labset-1

February 17, 2025

[1]:
```python
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.datasets import fetch_california_housing
```

[2]:
```python
data = fetch_california_housing()
print(data)
```

```
{'data': array([[   8.3252    ,   41.        ,    6.98412698, …,
2.55555556,
          37.88      , -122.23      ],
       [   8.3014    ,   21.        ,    6.23813708, …,    2.10984183,
          37.86      , -122.22      ],
       [   7.2574    ,   52.        ,    8.28813559, …,    2.80225989,
          37.85      , -122.24      ],
       …,
       [   1.7       ,   17.        ,    5.20554273, …,    2.3256351 ,
          39.43      , -121.22      ],
       [   1.8672    ,   18.        ,    5.32951289, …,    2.12320917,
          39.43      , -121.32      ],
       [   2.3886    ,   16.        ,    5.25471698, …,    2.61698113,
          39.37      , -121.24      ]]), 'target': array([4.526, 3.585, 3.521,
…, 0.923, 0.847, 0.894]), 'frame': None, 'target_names': ['MedHouseVal'],
'feature_names': ['MedInc', 'HouseAge', 'AveRooms', 'AveBedrms', 'Population',
'AveOccup', 'Latitude', 'Longitude'], 'DESCR': '..
_california_housing_dataset:\n\nCalifornia Housing
dataset\n--------------------------\n\n**Data Set Characteristics:**\n\n:Number
of Instances: 20640\n\n:Number of Attributes: 8 numeric, predictive attributes
and the target\n\n:Attribute Information:\n    - MedInc        median income in
block group\n    - HouseAge      median house age in block group\n    - AveRooms
average number of rooms per household\n    - AveBedrms     average number of
bedrooms per household\n    - Population    block group population\n    -
AveOccup      average number of household members\n    - Latitude      block
group latitude\n    - Longitude     block group longitude\n\n:Missing Attribute
Values: None\n\nThis dataset was obtained from the StatLib
repository.\nhttps://www.dcc.fc.up.pt/~ltorgo/Regression/cal_housing.html\n\nThe
target variable is the median house value for California districts,\nexpressed
```

```
in hundreds of thousands of dollars ($100,000).\n\nThis dataset was derived from
the 1990 U.S. census, using one row per census\nblock group. A block group is
the smallest geographical unit for which the U.S.\nCensus Bureau publishes
sample data (a block group typically has a population\nof 600 to 3,000
people).\n\nA household is a group of people residing within a home. Since the
average\nnumber of rooms and bedrooms in this dataset are provided per
household, these\ncolumns may take surprisingly large values for block groups
with few households\nand many empty houses, such as vacation resorts.\n\nIt can
be downloaded/loaded using
the\n:func:`sklearn.datasets.fetch_california_housing` function.\n\n.. topic::
References\n\n    - Pace, R. Kelley and Ronald Barry, Sparse Spatial
Autoregressions,\n      Statistics and Probability Letters, 33 (1997)
291-297\n'}
```

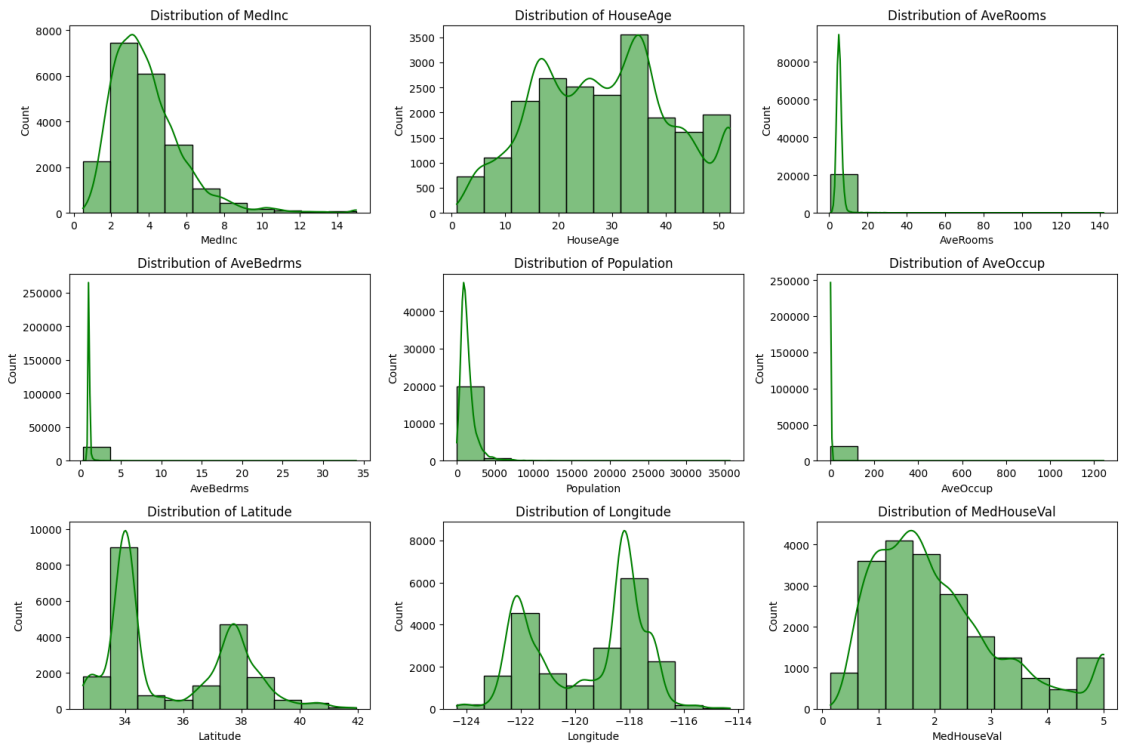
[3]:
```python
# Step 1: Load the California Housing dataset
data = fetch_california_housing(as_frame=True)
housing_df = data.frame
print(housing_df)
```

```
       MedInc  HouseAge  AveRooms  AveBedrms  Population  AveOccup  Latitude  \
0      8.3252      41.0  6.984127   1.023810       322.0  2.555556     37.88
1      8.3014      21.0  6.238137   0.971880      2401.0  2.109842     37.86
2      7.2574      52.0  8.288136   1.073446       496.0  2.802260     37.85
3      5.6431      52.0  5.817352   1.073059       558.0  2.547945     37.85
4      3.8462      52.0  6.281853   1.081081       565.0  2.181467     37.85
…       …        …        …         …          …        …        …
20635  1.5603      25.0  5.045455   1.133333       845.0  2.560606     39.48
20636  2.5568      18.0  6.114035   1.315789       356.0  3.122807     39.49
20637  1.7000      17.0  5.205543   1.120092      1007.0  2.325635     39.43
20638  1.8672      18.0  5.329513   1.171920       741.0  2.123209     39.43
20639  2.3886      16.0  5.254717   1.162264      1387.0  2.616981     39.37

       Longitude  MedHouseVal
0        -122.23        4.526
1        -122.22        3.585
2        -122.24        3.521
3        -122.25        3.413
4        -122.25        3.422
…          …          …
20635    -121.09        0.781
20636    -121.21        0.771
20637    -121.22        0.923
20638    -121.32        0.847
20639    -121.24        0.894

[20640 rows x 9 columns]
```

[5]:
```
# Step 2: Create histograms for numerical features
numerical_features = housing_df.select_dtypes(include = [np.number]).columns
print(numerical_features)
```

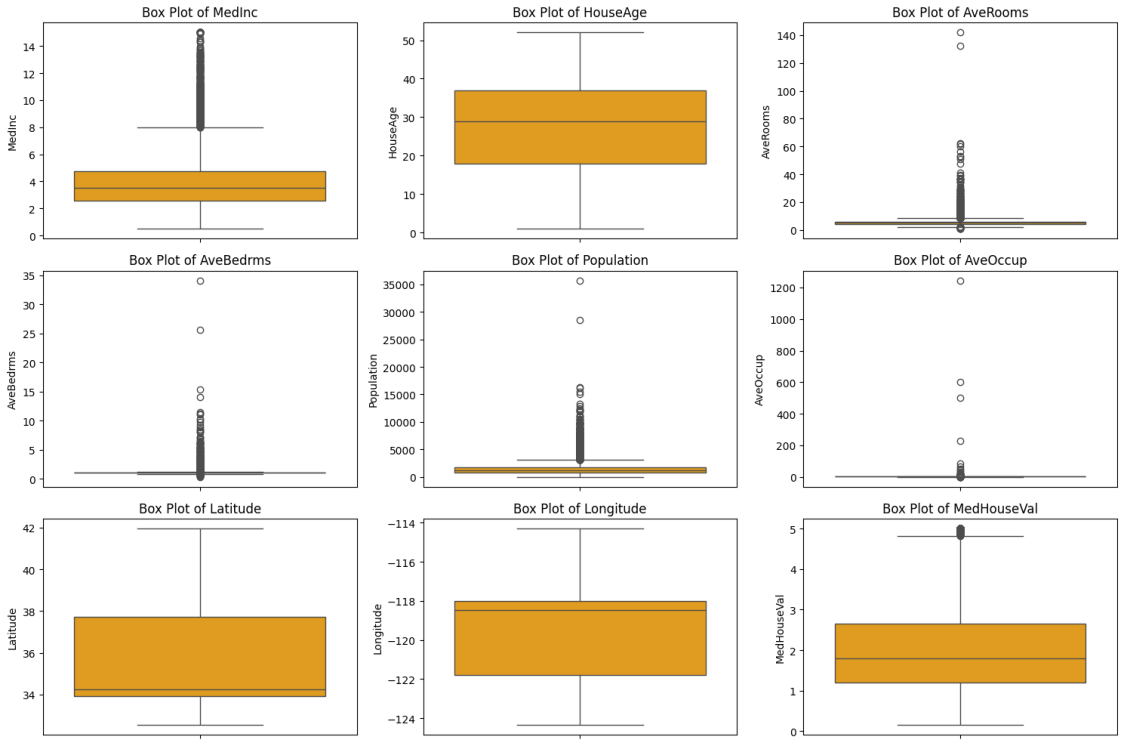
```
Index(['MedInc', 'HouseAge', 'AveRooms', 'AveBedrms', 'Population', 'AveOccup',
       'Latitude', 'Longitude', 'MedHouseVal'],
      dtype='object')
```

[6]:
```
# Plot histograms
plt.figure(figsize=(15, 10))
for i,feature in enumerate(numerical_features):
    plt.subplot(3, 3, i + 1)
    sns.histplot(housing_df[feature],kde = True,bins=10,color='green')
    plt.title(f'Distribution of {feature}')
plt.tight_layout()
```



[7]:
```
# Step 3: Generate box plots for numerical features
plt.figure(figsize=(15, 10))
for i, feature in enumerate(numerical_features):
    plt.subplot(3, 3, i + 1)
    sns.boxplot(housing_df[feature], color='orange')
    plt.title(f'Box Plot of {feature}')
plt.tight_layout()
```

```
plt.show()
```



[8]:
```
# Step 4: Identify outliers using the IQR method
print("Outliers Detection:")
outliers_summary = {}
for feature in numerical_features:
    Q1 = housing_df[feature].quantile(0.25)
    Q3 = housing_df[feature].quantile(0.75)
    IQR = Q3 - Q1
    lower_bound = Q1 - 1.5 * IQR
    upper_bound = Q3 + 1.5 * IQR
    outliers = housing_df[(housing_df[feature] < lower_bound) |␣
↪(housing_df[feature] > upper_bound)]
    outliers_summary[feature] = len(outliers)
    print(f"{feature}: {len(outliers)} outliers")
```

```
Outliers Detection:
MedInc: 681 outliers
HouseAge: 0 outliers
AveRooms: 511 outliers
AveBedrms: 1424 outliers
Population: 1196 outliers
AveOccup: 711 outliers
Latitude: 0 outliers
```

```
Longitude: 0 outliers
MedHouseVal: 1071 outliers
```

[9]:
```python
# Optional: Print a summary of the dataset
print("\nDataset Summary:")
print(housing_df.describe())
```

```
Dataset Summary:
             MedInc      HouseAge      AveRooms     AveBedrms    Population  \
count  20640.000000  20640.000000  20640.000000  20640.000000  20640.000000
mean       3.870671     28.639486      5.429000      1.096675   1425.476744
std        1.899822     12.585558      2.474173      0.473911   1132.462122
min        0.499900      1.000000      0.846154      0.333333      3.000000
25%        2.563400     18.000000      4.440716      1.006079    787.000000
50%        3.534800     29.000000      5.229129      1.048780   1166.000000
75%        4.743250     37.000000      6.052381      1.099526   1725.000000
max       15.000100     52.000000    141.909091     34.066667  35682.000000

           AveOccup      Latitude     Longitude   MedHouseVal
count  20640.000000  20640.000000  20640.000000  20640.000000
mean       3.070655     35.631861   -119.569704      2.068558
std       10.386050      2.135952      2.003532      1.153956
min        0.692308     32.540000   -124.350000      0.149990
25%        2.429741     33.930000   -121.800000      1.196000
50%        2.818116     34.260000   -118.490000      1.797000
75%        3.282261     37.710000   -118.010000      2.647250
max     1243.333333     41.950000   -114.310000      5.000010
```

[ ]:
```python

```