occupancy-dataset

June 10, 2023

1 ROOM OCCUPANCY ESTIMATION

Classification

[1]:
```python
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

[2]:
```python
df = pd.read_csv("C:/Users/Aditya Singh/Downloads/archive/Occupancy_Estimation.
 ↪csv")
df.head()
```

[2]:
```
         Date      Time  S1_Temp  S2_Temp  S3_Temp  S4_Temp  S1_Light  \
0  2017/12/22  10:49:41    24.94    24.75    24.56    25.38       121
1  2017/12/22  10:50:12    24.94    24.75    24.56    25.44       121
2  2017/12/22  10:50:42    25.00    24.75    24.50    25.44       121
3  2017/12/22  10:51:13    25.00    24.75    24.56    25.44       121
4  2017/12/22  10:51:44    25.00    24.75    24.56    25.44       121

   S2_Light  S3_Light  S4_Light  S1_Sound  S2_Sound  S3_Sound  S4_Sound  \
0        34        53        40      0.08      0.19      0.06      0.06
1        33        53        40      0.93      0.05      0.06      0.06
2        34        53        40      0.43      0.11      0.08      0.06
3        34        53        40      0.41      0.10      0.10      0.09
4        34        54        40      0.18      0.06      0.06      0.06

   S5_CO2  S5_CO2_Slope  S6_PIR  S7_PIR  Room_Occupancy_Count
0     390      0.769231       0       0                     1
1     390      0.646154       0       0                     1
2     390      0.519231       0       0                     1
3     390      0.388462       0       0                     1
4     390      0.253846       0       0                     1
```

[3]:
```python
df.shape
```

[3]:
```
(10129, 19)
```

[4]:
```python
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10129 entries, 0 to 10128
Data columns (total 19 columns):
 #   Column                Non-Null Count  Dtype
---  ------                --------------  -----
 0   Date                  10129 non-null  object
 1   Time                  10129 non-null  object
 2   S1_Temp               10129 non-null  float64
 3   S2_Temp               10129 non-null  float64
 4   S3_Temp               10129 non-null  float64
 5   S4_Temp               10129 non-null  float64
 6   S1_Light              10129 non-null  int64
 7   S2_Light              10129 non-null  int64
 8   S3_Light              10129 non-null  int64
 9   S4_Light              10129 non-null  int64
 10  S1_Sound              10129 non-null  float64
 11  S2_Sound              10129 non-null  float64
 12  S3_Sound              10129 non-null  float64
 13  S4_Sound              10129 non-null  float64
 14  S5_CO2                10129 non-null  int64
 15  S5_CO2_Slope          10129 non-null  float64
 16  S6_PIR                10129 non-null  int64
 17  S7_PIR                10129 non-null  int64
 18  Room_Occupancy_Count  10129 non-null  int64
dtypes: float64(9), int64(8), object(2)
memory usage: 1.5+ MB
```

[16]:

```
df['Date'] = pd.to_datetime(df['Date'])
df['Date'] = df['Date'].view('int64').astype('float64')
df['Time'] = pd.to_datetime(df['Time'], format='%H:%M:%S').dt.time
df['Time'] = df['Time'].apply(lambda x: x.hour * 3600 + x.minute * 60 + x.
 ↪second).astype('float64')
```

[20]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10129 entries, 0 to 10128
Data columns (total 19 columns):
 #   Column                Non-Null Count  Dtype
---  ------                --------------  -----
 0   Date                  10129 non-null  float64
 1   Time                  10129 non-null  float64
 2   S1_Temp               10129 non-null  float64
 3   S2_Temp               10129 non-null  float64
 4   S3_Temp               10129 non-null  float64
 5   S4_Temp               10129 non-null  float64
 6   S1_Light              10129 non-null  int64
 7   S2_Light              10129 non-null  int64
 8   S3_Light              10129 non-null  int64
 9   S4_Light              10129 non-null  int64
 10  S1_Sound              10129 non-null  float64
 11  S2_Sound              10129 non-null  float64
 12  S3_Sound              10129 non-null  float64
 13  S4_Sound              10129 non-null  float64
 14  S5_CO2                10129 non-null  int64
 15  S5_CO2_Slope          10129 non-null  float64
 16  S6_PIR                10129 non-null  int64
 17  S7_PIR                10129 non-null  int64
 18  Room_Occupancy_Count  10129 non-null  int64
dtypes: float64(11), int64(8)
memory usage: 1.5 MB
```

[21]:

```
df.isnull().sum()
```

[21]:

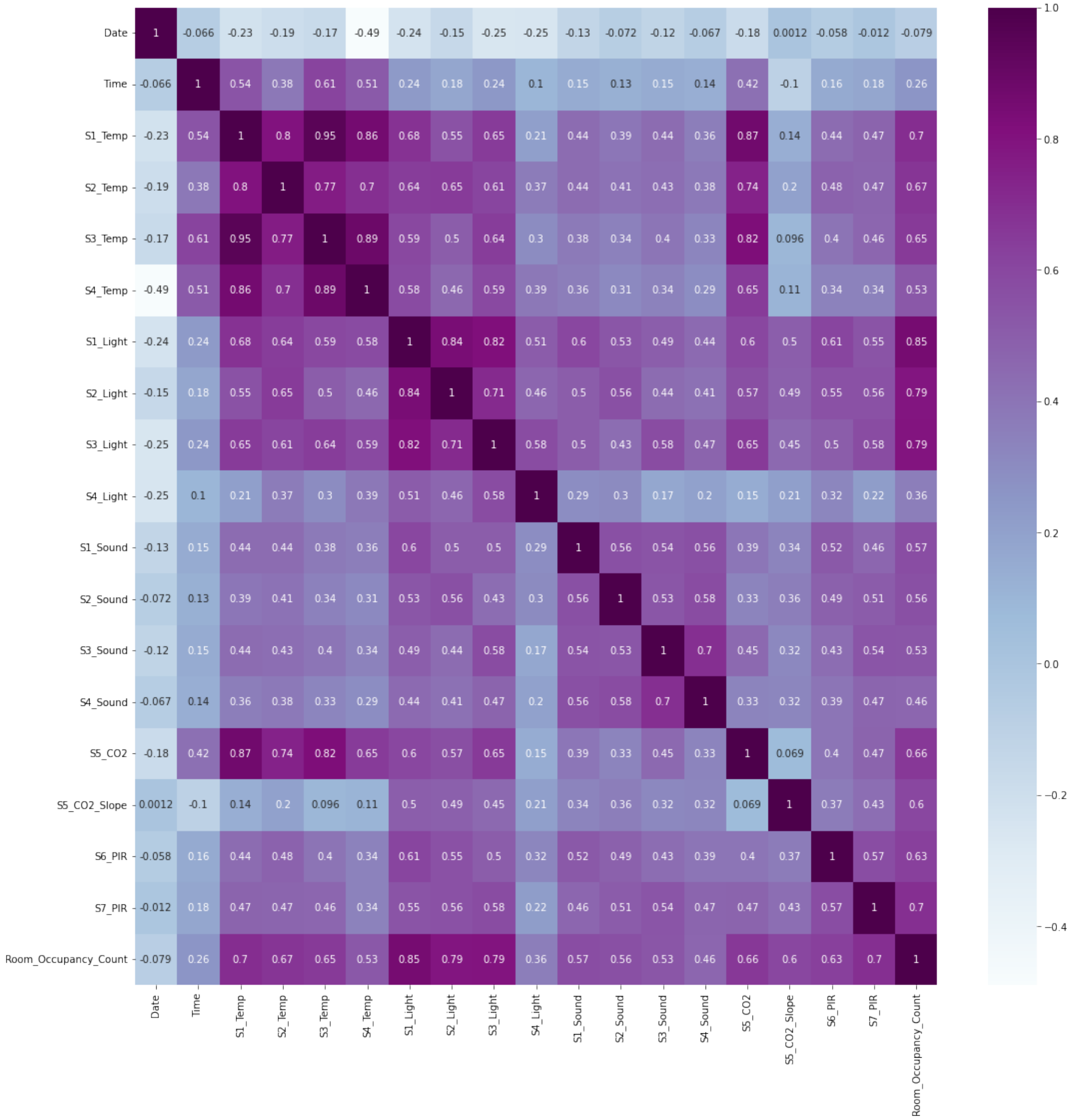
```
Date                    0
Time                    0
S1_Temp                 0
S2_Temp                 0
S3_Temp                 0
S4_Temp                 0
S1_Light                0
S2_Light                0
S3_Light                0
S4_Light                0
S1_Sound                0
S2_Sound                0
S3_Sound                0
S4_Sound                0
S5_CO2                  0
S5_CO2_Slope            0
S6_PIR                  0
S7_PIR                  0
Room_Occupancy_Count    0
dtype: int64
```

[22]:

```
import seaborn as sns
plt.figure(figsize=(18,18))
sns.heatmap(df.corr(),cbar=True,annot=True,cmap="BuPu")
```

[22]:

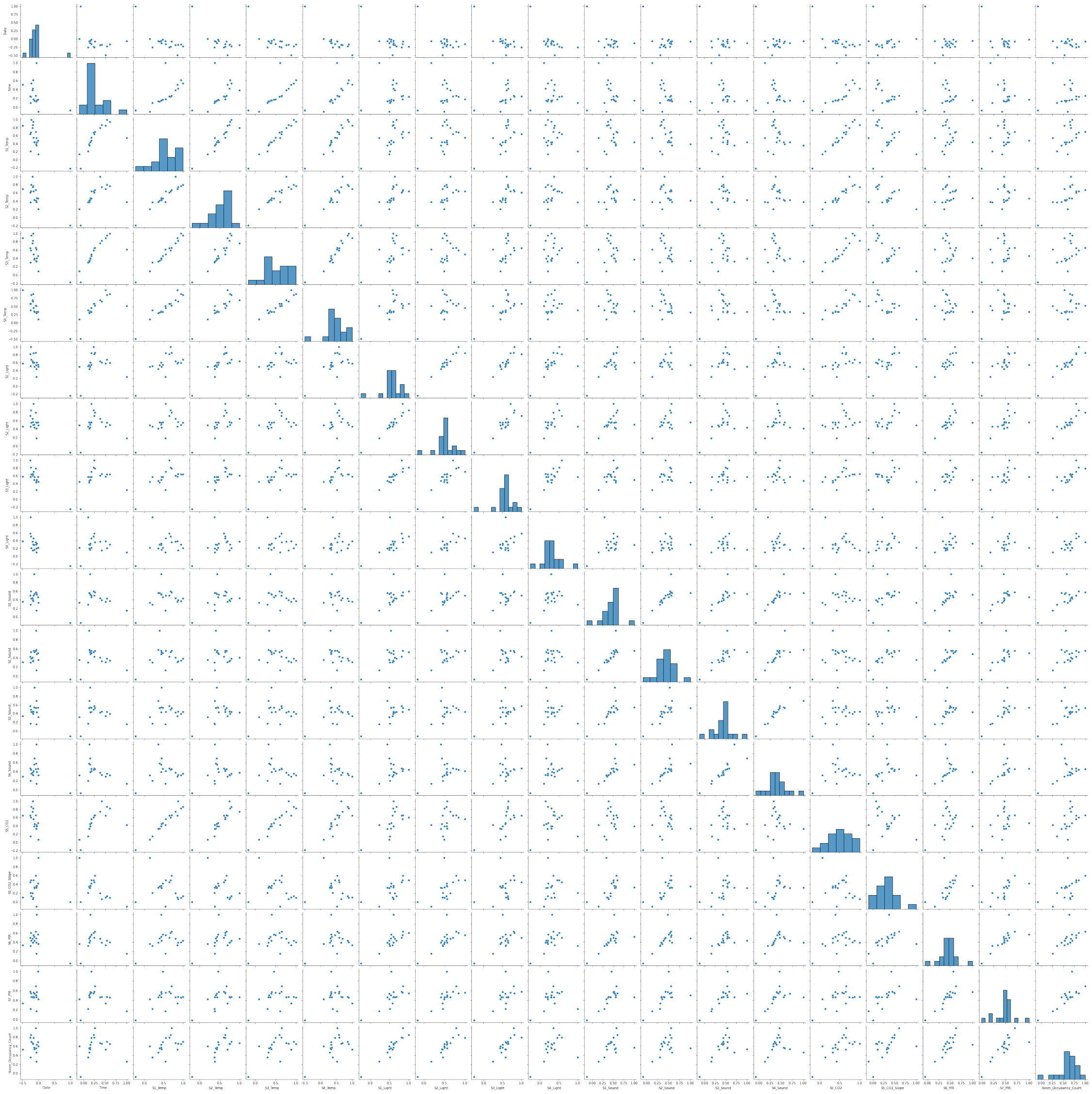
```
<AxesSubplot:>
```



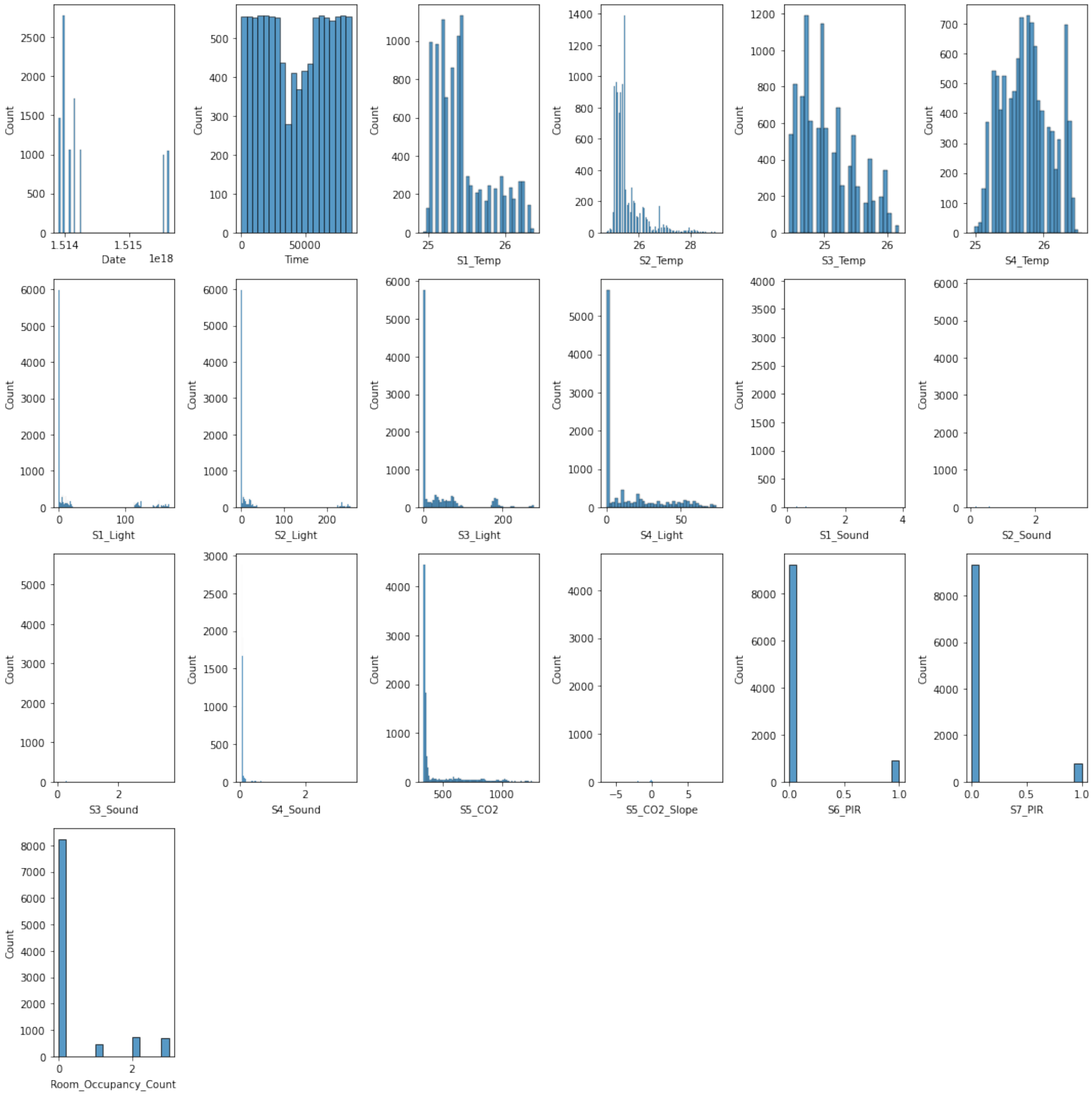
[23]:
```
plt.figure(figsize=(18, 18))
sns.pairplot(df.corr())
```

[23]:
```
<seaborn.axisgrid.PairGrid at 0x138b6c11550>
```

```
<Figure size 1296x1296 with 0 Axes>
```



[24]:
```
count=1
plt.subplots(figsize=(15, 15))
for i in df.columns:
    plt.subplot(4,6,count)
    sns.histplot(df[i])
    count+=1
plt.tight_layout()
plt.show()
```



```
[25]: x = df.drop(['Room_Occupancy_Count'],axis=1).values
      y = df[['Room_Occupancy_Count']].values
```

```
[26]: from sklearn.model_selection import train_test_split
      x_train,x_test,y_train,y_test = train_test_split(x,y,test_size = 0.
       ↪3,random_state=0)
```

```
[27]: print(x_train.shape)
      print(y_train.shape)
      print(x_test.shape)
      print(y_test.shape)
```

```
(7090, 18)
```

```
(7090, 1)
(3039, 18)
(3039, 1)
```

[28]:

```python
from sklearn.linear_model import LogisticRegression
from sklearn.svm import SVC
from sklearn.neighbors import KNeighborsClassifier
from sklearn.naive_bayes import GaussianNB
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import accuracy_score

clf1 = LogisticRegression()
clf2 = SVC()
clf3 = KNeighborsClassifier()
clf4 = GaussianNB()
clf5 = DecisionTreeClassifier()

clf = [clf1, clf2, clf3, clf4, clf5]
clf_name = ['LR', 'SVC', 'KNN', 'GNB', 'DT']
acc = {}

for model, model_name in zip(clf, clf_name):
    model.fit(x_train, y_train)
    pred = model.predict(x_test)
    acc[model_name] = accuracy_score(y_test, pred) * 100

print("ACCURACY SCORES")
for i, j in acc.items():
    print(i, ':-', j, '%')

print(acc.keys())
print(acc.values())

plt.figure()
sns.barplot(x=list(acc.keys()), y=list(acc.values()))
```

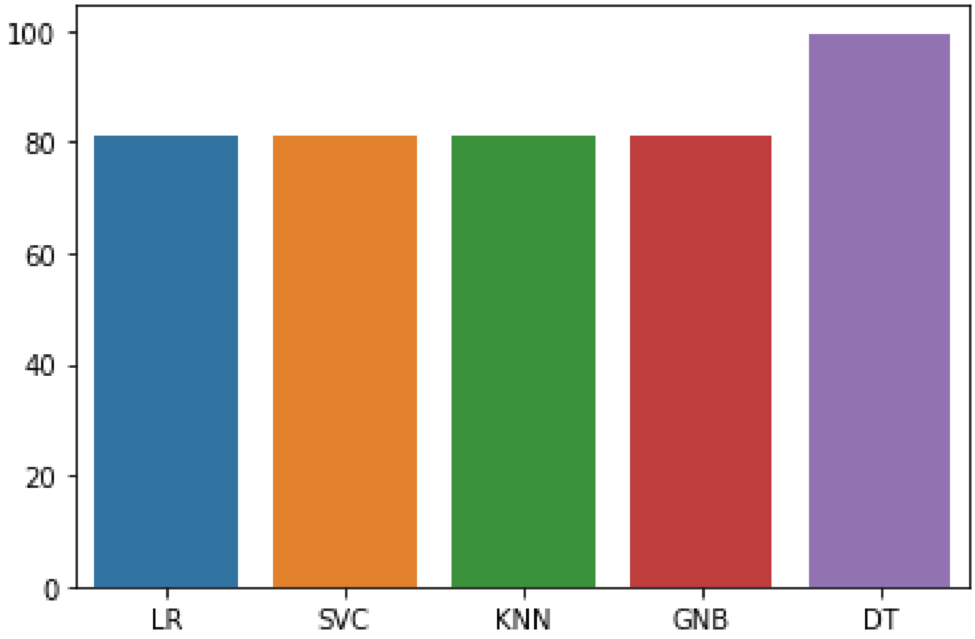
```
C:\ProgramData\Anaconda3\lib\site-packages\sklearn\utils\validation.py:63:
DataConversionWarning: A column-vector y was passed when a 1d array was
expected. Please change the shape of y to (n_samples, ), for example using
ravel().
  return f(*args, **kwargs)
C:\ProgramData\Anaconda3\lib\site-
packages\sklearn\linear_model\_logistic.py:763: ConvergenceWarning: lbfgs failed
to converge (status=2):
ABNORMAL_TERMINATION_IN_LNSRCH.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
```

```
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-
regression
  n_iter_i = _check_optimize_result(
C:\ProgramData\Anaconda3\lib\site-packages\sklearn\utils\validation.py:63:
DataConversionWarning: A column-vector y was passed when a 1d array was
expected. Please change the shape of y to (n_samples, ), for example using
ravel().
  return f(*args, **kwargs)
C:\ProgramData\Anaconda3\lib\site-
packages\sklearn\neighbors\_classification.py:179: DataConversionWarning: A
column-vector y was passed when a 1d array was expected. Please change the shape
of y to (n_samples,), for example using ravel().
  return self._fit(X, y)
C:\ProgramData\Anaconda3\lib\site-packages\sklearn\utils\validation.py:63:
DataConversionWarning: A column-vector y was passed when a 1d array was
expected. Please change the shape of y to (n_samples, ), for example using
ravel().
  return f(*args, **kwargs)

ACCURACY SCORES
LR :- 81.34254689042449 %
SVC :- 81.34254689042449 %
KNN :- 81.34254689042449 %
GNB :- 81.34254689042449 %
DT :- 99.53932214544258 %
dict_keys(['LR', 'SVC', 'KNN', 'GNB', 'DT'])
dict_values([81.34254689042449, 81.34254689042449, 81.34254689042449,
81.34254689042449, 99.53932214544258])
```

```
[28]: <AxesSubplot:>
```



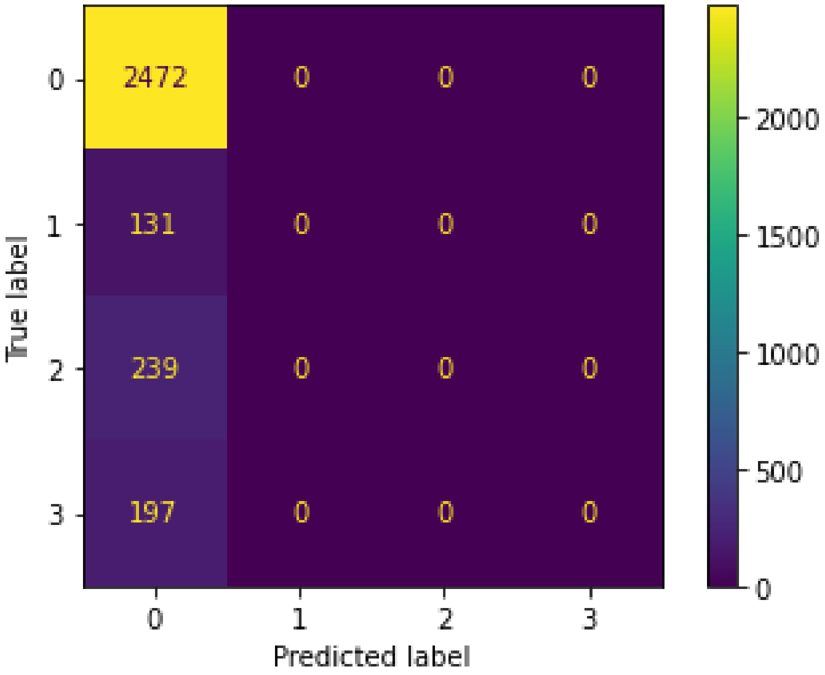
[29]:
```
base_pred = clf5.predict(x_test)
```

[30]:
```
from sklearn.metrics import confusion_matrix , classification_report,␣
 ↪plot_confusion_matrix
confusion_matrix(y_test,base_pred)
```

[30]:
```
array([[2472,    0,    0,    0],
       [   0,  128,    3,    0],
       [   0,    2,  232,    5],
       [   2,    0,    2,  193]], dtype=int64)
```

[31]:
```
plot_confusion_matrix(clf2,x_test,y_test)
```

[31]:
```
<sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at 0x138badb4c40>
```



[32]:
```
print(classification_report(y_test,base_pred))
```

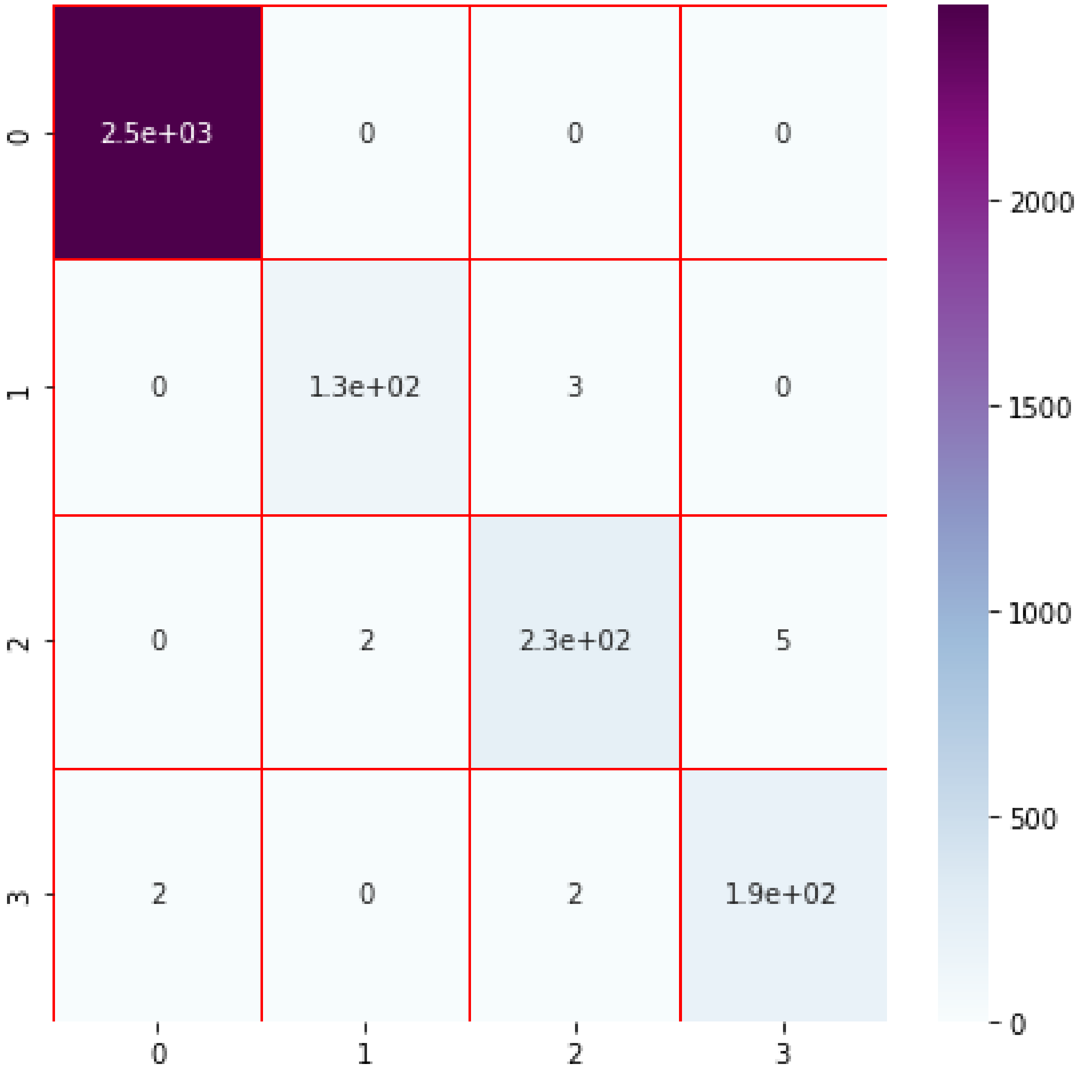
```
              precision    recall  f1-score   support

           0       1.00      1.00      1.00      2472
           1       0.98      0.98      0.98       131
           2       0.98      0.97      0.97       239
           3       0.97      0.98      0.98       197

    accuracy                           1.00      3039
   macro avg       0.98      0.98      0.98      3039
weighted avg       1.00      1.00      1.00      3039
```

[33]:
```
plt.figure(figsize = (7,7))
sns.heatmap(confusion_matrix(y_test,base_pred), annot = True, cbar = True, cmap␣
 ↪= "BuPu", linewidths='1', linecolor = 'red')
```

[33]:
```
<AxesSubplot:>
```


0
1
2
3
2.5e+03
0
0
0
0
1.3e+02
3
0
0
2
2.3e+02
5
2
0
2
1.9e+02
0
1
2
3
2000
1500
1000
500
0

[ ]: