```
# Import libraries
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

```
import os
os.environ['KAGGLE_CONFIG_DIR'] = '/content/drive/My Drive/kaggle'
```

```
%cd /content/drive/My Drive/kaggle
```

```
/content/drive/My Drive/kaggle
```

```
!kaggle datasets download -d camnugent/california-housing-prices
```

```
california-housing-prices.zip: Skipping, found more recently modified local copy (use --force to force download)
```

```
!unzip \*.zip && rm *.zip
```

```
Archive:  california-housing-prices.zip
replace housing.csv? [y]es, [n]o, [A]ll, [N]one, [r]ename: y
  inflating: housing.csv
```

```
data = pd.read_csv("/content/drive/MyDrive/kaggle/housing.csv")
```

```
data
```

	longitude	latitude	housing_median_age	total_rooms	total_bedrooms	population	households	median_income	median_h
0	-122.23	37.88	41.0	880.0	129.0	322.0	126.0	8.3252	
1	-122.22	37.86	21.0	7099.0	1106.0	2401.0	1138.0	8.3014	
2	-122.24	37.85	52.0	1467.0	190.0	496.0	177.0	7.2574	
3	-122.25	37.85	52.0	1274.0	235.0	558.0	219.0	5.6431	
4	-122.25	37.85	52.0	1627.0	280.0	565.0	259.0	3.8462	
...	...	...	...	...	...	...	...	...	
20635	-121.09	39.48	25.0	1665.0	374.0	845.0	330.0	1.5603	
20636	-121.21	39.49	18.0	697.0	150.0	356.0	114.0	2.5568	
20637	-121.22	39.43	17.0	2254.0	485.0	1007.0	433.0	1.7000	
20638	-121.32	39.43	18.0	1860.0	409.0	741.0	349.0	1.8672	
20639	-121.24	39.37	16.0	2785.0	616.0	1387.0	530.0	2.3886	

20640 rows × 10 columns

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 20640 entries, 0 to 20639
Data columns (total 10 columns):
 #   Column              Non-Null Count  Dtype
---  ------              --------------  -----
 0   longitude           20640 non-null  float64
 1   latitude            20640 non-null  float64
 2   housing_median_age  20640 non-null  float64
 3   total_rooms         20640 non-null  float64
 4   total_bedrooms      20433 non-null  float64
 5   population          20640 non-null  float64
 6   households          20640 non-null  float64
 7   median_income       20640 non-null  float64
 8   median_house_value  20640 non-null  float64
 9   ocean_proximity     20640 non-null  object
dtypes: float64(9), object(1)
memory usage: 1.6+ MB
```

```
data.dropna(inplace=True)
```

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 20433 entries, 0 to 20639
Data columns (total 10 columns):
```

```
 #   Column              Non-Null Count  Dtype
---  ------              --------------  -----
 0   longitude           20433 non-null  float64
 1   latitude            20433 non-null  float64
 2   housing_median_age  20433 non-null  float64
 3   total_rooms         20433 non-null  float64
 4   total_bedrooms      20433 non-null  float64
 5   population          20433 non-null  float64
 6   households          20433 non-null  float64
 7   median_income       20433 non-null  float64
 8   median_house_value  20433 non-null  float64
 9   ocean_proximity     20433 non-null  object
dtypes: float64(9), object(1)
memory usage: 1.7+ MB
```

```
from sklearn.model_selection import train_test_split

X = data.drop(['median_house_value'], axis=1)
y = data['median_house_value']
```

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2)
```

```
train_data = X_train.join(y_train)
```

