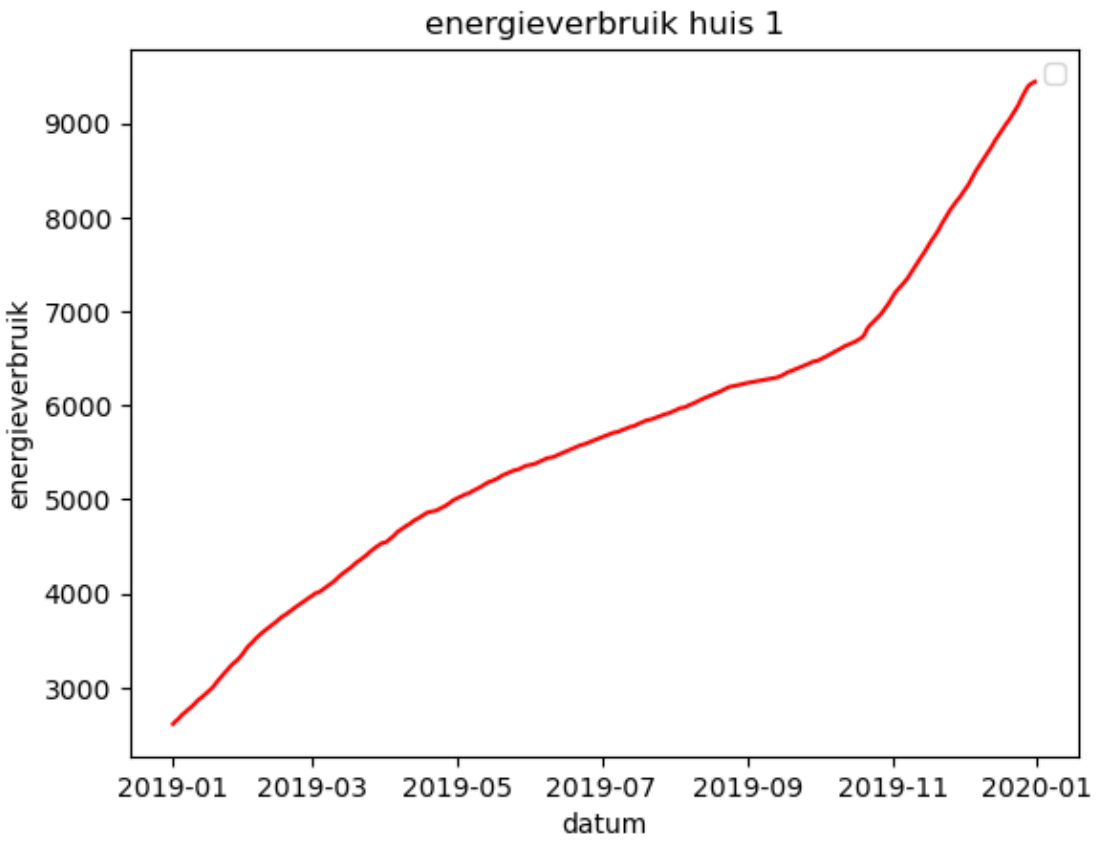
[121]: <matplotlib.legend.Legend at 0x7fd81f567700>



[123]:
```
plt.plot(huis1['energie_verbruik'], color='r')
plt.xlabel('datum')
plt.ylabel('energieverbruik')
plt.title('energieverbruik huis 1')
plt.legend()
```

```
No artists with labels found to put in legend.  Note that artists whose label
start with an underscore are ignored when legend() is called with no argument.
```

[123]:
```
<matplotlib.legend.Legend at 0x7fd81ffff7c0>
```



4 energieverbruik stationaire maken

[169]:
```
huis1['energie_verbruik_st']= huis1['energie_verbruik'].diff().fillna(0)
```

[170]:
```
huis1
```

[170]:

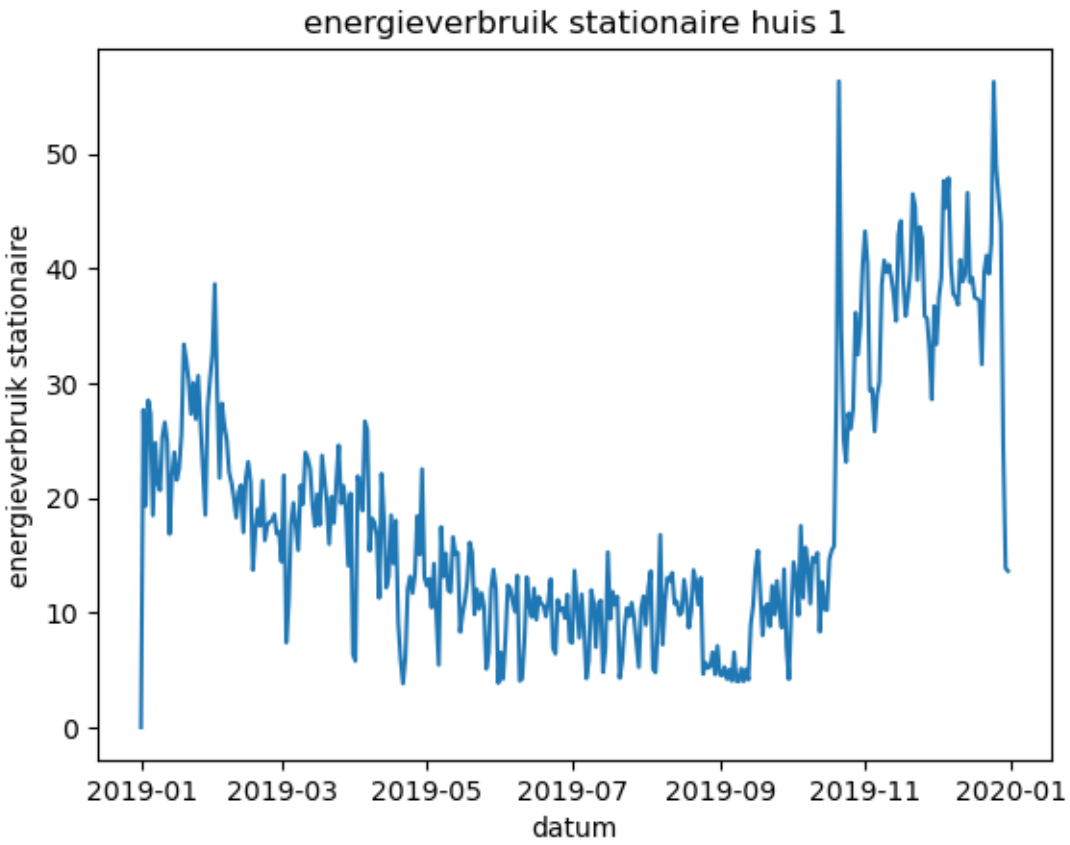
datum	smart_in	smart_out	solar_in	solar_out	energie_verbruik	\
2019-01-01	2405.000	122.982	3.37	329.83	2611.848	
2019-01-02	2430.040	123.191	3.42	332.67	2639.519	
2019-01-03	2446.929	123.638	3.48	335.54	2658.831	
2019-01-04	2471.459	125.122	3.54	341.00	2687.337	
2019-01-05	2498.067	125.123	3.61	341.73	2714.674	
…	…	…	…	…	…	
2019-12-27	7276.278	6483.856	19.44	8554.42	9346.842	
2019-12-28	7312.645	6484.041	19.49	8562.04	9390.644	
2019-12-29	7331.926	6484.496	19.55	8567.71	9415.140	
2019-12-30	7342.951	6486.070	19.60	8572.12	9429.001	

```
2019-12-31  7353.788   6491.902     19.66    8580.73          9442.616

            energie_verbruik_st
datum
2019-01-01                0.000
2019-01-02               27.671
2019-01-03               19.312
2019-01-04               28.506
2019-01-05               27.337
…                             …
2019-12-27               46.318
2019-12-28               43.802
2019-12-29               24.496
2019-12-30               13.861
2019-12-31               13.615

[365 rows x 6 columns]
```

