```
import pandas as pd
import numpy as np
from sklearn import metrics
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
```

```
BostonTrain = pd.read_csv("/content/drive/MyDrive/archive (1).zip")
```

```
BostonTrain.head()
```

	Unnamed: 0	crim	zn	indus	chas	nox	rm	age	dis	rad	tax	ptratio	black	lstat	med
0	1	0.00632	18.0	2.31	0	0.538	6.575	65.2	4.0900	1	296	15.3	396.90	4.98	24.
1	2	0.02731	0.0	7.07	0	0.469	6.421	78.9	4.9671	2	242	17.8	396.90	9.14	21.
2	3	0.02729	0.0	7.07	0	0.469	7.185	61.1	4.9671	2	242	17.8	392.83	4.03	34.
3	4	0.03237	0.0	2.18	0	0.458	6.998	45.8	6.0622	3	222	18.7	394.63	2.94	33.
4	5	0.06905	0.0	2.18	0	0.458	7.147	54.2	6.0622	3	222	18.7	396.90	5.33	36.

```
BostonTrain.info()
BostonTrain.describe()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 506 entries, 0 to 505
Data columns (total 15 columns):
 #   Column      Non-Null Count  Dtype
---  ------      --------------  -----
```

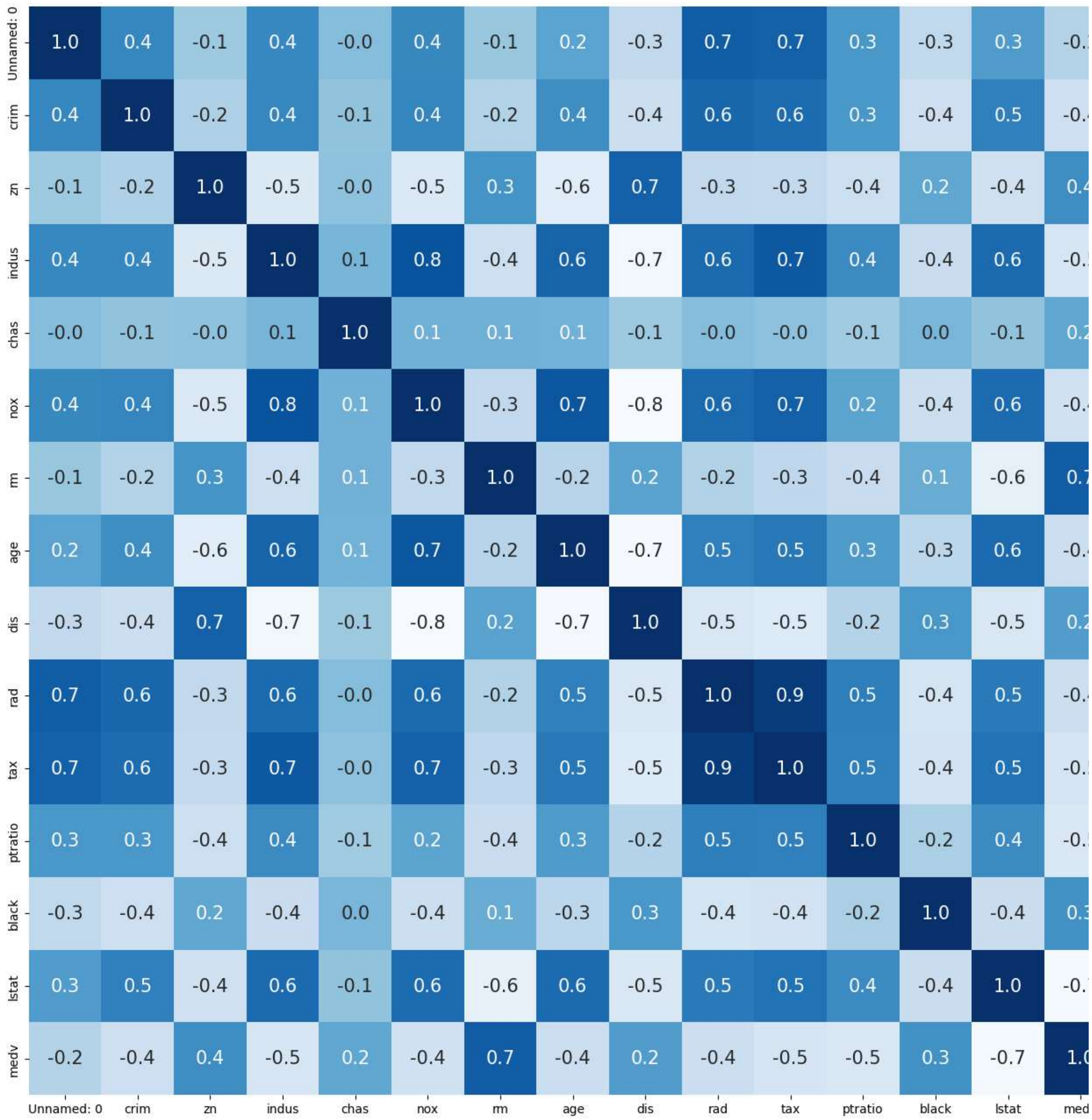
```
corr = BostonTrain.corr()
corr.shape
```

```
(15, 15)
```

```
 5   nox         506 non-null    float64
```

```
plt.figure(figsize=(20,20))
sns.heatmap(corr, cbar=True, square= True, fmt='.1f', annot=True, annot_kws={'size':15}, cmap='Blues')
```

```
<Axes: >
```




```
X = BostonTrain.drop(['medv'], axis = 1)
y = BostonTrain['medv']
```

```
# Splitting to training and testing data

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 = 4)
```

```
from sklearn.linear_model import LinearRegression

# Create a Linear regressor
lm = LinearRegression()

# Train the model using the training sets
lm.fit(X_train, y_train)
LinearRegression(copy_X=True, fit_intercept=True, n_jobs=None)
```

```
▾ LinearRegression
LinearRegression()
```

```
lm.intercept_
```

```
36.16448443981083
```

```
coeffcients = pd.DataFrame([X_train.columns,lm.coef_]).T
coeffcients = coeffcients.rename(columns={0: 'Attribute', 1: 'Coefficients'})
coeffcients
```

	Attribute	Coefficients
0	Unnamed: 0	-0.002223
1	crim	-0.123405
2	zn	0.057502
3	indus	-0.008676
4	chas	4.683688
5	nox	-14.127075
6	rm	3.320913
7	age	-0.005862
8	dis	-1.563919
9	rad	0.344319
10	tax	-0.013476
11	ptratio	-0.796731
12	black	0.009382
13	lstat	-0.525367

```
y_pred = lm.predict(X_train)
# Model Evaluation
print('R^2:',metrics.r2_score(y_train, y_pred))
print('Adjusted R^2:',1 - (1-metrics.r2_score(y_train, y_pred))*(len(y_train)-1)/(len(y_train)-X_train.shape[
print('MAE:',metrics.mean_absolute_error(y_train, y_pred))
print('MSE:',metrics.mean_squared_error(y_train, y_pred))
print('RMSE:',np.sqrt(metrics.mean_squared_error(y_train, y_pred)))
```

```
R^2: 0.7472849101482609
Adjusted R^2: 0.7368482987679531
```

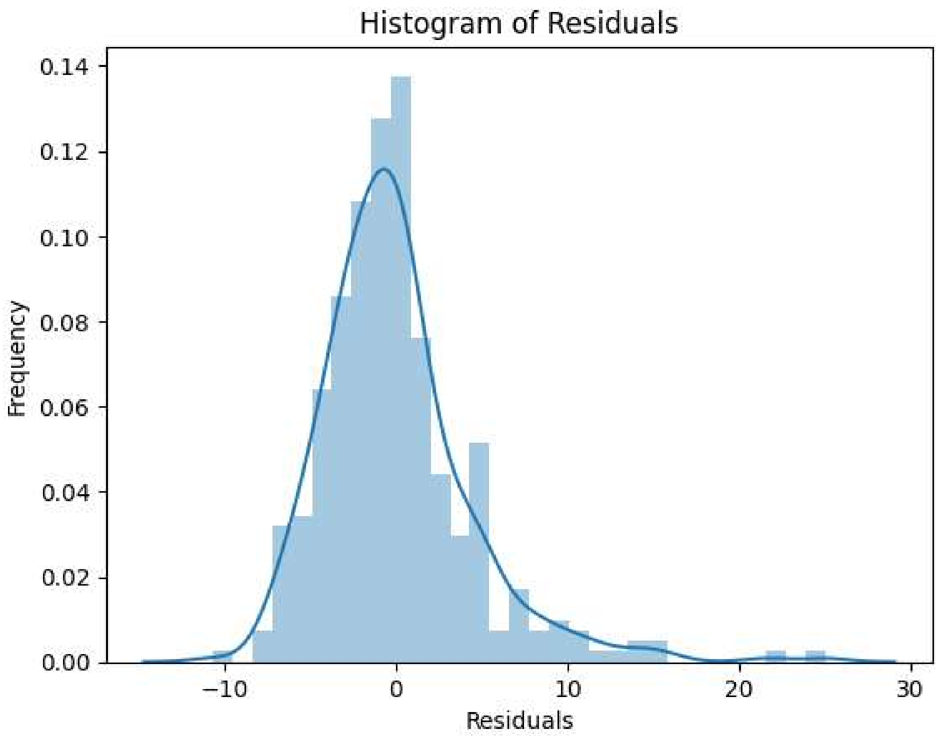
```
MAE: 3.079972468824701
MSE: 19.022074481402168
RMSE: 4.36143032518028
```

```
plt.scatter(y_train, y_pred)
plt.xlabel("Medv")
plt.ylabel("Predicted prices")
plt.title("Prices vs Predicted prices")
plt.show()
```


```
plt.scatter(y_pred,y_train-y_pred)
plt.title("Predicted vs residuals")
plt.xlabel("Predicted")
plt.ylabel("Residuals")
plt.show()
```

```
sns.distplot(y_train-y_pred)
plt.title("Histogram of Residuals")
plt.xlabel("Residuals")
plt.ylabel("Frequency")
plt.show()
```

```
<ipython-input-24-3959bf587b5e>:1: UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751

  sns.distplot(y_train-y_pred)
```




```
y_test_pred = lm.predict(X_test)
# Model Evaluation
acc_linreg = metrics.r2_score(y_test, y_test_pred)
print('R^2:', acc_linreg)
print('Adjusted R^2:',1 - (1-metrics.r2_score(y_test, y_test_pred))*(len(y_test)-1)/(len(y_test)-X_test.shape
print('MAE:',metrics.mean_absolute_error(y_test, y_test_pred))
print('MSE:',metrics.mean_squared_error(y_test, y_test_pred))
print('RMSE:',np.sqrt(metrics.mean_squared_error(y_test, y_test_pred)))
```

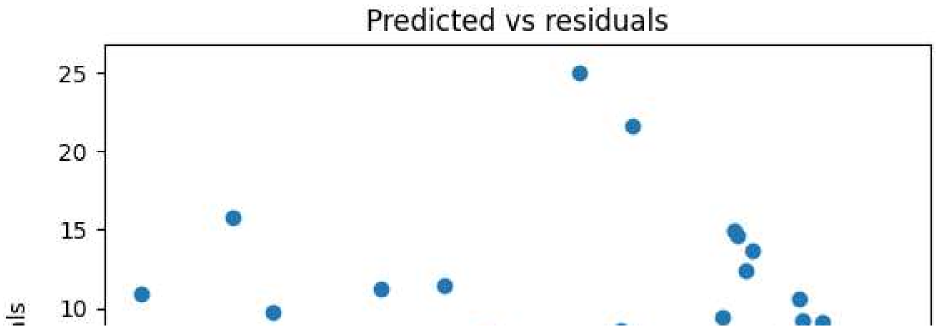
```
R^2: 0.7134033837044166
Adjusted R^2: 0.6841161382435541
MAE: 3.854992058726411
MSE: 29.92643938932016
RMSE: 5.47050631928345
```

```
from sklearn.ensemble import RandomForestRegressor

# Create a Random Forest Regressor
reg = RandomForestRegressor()

# Train the model using the training sets
reg.fit(X_train, y_train)
```

```
▾ RandomForestRegressor
RandomForestRegressor()
```

```
plt.scatter(y_train, y_pred)
plt.xlabel("medv")
plt.ylabel("Predicted prices")
plt.title("Prices vs Predicted prices")
plt.show()
```


```
plt.scatter(y_pred,y_train-y_pred)
plt.title("Predicted vs residuals")
plt.xlabel("Predicted")
plt.ylabel("Residuals")
plt.show()
```




```
y_test_pred = reg.predict(X_test)
# Model Evaluation
acc_rf = metrics.r2_score(y_test, y_test_pred)
print('R^2:', acc_rf)
print('Adjusted R^2:',1 - (1-metrics.r2_score(y_test, y_test_pred))*(len(y_test)-1)/(len(y_test)-X_test.shape
print('MAE:',metrics.mean_absolute_error(y_test, y_test_pred))
print('MSE:',metrics.mean_squared_error(y_test, y_test_pred))
print('RMSE:',np.sqrt(metrics.mean_squared_error(y_test, y_test_pred)))
```

```
R^2: 0.8366030910225934
Adjusted R^2: 0.8199055966745373
MAE: 2.436598684210526
MSE: 17.061917046052635
RMSE: 4.130607345906003
```

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