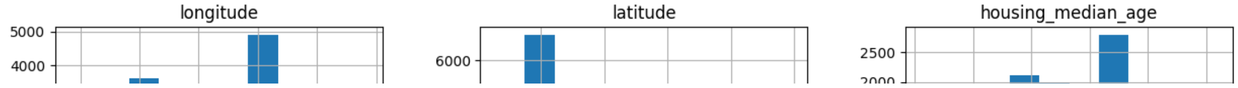
```
train_data
```

	longitude	latitude	housing_median_age	total_rooms	total_bedrooms	population	households	median_income	ocean_pr
7415	-118.22	33.94	42.0	1046.0	287.0	1218.0	289.0	2.6538	<1H
3799	-118.36	34.16	45.0	1755.0	335.0	822.0	342.0	5.1423	<1H
6063	-117.83	33.99	14.0	17527.0	2751.0	8380.0	2676.0	6.2734	<1H
92	-122.28	37.80	52.0	96.0	31.0	191.0	34.0	0.7500	NI
15273	-117.28	33.06	8.0	4172.0	1022.0	2585.0	941.0	4.0118	NEAR
...	...	...	...	...	...	...	...	...	
10040	-121.05	39.20	48.0	1759.0	389.0	716.0	350.0	2.3125	
6539	-118.04	34.04	35.0	1734.0	363.0	1527.0	344.0	3.0000	<1H
6969	-118.05	33.98	41.0	1694.0	413.0	1222.0	387.0	2.8311	<1H
13853	-117.31	34.50	14.0	2443.0	447.0	883.0	465.0	2.1111	
5617	-118.26	33.79	42.0	1162.0	264.0	1044.0	241.0	3.5488	<1H

16346 rows × 10 columns

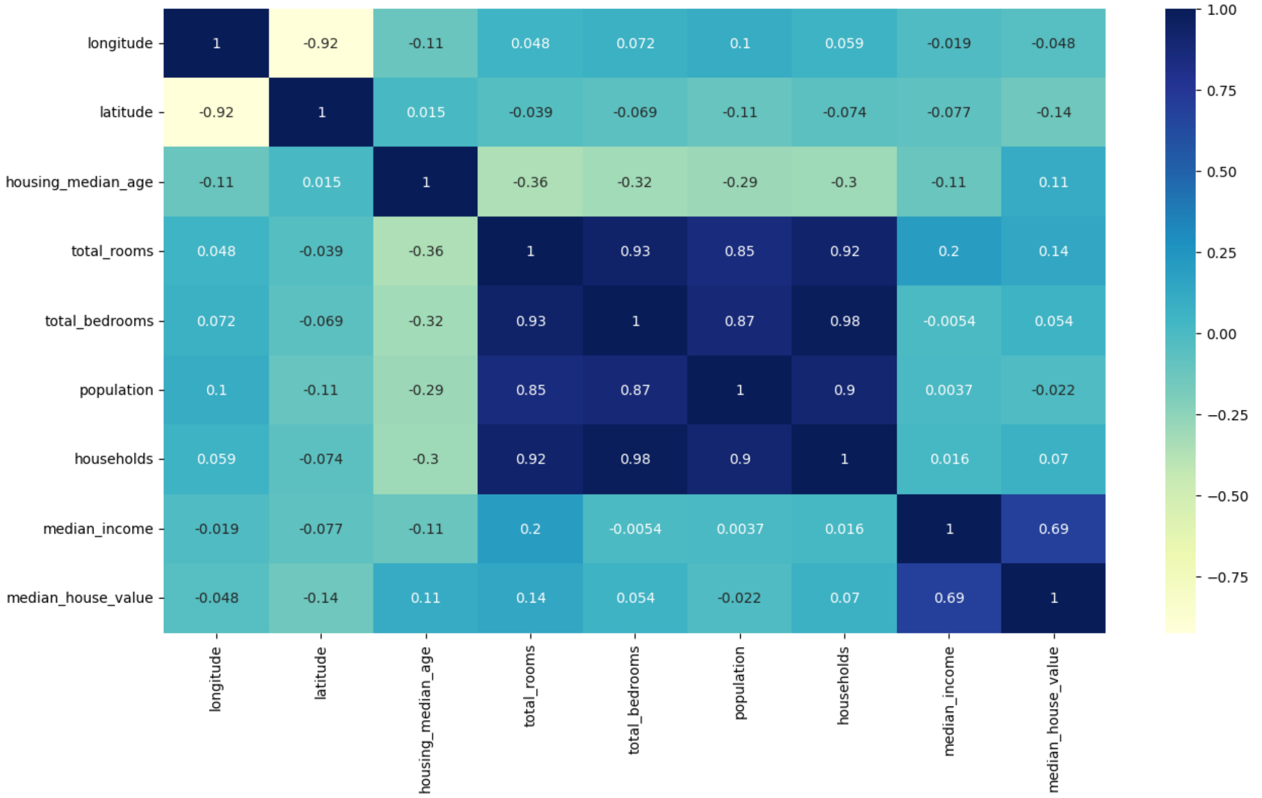
```
train_data.hist(figsize=(15, 8))
```

```
array([[<Axes: title={'center': 'longitude'}>,
        <Axes: title={'center': 'latitude'}>,
        <Axes: title={'center': 'housing_median_age'}>],
       [<Axes: title={'center': 'total_rooms'}>,
        <Axes: title={'center': 'total_bedrooms'}>,
        <Axes: title={'center': 'population'}>],
       [<Axes: title={'center': 'households'}>,
        <Axes: title={'center': 'median_income'}>,
        <Axes: title={'center': 'median_house_value'}>]], dtype=object)
```




```
plt.figure(figsize= (15,8) )
sns.heatmap(train_data.corr(), annot=True, cmap= "YlGnBu" )
```

```
<ipython-input-16-2fd49b6ee71a>:2: FutureWarning: The default value of numeric_only in DataFrame.corr is deprecated. In a f
  sns.heatmap(train_data.corr(), annot=True, cmap= "YlGnBu" )
<Axes: >
```

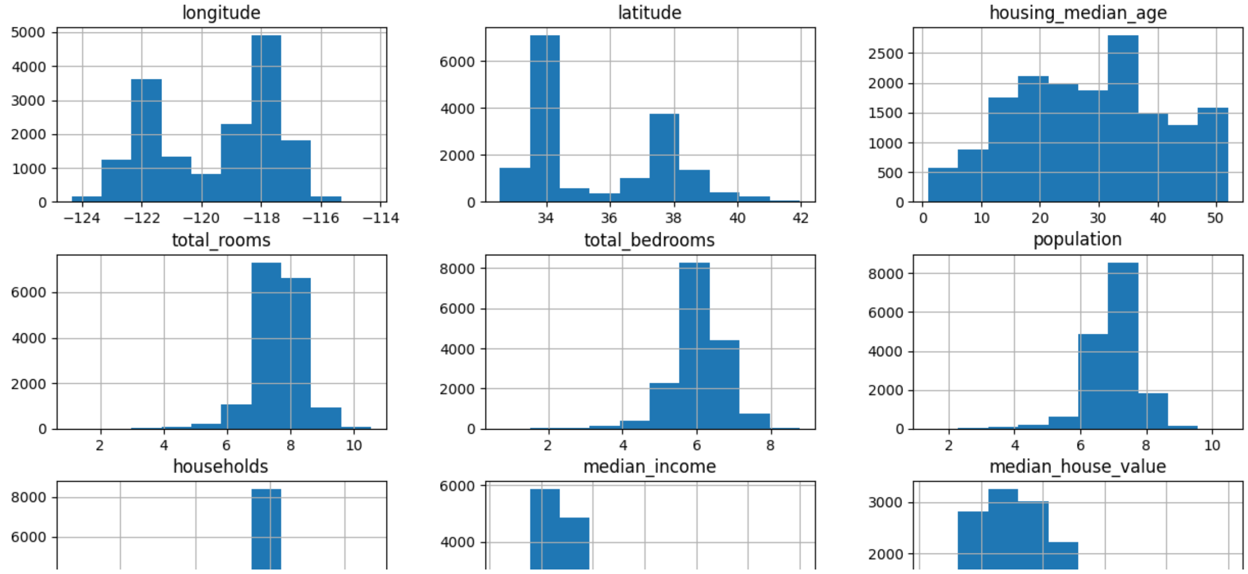



```
# Import libraries
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

```
train_data['total_rooms'] = np.log(train_data['total_rooms'] + 1)
train_data['total_bedrooms'] = np.log(train_data['total_bedrooms'] + 1)
train_data['population'] = np.log(train_data['population'] + 1)
train_data['households'] = np.log(train_data['households'] + 1)
```

```
train_data.hist(figsize=(15,8))
```

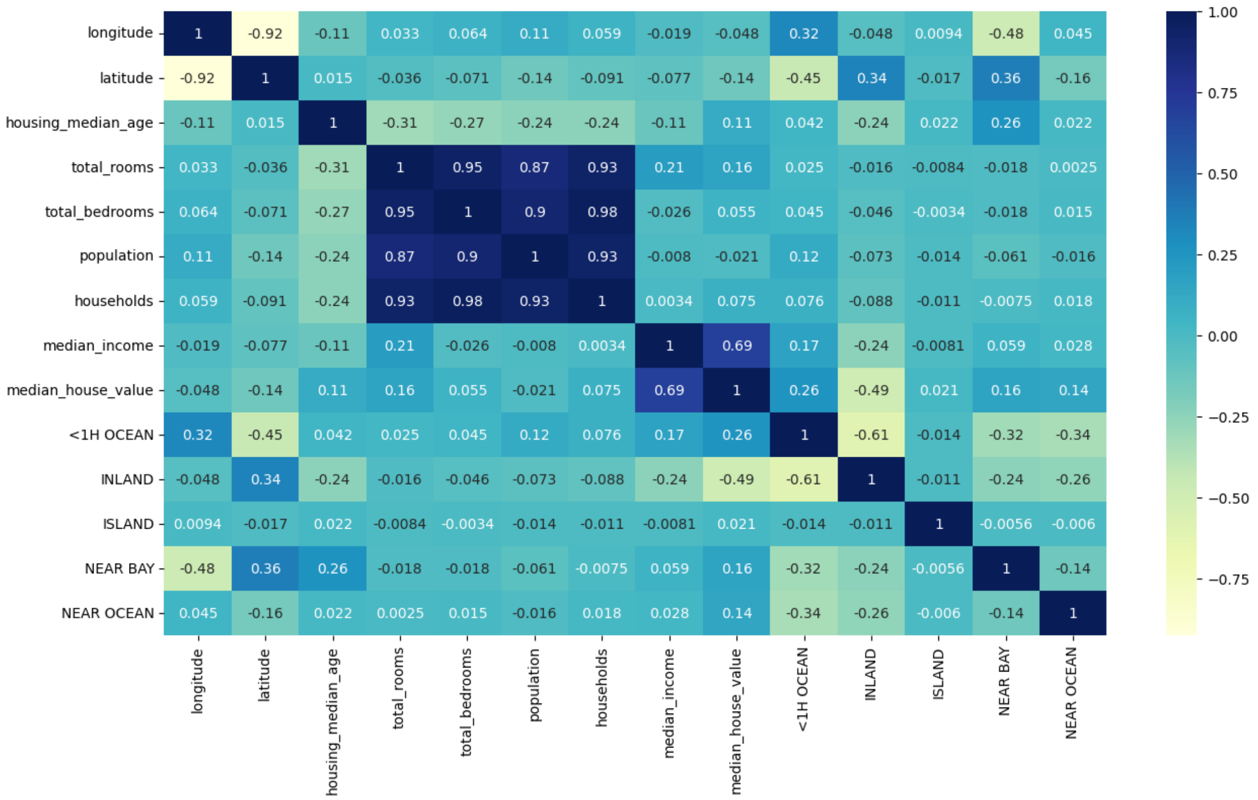
```
array([[<Axes: title={'center': 'longitude'}>,
        <Axes: title={'center': 'latitude'}>,
        <Axes: title={'center': 'housing_median_age'}>],
       [<Axes: title={'center': 'total_rooms'}>,
        <Axes: title={'center': 'total_bedrooms'}>,
        <Axes: title={'center': 'population'}>],
       [<Axes: title={'center': 'households'}>,
        <Axes: title={'center': 'median_income'}>,
        <Axes: title={'center': 'median_house_value'}>]], dtype=object)
```




```
train_data = train_data.join(pd.get_dummies(train_data.ocean_proximity)).drop(['ocean_proximity'], axis=1)
```

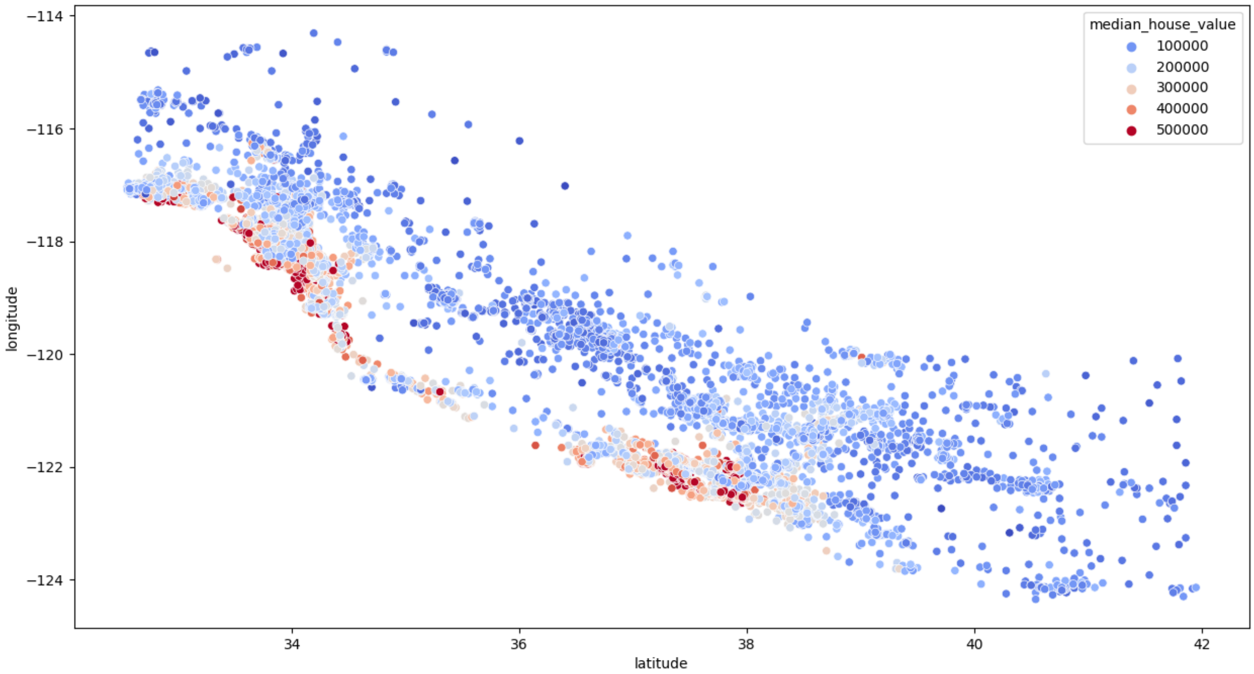
```
plt.figure(figsize= (15,8) )
sns.heatmap(train_data.corr(), annot=True, cmap= "YlGnBu" )
```

```
<Axes: >
```




```
plt.figure(figsize=(15,8))
sns.scatterplot(x="latitude", y="longitude", data=train_data, hue="median_house_value", palette="coolwarm")
```

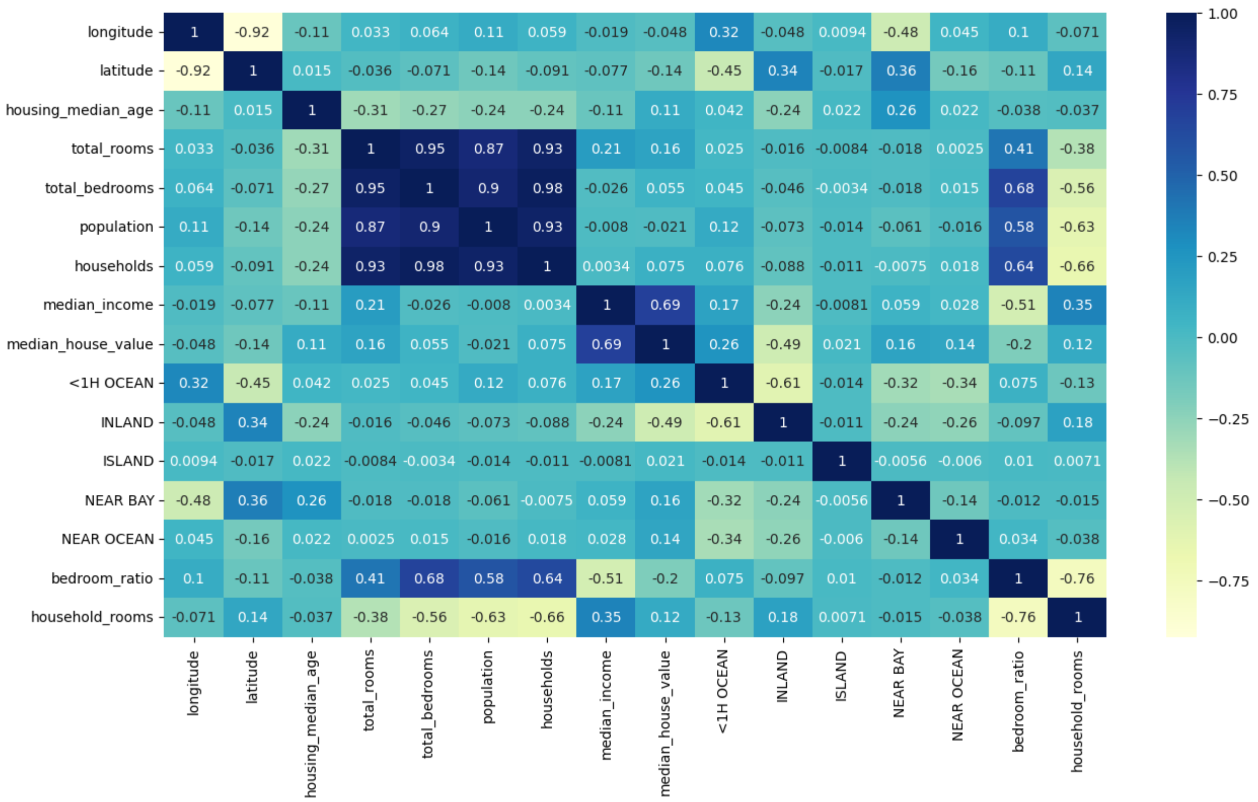
```
<Axes: xlabel='latitude', ylabel='longitude'>
```




```
train_data['bedroom_ratio'] = train_data['total_bedrooms'] / train_data['total_rooms']
train_data['household_rooms'] = train_data['total_rooms'] / train_data['households']
```

```
plt.figure(figsize= (15,8) )
sns.heatmap(train_data.corr(), annot=True, cmap= "YlGnBu" )
```

```
<Axes: >
```




```
from sklearn.linear_model import LinearRegression
from sklearn.preprocessing import StandardScaler

scaler = StandardScaler()
```

```
X_train, y_train = train_data.drop(['median_house_value'], axis=1), train_data['median_house_value']
X_train_s = scaler.fit_transform(X_train)

reg = LinearRegression()

reg.fit(X_train_s, y_train)
```

```
▾ LinearRegression
LinearRegression()
```

```
test_data = X_test.join(y_test)

test_data['total_rooms'] = np.log(test_data['total_rooms'] + 1)
test_data['total_bedrooms'] = np.log(test_data['total_bedrooms'] + 1)
test_data['population'] = np.log(test_data['population'] + 1)
test_data['households'] = np.log(test_data['households'] + 1)

test_data = test_data.join(pd.get_dummies(test_data.ocean_proximity)).drop(['ocean_proximity'], axis=1)

test_data['bedroom_ratio'] = test_data['total_bedrooms'] / test_data['total_rooms']
test_data['household_rooms'] = test_data['total_rooms'] / test_data['households']
```

```
X_test, y_test = test_data.drop(['median_house_value'], axis=1), test_data['median_house_value']
```

```
X_test_s = scaler.transform(X_test)
```

```
reg.score(X_test_s, y_test)
```

```
0.6662930852567805
```

```
from sklearn.ensemble import RandomForestRegressor

forest = RandomForestRegressor()

forest.fit(X_train_s, y_train)
```

```
▾ RandomForestRegressor
RandomForestRegressor()
```

```
forest.score(X_test_s, y_test)
```

```
0.8055368164709462
```

```
from sklearn.model_selection import GridSearchCV

forest = RandomForestRegressor()

param_grid = {
    "n_estimators": [100, 200, 300],
    "min_samples_split": [2, 4],
    "max_depth": [None, 4, 8]
}

grid_search = GridSearchCV(forest, param_grid, cv=5,
                          scoring="neg_mean_squared_error",
                          return_train_score=True)

grid_search.fit(X_train_s, y_train)
```

```
▸ GridSearchCV
▸ estimator: RandomForestRegressor
  ▸ RandomForestRegressor
```

```
grid_search.best_estimator_
```

```
▾ RandomForestRegressor
RandomForestRegressor(min_samples_split=4, n_estimators=300)
```

```
grid_search.best_estimator_.score(X_test_s, y_test)
```

```
0.8074470465364803
```