5 visualisatie met stationaire verbruik

[126]:
```
plt.plot(huis1['energie_verbruik_st'])
plt.xlabel('datum')
plt.ylabel('energieverbruik stationaire')
plt.title('energieverbruik stationaire huis 1')
```

[126]:
```
Text(0.5, 1.0, 'energieverbruik stationaire huis 1')
```



6 nieuwe kolommen aanmaken om straks als features te gebruiken

[171]:
```
huis1.index = pd.to_datetime(huis1.index, errors='coerce')
huis1['datum']= huis1.index
huis1['maand'] = huis1['datum'].dt.strftime('%m')
huis1['dag']= [*range(1, len(huis1)+1)]
```

7 weerdata inladen en met huis1 mergen

[173]:
```
weer = pd.read_csv('KNMI.txt')
weer= weer[weer['YYYYMMDD'] >20181231]
weer= weer[weer['YYYYMMDD'] <20200101]
weer['datum'] = weer['YYYYMMDD'].apply(lambda x: pd.to_datetime(str(x),␣
 ↪format='%Y-%m-%d'))
weer= weer[['datum', '    Q']]
weer.columns= ['datum', 'zonsterkte']
```

```
weer= weer.set_index('datum')
weer
```

[173]:
```
            zonsterkte
datum
2019-01-01         161
2019-01-02         147
2019-01-03         257
2019-01-04          49
2019-01-05          56
…                  …
2019-12-27         334
2019-12-28         235
2019-12-29         199
2019-12-30         362
2019-12-31         303

[365 rows x 1 columns]
```

[175]:
```
huis1= huis1.drop(['datum'], axis=1)
```

[177]:
```
huis1= huis1.merge(weer, on='datum', how='outer')
huis1
```

[177]:
```
             smart_in  smart_out  solar_in  solar_out  energie_verbruik  \
datum
2019-01-01  2405.000    122.982      3.37     329.83          2611.848
2019-01-02  2430.040    123.191      3.42     332.67          2639.519
2019-01-03  2446.929    123.638      3.48     335.54          2658.831
2019-01-04  2471.459    125.122      3.54     341.00          2687.337
2019-01-05  2498.067    125.123      3.61     341.73          2714.674
…              …          …         …          …                …
2019-12-27  7276.278   6483.856     19.44    8554.42          9346.842
2019-12-28  7312.645   6484.041     19.49    8562.04          9390.644
2019-12-29  7331.926   6484.496     19.55    8567.71          9415.140
2019-12-30  7342.951   6486.070     19.60    8572.12          9429.001
2019-12-31  7353.788   6491.902     19.66    8580.73          9442.616

             energie_verbruik_st maand  dag zonsterkte
datum
2019-01-01                 0.000    01    1        161
2019-01-02                27.671    01    2        147
2019-01-03                19.312    01    3        257
2019-01-04                28.506    01    4         49
2019-01-05                27.337    01    5         56
…                            …     …   …          …
2019-12-27                46.318    12  361        334
```

```
2019-12-28              43.802    12  362         235
2019-12-29              24.496    12  363         199
2019-12-30              13.861    12  364         362
2019-12-31              13.615    12  365         303

[365 rows x 9 columns]
```

nu filter ik de dataset van huis1 en laat ik alleen de nodige kolommen staan

[178]:
```
huis1= huis1[['dag', 'maand', 'zonsterkte', 'energie_verbruik',␣
 ↪'energie_verbruik_st']]
```

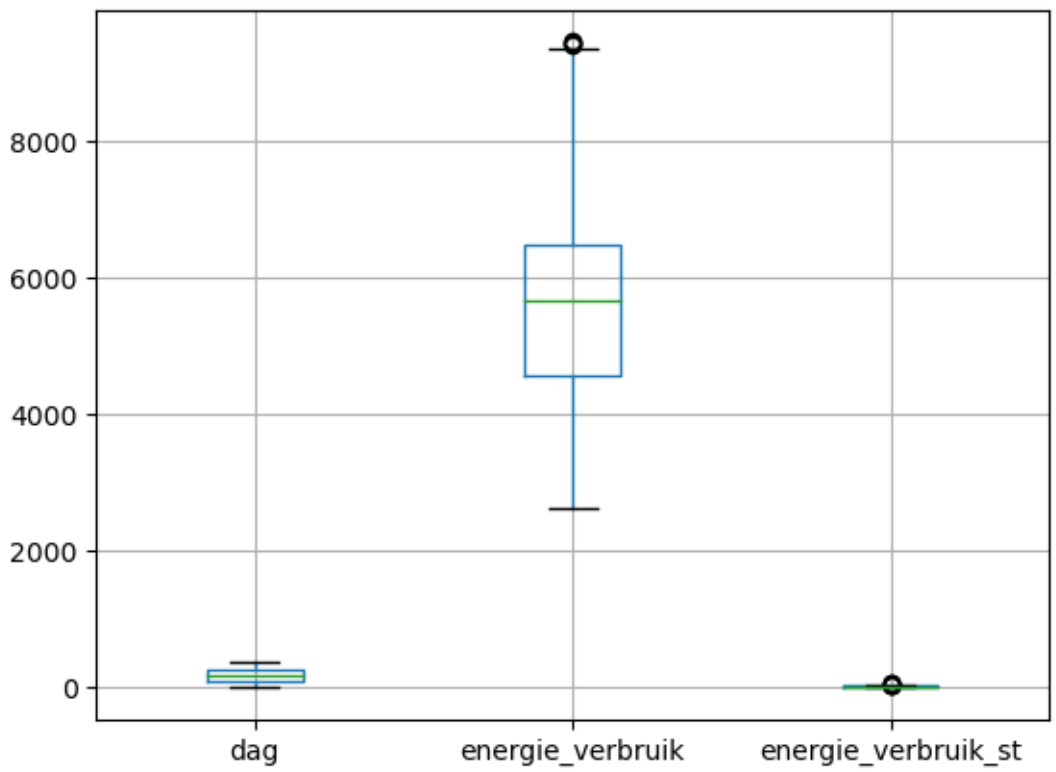
[179]:
```
huis1
```

[179]:
```
            dag maand zonsterkte  energie_verbruik  energie_verbruik_st
datum
2019-01-01    1    01        161          2611.848                0.000
2019-01-02    2    01        147          2639.519               27.671
2019-01-03    3    01        257          2658.831               19.312
2019-01-04    4    01         49          2687.337               28.506
2019-01-05    5    01         56          2714.674               27.337
…           …    …         …                …                      …
2019-12-27  361    12        334          9346.842               46.318
2019-12-28  362    12        235          9390.644               43.802
2019-12-29  363    12        199          9415.140               24.496
2019-12-30  364    12        362          9429.001               13.861
2019-12-31  365    12        303          9442.616               13.615

[365 rows x 5 columns]
```

8 detect outliers

[180]:
```
huis1.boxplot()
```

[180]:
```
<AxesSubplot:>
```



[181]:
```
huis1['energie_verbruik'].std()
```

[181]: 1602.6714419699108

[190]:
```
huis1['energie_verbruik'].mean()
```

[190]: 5677.82577260274

[182]:
```
huis1['energie_verbruik'].max(), huis1['energie_verbruik'].min()
```

[182]: (9442.616, 2611.848)

[189]:
```
max= np.percentile(huis1['energie_verbruik'], [99])
```

[96]:
```
min= np.percentile(huis1['energie_verbruik'], [1])[0]
```

[71]:
```
def remove_outliers(x):
    if(x>max):
        x= max
    elif(x<min):
        x=min
    return x
```

[ ]: