In [1]:
```
# This Python 3 environment comes with many helpful analytics libraries installed
# It is defined by the kaggle/python Docker image: https://github.com/kaggle/docker-python
# For example, here's several helpful packages to load

import numpy as np # linear algebra
import pandas as pd # data processing, CSV file I/O (e.g. pd.read_csv)
import seaborn as sns
import matplotlib.pyplot as plt

# Input data files are available in the read-only "../input/" directory
# For example, running this (by clicking run or pressing Sh'ift+Enter) will list all files under the input direc
tory

import os
for dirname, _, filenames in os.walk('/kaggle/input'):
    for filename in filenames:
        print(os.path.join(dirname, filename))

# You can write up to 20GB to the current directory (/kaggle/working/) that gets preserved as output when you cr
eate a version using "Save & Run All"
# You can also write temporary files to /kaggle/temp/, but they won't be saved outside of the current session
```

```
/kaggle/input/graduates-admission-prediction/admission_data.csv
```

In [2]:
```
df=pd.read_csv('../input/graduates-admission-prediction/admission_data.csv')
```

In [3]:
```
df.head()
```

Out[3]:

	GRE Score	TOEFL Score	University Rating	SOP	LOR	CGPA	Research	Chance of Admit
0	337	118	4	4.5	4.5	9.65	1	0.92
1	324	107	4	4.0	4.5	8.87	1	0.76
2	316	104	3	3.0	3.5	8.00	1	0.72
3	322	110	3	3.5	2.5	8.67	1	0.80
4	314	103	2	2.0	3.0	8.21	0	0.65

In [4]:
```
df.columns
```

Out[4]:
```
Index(['GRE Score', 'TOEFL Score', 'University Rating', 'SOP', 'LOR ', 'CGPA',
       'Research', 'Chance of Admit '],
      dtype='object')
```

In [5]:
```
df.isnull().any()
```

Out[5]:
```
GRE Score            False
TOEFL Score          False
University Rating    False
SOP                  False
LOR                  False
CGPA                 False
Research             False
Chance of Admit      False
dtype: bool
```

In [6]:
```
df.describe()
```

Out[6]:

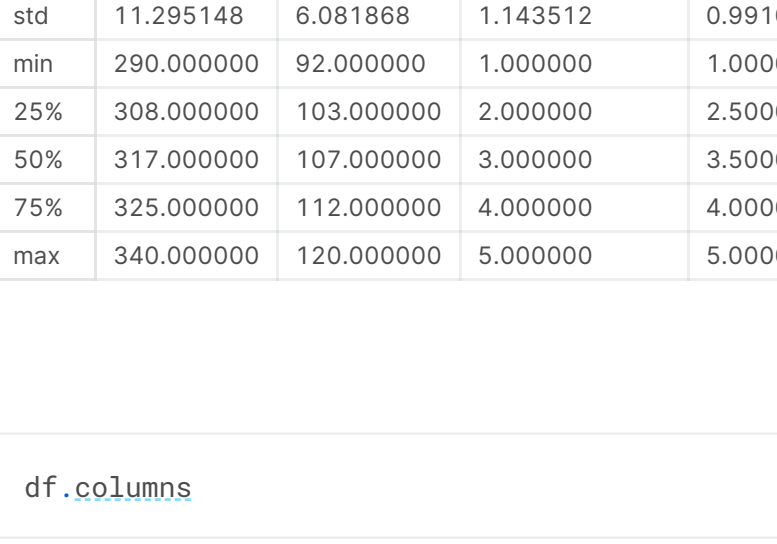
	GRE Score	TOEFL Score	University Rating	SOP	LOR	CGPA	Research	Chance of Admit
count	500.000000	500.000000	500.000000	500.000000	500.00000	500.000000	500.000000	500.00000
mean	316.472000	107.192000	3.114000	3.374000	3.48400	8.576440	0.560000	0.72174
std	11.295148	6.081868	1.143512	0.991004	0.92545	0.604813	0.496884	0.14114
min	290.000000	92.000000	1.000000	1.000000	1.00000	6.800000	0.000000	0.34000
25%	308.000000	103.000000	2.000000	2.500000	3.00000	8.127500	0.000000	0.63000
50%	317.000000	107.000000	3.000000	3.500000	3.50000	8.560000	1.000000	0.72000
75%	325.000000	112.000000	4.000000	4.000000	4.00000	9.040000	1.000000	0.82000
max	340.000000	120.000000	5.000000	5.000000	5.00000	9.920000	1.000000	0.97000

In [7]:
```
df.columns
```

Out[7]:
```
Index(['GRE Score', 'TOEFL Score', 'University Rating', 'SOP', 'LOR ', 'CGPA',
       'Research', 'Chance of Admit '],
      dtype='object')
```

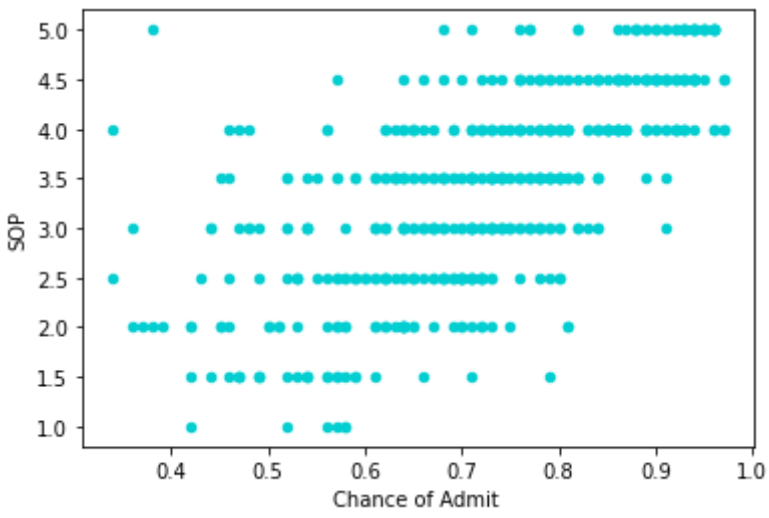
In [8]:
```
sns.countplot(x='Research',data=df)
```

Out[8]:
```
<AxesSubplot:xlabel='Research', ylabel='count'>
```



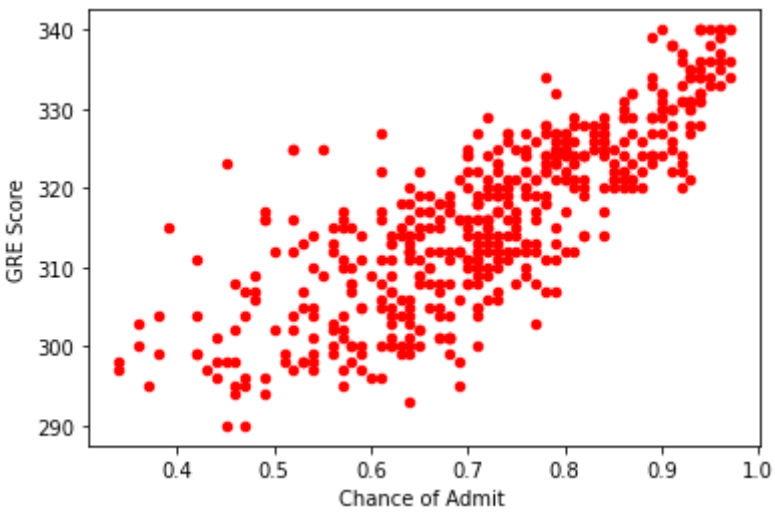
In [9]:
```
df.plot.scatter('Chance of Admit ','SOP', color = 'darkturquoise')
```

Out[9]:
```
<AxesSubplot:xlabel='Chance of Admit ', ylabel='SOP'>
```



In [10]:
```
df.plot.scatter('Chance of Admit ','GRE Score', color = 'red')
```

Out[10]:
```
<AxesSubplot:xlabel='Chance of Admit ', ylabel='GRE Score'>
```

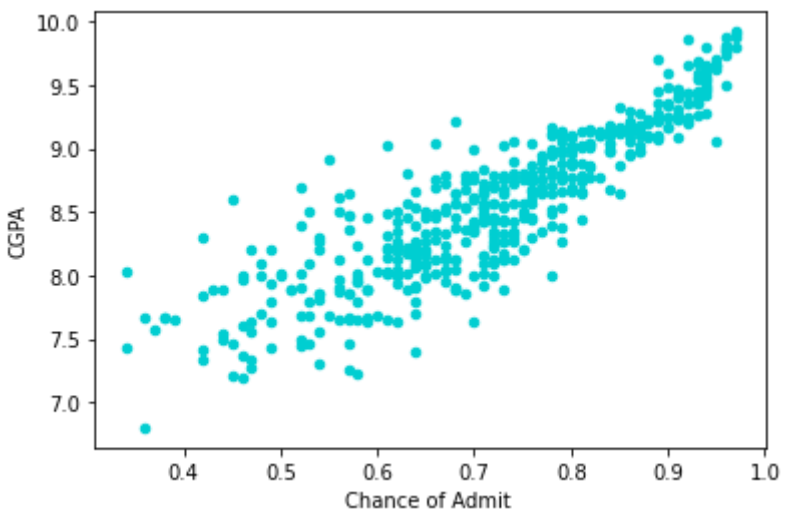


THE CHANCE OF GETTING AN ADMIT INCREASES WITH HIGH GRE SCORE.

THE IDEAL GRE SCORE IS 320+

In [11]:
```
df.plot.scatter('Chance of Admit ','CGPA', color = 'darkturquoise')
```

Out[11]:
```
<AxesSubplot:xlabel='Chance of Admit ', ylabel='CGPA'>
```

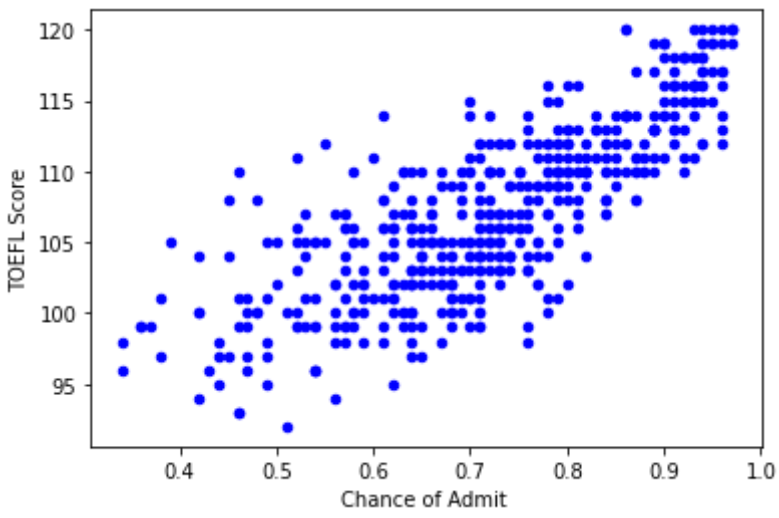


CHANCE OF ADMIT INCREASES WITH CGPA.

IDEAL CGPA IS 8.5 CGPA +

In [12]:
```
df.plot.scatter('Chance of Admit ','TOEFL Score', color = 'blue')
```

Out[12]:
```
<AxesSubplot:xlabel='Chance of Admit ', ylabel='TOEFL Score'>
```

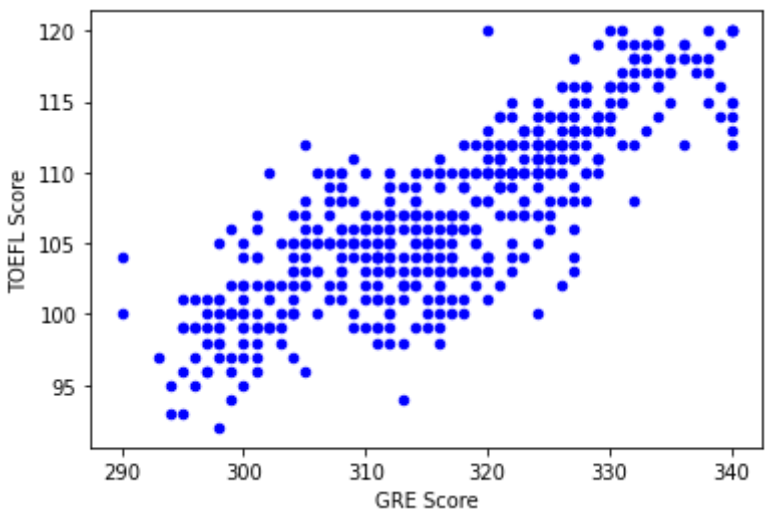


CHANCE OF ADMIT INCREASES WITH TOEFL SCORE

IDEAL SCORE IS 110 +

In [13]:
```
df.plot.scatter('GRE Score','TOEFL Score', color = 'blue')
```

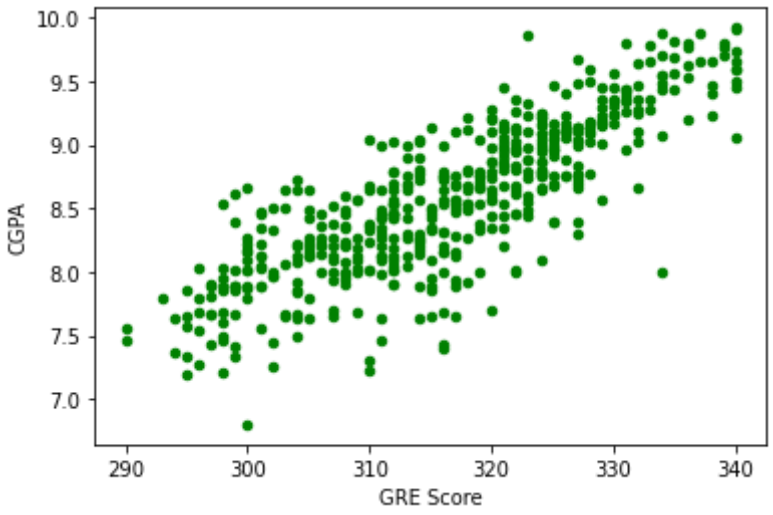
Out[13]:
```
<AxesSubplot:xlabel='GRE Score', ylabel='TOEFL Score'>
```



THE TREND OBSERVED IS THAT ASPIRANTS WHO SCORED BETTER IN GRE SCORED BETTER IN TOEFL AND VICE-VERSA

In [14]:
```
df.plot.scatter('GRE Score','CGPA', color = 'green')
```

Out[14]:
```
<AxesSubplot:xlabel='GRE Score', ylabel='CGPA'>
```

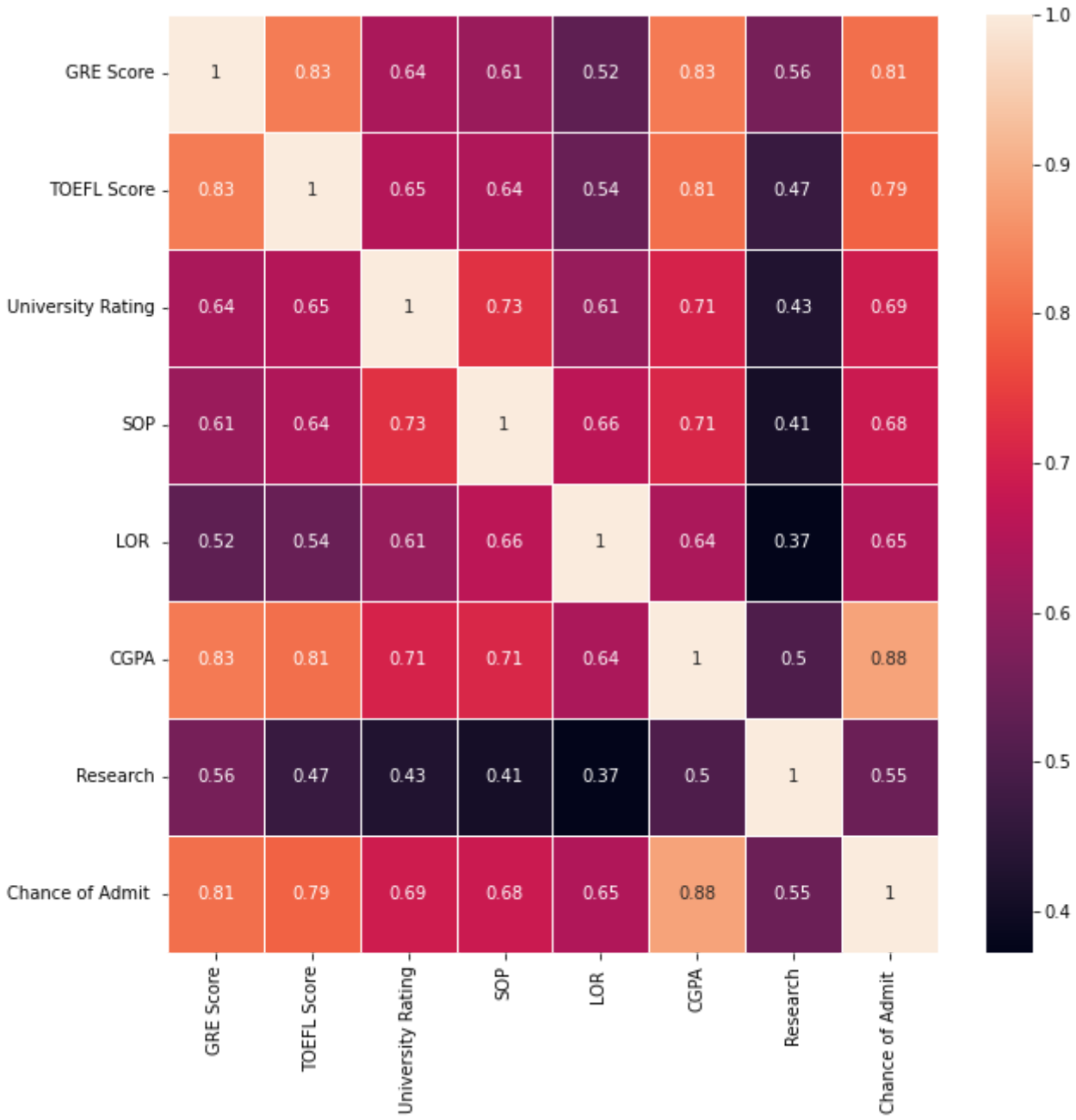


THE TREND OBSERVED IS THAT THOSE WHO HAVE A BETTER CGPA IN COLLEGE TEND TO SCORE BETTER IN GRE

In [15]:
```
X=df.drop(["Chance of Admit ",],axis=1)
y=df['Chance of Admit ']
```

In [16]:

```
import matplotlib.pyplot as plt
import seaborn as sns
plt.figure(figsize=(10,10))
sns.heatmap(df.corr(),linewidths=0.5,annot=True)
plt.show()
```



In [17]:

```
from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.2,random_state=2003)
```

In [18]:

```
X_train
```

Out[18]:

	GRE Score	TOEFL Score	University Rating	SOP	LOR	CGPA	Research
226	306	110	2	3.5	4.0	8.45	0
31	327	103	3	4.0	4.0	8.30	1
279	304	102	2	3.0	4.0	8.73	0
435	309	105	2	2.5	4.0	7.68	0
90	318	106	2	4.0	4.0	7.92	1
...	...	...	...	...	...	...	...
478	318	103	3	4.0	4.5	8.49	1
327	295	101	2	2.5	2.0	7.86	0
26	322	109	5	4.5	3.5	8.80	0
407	298	100	3	2.5	4.0	7.95	1
392	326	112	4	4.0	3.5	9.12	1

400 rows × 7 columns

In [19]:
```
X_test
```

Out[19]:

	GRE Score	TOEFL Score	University Rating	SOP	LOR	CGPA	Research
105	316	110	3	4.0	4.5	8.78	1
131	303	105	5	5.0	4.5	8.65	0
59	311	104	2	2.0	2.0	8.30	0
378	303	98	1	2.0	2.5	7.65	0
355	317	106	2	2.0	3.5	8.12	0
...	...	...	...	...	...	...	...
381	319	105	3	3.0	3.5	8.67	1
44	326	113	5	4.5	4.0	9.40	1
171	334	117	5	4.0	4.5	9.07	1
364	313	102	3	3.5	4.0	8.90	1
182	299	100	2	3.0	3.5	7.88	0

100 rows × 7 columns

In [20]:
```
y_train
```

Out[20]:
```
226    0.63
31     0.74
279    0.67
435    0.55
90     0.64
       ...
478    0.71
327    0.69
26     0.76
407    0.58
392    0.84
Name: Chance of Admit , Length: 400, dtype: float64
```

In [21]:
```
y_test
```

Out[21]:
```
105    0.69
131    0.77
59     0.42
378    0.56
355    0.73
       ...
381    0.73
44     0.91
171    0.89
364    0.77
182    0.68
Name: Chance of Admit , Length: 100, dtype: float64
```

In [22]:
```
from sklearn.ensemble import RandomForestRegressor
rf_classifier=RandomForestRegressor(n_estimators=100).fit(X_train,y_train)
prediction=rf_classifier.predict(X_test)
```

In [23]:
```
from sklearn.metrics import r2_score
r2_score(y_test, prediction)
```

Out[23]:
```
0.8081949202352426
```

In [24]:
```
from sklearn.model_selection import RandomizedSearchCV
n_estimators = [int(x) for x in np.linspace(start = 200, stop = 3000, num = 20)]
# Number of features to consider at every split
max_features = ['auto', 'sqrt','log2']
# Maximum number of levels in tree
max_depth = [int(x) for x in np.linspace(10, 1000,20)]
# Minimum number of samples required to split a node
min_samples_split = [2, 5, 10,15,20]
# Minimum number of samples required at each leaf node
min_samples_leaf = [1, 3, 5,7,9,15]
# Create the random grid
random_grid = {'n_estimators': n_estimators,
               'max_features': max_features,
               'max_depth': max_depth,
               'min_samples_split': min_samples_split,
               'min_samples_leaf': min_samples_leaf,
              'criterion':["squared_error", "absolute_error", "poisson"]}
print(random_grid)
```

```
{'n_estimators': [200, 347, 494, 642, 789, 936, 1084, 1231, 1378, 1526, 1673, 1821, 1968, 2115, 2263, 241
0, 2557, 2705, 2852, 3000], 'max_features': ['auto', 'sqrt', 'log2'], 'max_depth': [10, 62, 114, 166, 218,
270, 322, 374, 426, 478, 531, 583, 635, 687, 739, 791, 843, 895, 947, 1000], 'min_samples_split': [2, 5, 1
0, 15, 20], 'min_samples_leaf': [1, 3, 5, 7, 9, 15], 'criterion': ['squared_error', 'absolute_error', 'poi
sson']}
```

In [25]:

```
rf=RandomForestRegressor()
rf_randomcv=RandomizedSearchCV(estimator=rf,param_distributions=random_grid,n_iter=100,cv=3,verbose=2,
                               random_state=100,n_jobs=-1)
rf_randomcv.fit(X_train,y_train)
```

```
Fitting 3 folds for each of 100 candidates, totalling 300 fits
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
2, n_estimators=1378; total time=   6.1s
[CV] END criterion=poisson, max_depth=218, max_features=auto, min_samples_leaf=9, min_samples_split=20, n_
estimators=642; total time=   1.6s
[CV] END criterion=poisson, max_depth=218, max_features=auto, min_samples_leaf=9, min_samples_split=20, n_
estimators=642; total time=   1.6s
[CV] END criterion=poisson, max_depth=166, max_features=auto, min_samples_leaf=5, min_samples_split=10, n_
estimators=2410; total time=   7.1s
[CV] END criterion=absolute_error, max_depth=843, max_features=sqrt, min_samples_leaf=5, min_samples_split
=2, n_estimators=2410; total time=   7.2s
[CV] END criterion=poisson, max_depth=270, max_features=log2, min_samples_leaf=1, min_samples_split=15, n_
estimators=1673; total time=   4.1s
[CV] END criterion=squared_error, max_depth=374, max_features=log2, min_samples_leaf=9, min_samples_split=
15, n_estimators=200; total time=   0.5s
[CV] END criterion=squared_error, max_depth=374, max_features=log2, min_samples_leaf=9, min_samples_split=
15, n_estimators=200; total time=   0.5s
[CV] END criterion=squared_error, max_depth=374, max_features=log2, min_samples_leaf=9, min_samples_split=
15, n_estimators=200; total time=   0.4s
[CV] END criterion=poisson, max_depth=114, max_features=auto, min_samples_leaf=1, min_samples_split=2, n_e
stimators=2852; total time=  13.0s
[CV] END criterion=squared_error, max_depth=374, max_features=log2, min_samples_leaf=1, min_samples_split=
20, n_estimators=1673; total time=   4.0s
[CV] END criterion=poisson, max_depth=1000, max_features=auto, min_samples_leaf=1, min_samples_split=2, n_
estimators=1673; total time=   7.4s
[CV] END criterion=absolute_error, max_depth=374, max_features=log2, min_samples_leaf=3, min_samples_split
=10, n_estimators=2263; total time=   7.1s
[CV] END criterion=poisson, max_depth=374, max_features=log2, min_samples_leaf=9, min_samples_split=20, n_
estimators=2557; total time=   5.7s
[CV] END criterion=poisson, max_depth=531, max_features=log2, min_samples_leaf=15, min_samples_split=20, n
_estimators=1821; total time=   3.9s
[CV] END criterion=squared_error, max_depth=478, max_features=log2, min_samples_leaf=7, min_samples_split=
5, n_estimators=789; total time=   1.7s
[CV] END criterion=squared_error, max_depth=218, max_features=auto, min_samples_leaf=15, min_samples_split
=5, n_estimators=2852; total time=   6.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=3, min_samples_split=
5, n_estimators=2705; total time=   8.7s
[CV] END criterion=poisson, max_depth=218, max_features=log2, min_samples_leaf=15, min_samples_split=20, n
_estimators=1526; total time=   3.7s
[CV] END criterion=squared_error, max_depth=166, max_features=sqrt, min_samples_leaf=5, min_samples_split=
5, n_estimators=1673; total time=   3.7s
[CV] END criterion=absolute_error, max_depth=1000, max_features=sqrt, min_samples_leaf=15, min_samples_spl
it=5, n_estimators=642; total time=   1.7s
[CV] END criterion=absolute_error, max_depth=1000, max_features=sqrt, min_samples_leaf=15, min_samples_spl
it=5, n_estimators=642; total time=   1.7s
[CV] END criterion=poisson, max_depth=322, max_features=sqrt, min_samples_leaf=9, min_samples_split=5, n_e
stimators=200; total time=   0.4s
[CV] END criterion=squared_error, max_depth=843, max_features=log2, min_samples_leaf=15, min_samples_split
=20, n_estimators=2557; total time=   5.2s
[CV] END criterion=squared_error, max_depth=791, max_features=auto, min_samples_leaf=1, min_samples_split=
5, n_estimators=3000; total time=   7.9s
[CV] END criterion=squared_error, max_depth=1000, max_features=log2, min_samples_leaf=15, min_samples_spli
t=20, n_estimators=347; total time=   0.7s
[CV] END criterion=squared_error, max_depth=1000, max_features=log2, min_samples_leaf=15, min_samples_spli
t=20, n_estimators=347; total time=   0.7s
[CV] END criterion=squared_error, max_depth=166, max_features=log2, min_samples_leaf=7, min_samples_split=
2, n_estimators=347; total time=   0.7s
[CV] END criterion=absolute_error, max_depth=531, max_features=sqrt, min_samples_leaf=7, min_samples_split
=20, n_estimators=2410; total time=   6.9s
[CV] END criterion=poisson, max_depth=687, max_features=sqrt, min_samples_leaf=7, min_samples_split=2, n_e
stimators=936; total time=   2.1s
[CV] END criterion=poisson, max_depth=687, max_features=sqrt, min_samples_leaf=7, min_samples_split=2, n_e
```

```
stimators=936; total time=   2.1s
[CV] END criterion=poisson, max_depth=687, max_features=sqrt, min_samples_leaf=7, min_samples_split=2, n_e
stimators=936; total time=   2.1s
[CV] END criterion=absolute_error, max_depth=218, max_features=log2, min_samples_leaf=1, min_samples_split
=15, n_estimators=642; total time=   2.1s
[CV] END criterion=poisson, max_depth=114, max_features=auto, min_samples_leaf=9, min_samples_split=20, n_
estimators=2115; total time=   5.6s
[CV] END criterion=poisson, max_depth=374, max_features=sqrt, min_samples_leaf=9, min_samples_split=20, n_
estimators=1231; total time=   2.8s
[CV] END criterion=squared_error, max_depth=583, max_features=log2, min_samples_leaf=5, min_samples_split=
10, n_estimators=642; total time=   1.3s
[CV] END criterion=absolute_error, max_depth=478, max_features=auto, min_samples_leaf=7, min_samples_split
=15, n_estimators=200; total time=   0.9s
[CV] END criterion=absolute_error, max_depth=374, max_features=auto, min_samples_leaf=15, min_samples_spli
t=10, n_estimators=2263; total time=   8.8s
[CV] END criterion=poisson, max_depth=895, max_features=auto, min_samples_leaf=9, min_samples_split=2, n_e
stimators=2705; total time=   7.1s
[CV] END criterion=squared_error, max_depth=1000, max_features=sqrt, min_samples_leaf=9, min_samples_split
=20, n_estimators=2263; total time=   4.8s
[CV] END criterion=absolute_error, max_depth=739, max_features=auto, min_samples_leaf=1, min_samples_split
=10, n_estimators=200; total time=   1.2s
[CV] END criterion=absolute_error, max_depth=739, max_features=auto, min_samples_leaf=1, min_samples_split
=10, n_estimators=200; total time=   1.3s
[CV] END criterion=absolute_error, max_depth=739, max_features=log2, min_samples_leaf=9, min_samples_split
=5, n_estimators=2115; total time=   6.0s
[CV] END criterion=absolute_error, max_depth=947, max_features=auto, min_samples_leaf=3, min_samples_split
=5, n_estimators=1378; total time=   7.6s
[CV] END criterion=squared_error, max_depth=322, max_features=sqrt, min_samples_leaf=3, min_samples_split=
15, n_estimators=1231; total time=   2.6s
[CV] END criterion=squared_error, max_depth=947, max_features=auto, min_samples_leaf=1, min_samples_split=
5, n_estimators=642; total time=   1.7s
[CV] END criterion=squared_error, max_depth=10, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=1084; total time=   2.4s
[CV] END criterion=squared_error, max_depth=10, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=1084; total time=   2.3s
[CV] END criterion=squared_error, max_depth=270, max_features=log2, min_samples_leaf=5, min_samples_split=
2, n_estimators=1968; total time=   4.3s
[CV] END criterion=squared_error, max_depth=531, max_features=sqrt, min_samples_leaf=1, min_samples_split=
5, n_estimators=789; total time=   2.3s
[CV] END criterion=squared_error, max_depth=531, max_features=sqrt, min_samples_leaf=1, min_samples_split=
5, n_estimators=789; total time=   1.8s
[CV] END criterion=absolute_error, max_depth=478, max_features=log2, min_samples_leaf=5, min_samples_split
=20, n_estimators=936; total time=   2.8s
[CV] END criterion=absolute_error, max_depth=478, max_features=log2, min_samples_leaf=5, min_samples_split
=20, n_estimators=936; total time=   2.7s
[CV] END criterion=absolute_error, max_depth=478, max_features=log2, min_samples_leaf=5, min_samples_split
=20, n_estimators=936; total time=   2.8s
[CV] END criterion=poisson, max_depth=62, max_features=log2, min_samples_leaf=5, min_samples_split=15, n_e
stimators=2705; total time=   6.5s
[CV] END criterion=absolute_error, max_depth=114, max_features=log2, min_samples_leaf=3, min_samples_split
=15, n_estimators=2705; total time=   8.6s
[CV] END criterion=absolute_error, max_depth=1000, max_features=log2, min_samples_leaf=7, min_samples_spli
t=10, n_estimators=1378; total time=   4.1s[CV] END criterion=absolute_error, max_depth=62, max_features=s
qrt, min_samples_leaf=1, min_samples_split=2, n_estimators=1378; total time=   5.7s
[CV] END criterion=absolute_error, max_depth=583, max_features=auto, min_samples_leaf=5, min_samples_split
=20, n_estimators=1378; total time=   6.3s
[CV] END criterion=poisson, max_depth=166, max_features=auto, min_samples_leaf=5, min_samples_split=10, n_
estimators=2410; total time=   7.2s
[CV] END criterion=poisson, max_depth=270, max_features=sqrt, min_samples_leaf=5, min_samples_split=10, n_
estimators=200; total time=   0.5s
[CV] END criterion=poisson, max_depth=270, max_features=sqrt, min_samples_leaf=5, min_samples_split=10, n_
estimators=200; total time=   0.5s
[CV] END criterion=absolute_error, max_depth=791, max_features=auto, min_samples_leaf=7, min_samples_split
```

```
=15, n_estimators=1673; total time=   7.7s
[CV] END criterion=poisson, max_depth=270, max_features=log2, min_samples_leaf=1, min_samples_split=15, n_
estimators=1673; total time=   4.2s
[CV] END criterion=squared_error, max_depth=583, max_features=sqrt, min_samples_leaf=3, min_samples_split=
5, n_estimators=2115; total time=   4.5s
[CV] END criterion=squared_error, max_depth=583, max_features=sqrt, min_samples_leaf=3, min_samples_split=
5, n_estimators=2115; total time=   4.5s
[CV] END criterion=squared_error, max_depth=583, max_features=sqrt, min_samples_leaf=3, min_samples_split=
5, n_estimators=2115; total time=   4.9s
[CV] END criterion=poisson, max_depth=1000, max_features=auto, min_samples_leaf=1, min_samples_split=2, n_
estimators=1673; total time=   7.6s
[CV] END criterion=absolute_error, max_depth=374, max_features=log2, min_samples_leaf=3, min_samples_split
=10, n_estimators=2263; total time=   7.2s
[CV] END criterion=poisson, max_depth=374, max_features=log2, min_samples_leaf=9, min_samples_split=20, n_
estimators=2557; total time=   5.7s
[CV] END criterion=poisson, max_depth=531, max_features=log2, min_samples_leaf=15, min_samples_split=20, n
_estimators=1821; total time=   3.9s
[CV] END criterion=squared_error, max_depth=478, max_features=log2, min_samples_leaf=7, min_samples_split=
5, n_estimators=789; total time=   1.7s
[CV] END criterion=squared_error, max_depth=218, max_features=auto, min_samples_leaf=15, min_samples_split
=5, n_estimators=2852; total time=   6.4s
[CV] END criterion=absolute_error, max_depth=166, max_features=sqrt, min_samples_leaf=9, min_samples_split
=20, n_estimators=1821; total time=   5.2s
[CV] END criterion=poisson, max_depth=218, max_features=log2, min_samples_leaf=15, min_samples_split=20, n
_estimators=1526; total time=   3.2s
[CV] END criterion=poisson, max_depth=218, max_features=log2, min_samples_leaf=15, min_samples_split=20, n
_estimators=1526; total time=   3.4s
[CV] END criterion=squared_error, max_depth=166, max_features=sqrt, min_samples_leaf=5, min_samples_split=
5, n_estimators=1673; total time=   3.6s
[CV] END criterion=poisson, max_depth=322, max_features=log2, min_samples_leaf=7, min_samples_split=10, n_
estimators=2263; total time=   5.0s
[CV] END criterion=squared_error, max_depth=791, max_features=auto, min_samples_leaf=1, min_samples_split=
5, n_estimators=3000; total time=   7.8s
[CV] END criterion=squared_error, max_depth=583, max_features=log2, min_samples_leaf=7, min_samples_split=
15, n_estimators=2705; total time=   5.7s
[CV] END criterion=squared_error, max_depth=166, max_features=log2, min_samples_leaf=7, min_samples_split=
2, n_estimators=347; total time=   0.7s
[CV] END criterion=absolute_error, max_depth=531, max_features=sqrt, min_samples_leaf=7, min_samples_split
=20, n_estimators=2410; total time=   6.9s
[CV] END criterion=poisson, max_depth=166, max_features=auto, min_samples_leaf=7, min_samples_split=10, n_
estimators=2410; total time=   6.9s
[CV] END criterion=absolute_error, max_depth=218, max_features=log2, min_samples_leaf=1, min_samples_split
=15, n_estimators=642; total time=   2.1s
[CV] END criterion=poisson, max_depth=635, max_features=auto, min_samples_leaf=5, min_samples_split=20, n_
estimators=1526; total time=   4.6s
[CV] END criterion=poisson, max_depth=374, max_features=sqrt, min_samples_leaf=9, min_samples_split=20, n_
estimators=1231; total time=   2.7s
[CV] END criterion=poisson, max_depth=374, max_features=sqrt, min_samples_leaf=9, min_samples_split=20, n_
estimators=1231; total time=   2.7s
[CV] END criterion=absolute_error, max_depth=478, max_features=auto, min_samples_leaf=7, min_samples_split
=15, n_estimators=200; total time=   0.9s
[CV] END criterion=absolute_error, max_depth=374, max_features=auto, min_samples_leaf=15, min_samples_spli
t=10, n_estimators=2263; total time=   9.4s
[CV] END criterion=squared_error, max_depth=1000, max_features=sqrt, min_samples_leaf=9, min_samples_split
=20, n_estimators=2263; total time=   4.7s
[CV] END criterion=squared_error, max_depth=1000, max_features=sqrt, min_samples_leaf=9, min_samples_split
=20, n_estimators=2263; total time=   4.7s
[CV] END criterion=squared_error, max_depth=322, max_features=log2, min_samples_leaf=15, min_samples_split
=15, n_estimators=1821; total time=   3.8s
[CV] END criterion=squared_error, max_depth=687, max_features=auto, min_samples_leaf=7, min_samples_split=
20, n_estimators=1673; total time=   3.8s
[CV] END criterion=absolute_error, max_depth=739, max_features=log2, min_samples_leaf=9, min_samples_split
=5, n_estimators=2115; total time=   6.1s
```

```
[CV] END criterion=squared_error, max_depth=322, max_features=sqrt, min_samples_leaf=3, min_samples_split=
15, n_estimators=1231; total time=   2.5s
[CV] END criterion=squared_error, max_depth=322, max_features=sqrt, min_samples_leaf=3, min_samples_split=
15, n_estimators=1231; total time=   2.5s
[CV] END criterion=squared_error, max_depth=947, max_features=auto, min_samples_leaf=1, min_samples_split=
5, n_estimators=642; total time=   1.6s
[CV] END criterion=poisson, max_depth=843, max_features=log2, min_samples_leaf=5, min_samples_split=10, n_
estimators=2115; total time=   4.9s
[CV] END criterion=squared_error, max_depth=10, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=1084; total time=   2.4s
[CV] END criterion=poisson, max_depth=1000, max_features=auto, min_samples_leaf=15, min_samples_split=15,
n_estimators=1673; total time=   4.2s
[CV] END criterion=squared_error, max_depth=531, max_features=sqrt, min_samples_leaf=1, min_samples_split=
5, n_estimators=789; total time=   1.8s
[CV] END criterion=squared_error, max_depth=687, max_features=auto, min_samples_leaf=1, min_samples_split=
20, n_estimators=200; total time=   0.5s
[CV] END criterion=squared_error, max_depth=687, max_features=auto, min_samples_leaf=1, min_samples_split=
20, n_estimators=200; total time=   0.5s
[CV] END criterion=poisson, max_depth=947, max_features=sqrt, min_samples_leaf=7, min_samples_split=15, n_
estimators=2852; total time=   6.5s
[CV] END criterion=squared_error, max_depth=10, max_features=log2, min_samples_leaf=15, min_samples_split=
5, n_estimators=2852; total time=   6.1s
[CV] END criterion=poisson, max_depth=62, max_features=log2, min_samples_leaf=5, min_samples_split=15, n_e
stimators=2705; total time=   6.3s
[CV] END criterion=poisson, max_depth=947, max_features=sqrt, min_samples_leaf=15, min_samples_split=5, n_
estimators=936; total time=   2.0s
[CV] END criterion=poisson, max_depth=947, max_features=sqrt, min_samples_leaf=15, min_samples_split=5, n_
estimators=936; total time=   2.0s
[CV] END criterion=absolute_error, max_depth=1000, max_features=log2, min_samples_leaf=7, min_samples_spli
t=10, n_estimators=1378; total time=   4.1s
[CV] END criterion=poisson, max_depth=739, max_features=sqrt, min_samples_leaf=9, min_samples_split=5, n_e
stimators=1084; total time=   2.5s
[CV] END criterion=squared_error, max_depth=10, max_features=auto, min_samples_leaf=9, min_samples_split=2
0, n_estimators=1378; total time=   3.2s
[CV] END criterion=squared_error, max_depth=895, max_features=auto, min_samples_leaf=15, min_samples_split
=20, n_estimators=2410; total time=   5.3s
[CV] END criterion=squared_error, max_depth=895, max_features=auto, min_samples_leaf=1, min_samples_split=
15, n_estimators=2410; total time=   6.2s
[CV] END criterion=absolute_error, max_depth=322, max_features=sqrt, min_samples_leaf=15, min_samples_spli
t=10, n_estimators=1673; total time=   4.6s[CV] END criterion=absolute_error, max_depth=62, max_features=s
qrt, min_samples_leaf=1, min_samples_split=2, n_estimators=1378; total time=   6.0s
[CV] END criterion=absolute_error, max_depth=583, max_features=auto, min_samples_leaf=5, min_samples_split
=20, n_estimators=1378; total time=   6.3s
[CV] END criterion=absolute_error, max_depth=843, max_features=sqrt, min_samples_leaf=5, min_samples_split
=2, n_estimators=2410; total time=   7.3s
[CV] END criterion=poisson, max_depth=270, max_features=sqrt, min_samples_leaf=5, min_samples_split=10, n_
estimators=200; total time=   0.5s
[CV] END criterion=absolute_error, max_depth=791, max_features=auto, min_samples_leaf=7, min_samples_split
=15, n_estimators=1673; total time=   7.5s
[CV] END criterion=poisson, max_depth=270, max_features=log2, min_samples_leaf=1, min_samples_split=15, n_
estimators=1673; total time=   4.3s
[CV] END criterion=poisson, max_depth=114, max_features=auto, min_samples_leaf=1, min_samples_split=2, n_e
stimators=2852; total time=  12.5s
[CV] END criterion=squared_error, max_depth=374, max_features=log2, min_samples_leaf=1, min_samples_split=
20, n_estimators=1673; total time=   3.8s
[CV] END criterion=absolute_error, max_depth=1000, max_features=sqrt, min_samples_leaf=7, min_samples_spli
t=20, n_estimators=494; total time=   1.5s
[CV] END criterion=absolute_error, max_depth=1000, max_features=sqrt, min_samples_leaf=7, min_samples_spli
t=20, n_estimators=494; total time=   1.4s
[CV] END criterion=absolute_error, max_depth=1000, max_features=sqrt, min_samples_leaf=7, min_samples_spli
t=20, n_estimators=494; total time=   1.4s
[CV] END criterion=absolute_error, max_depth=374, max_features=log2, min_samples_leaf=3, min_samples_split
=10, n_estimators=2263; total time=   7.0s
```

```
[CV] END criterion=poisson, max_depth=166, max_features=log2, min_samples_leaf=5, min_samples_split=5, n_e
stimators=2115; total time=   4.9s
[CV] END criterion=poisson, max_depth=374, max_features=log2, min_samples_leaf=9, min_samples_split=20, n_
estimators=2557; total time=   5.6s
[CV] END criterion=absolute_error, max_depth=635, max_features=log2, min_samples_leaf=9, min_samples_split
=10, n_estimators=642; total time=   1.9s
[CV] END criterion=squared_error, max_depth=478, max_features=log2, min_samples_leaf=7, min_samples_split=
5, n_estimators=789; total time=   1.6s
[CV] END criterion=absolute_error, max_depth=166, max_features=sqrt, min_samples_leaf=9, min_samples_split
=20, n_estimators=1821; total time=   5.1s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=3, min_samples_split=
5, n_estimators=2705; total time=   9.0s
[CV] END criterion=squared_error, max_depth=166, max_features=sqrt, min_samples_leaf=5, min_samples_split=
5, n_estimators=1673; total time=   3.9s
[CV] END criterion=poisson, max_depth=322, max_features=log2, min_samples_leaf=7, min_samples_split=10, n_
estimators=2263; total time=   5.2s
[CV] END criterion=absolute_error, max_depth=1000, max_features=sqrt, min_samples_leaf=15, min_samples_spl
it=5, n_estimators=642; total time=   1.7s
[CV] END criterion=squared_error, max_depth=843, max_features=log2, min_samples_leaf=15, min_samples_split
=20, n_estimators=2557; total time=   5.4s
[CV] END criterion=squared_error, max_depth=791, max_features=auto, min_samples_leaf=1, min_samples_split=
5, n_estimators=3000; total time=   8.0s
[CV] END criterion=squared_error, max_depth=1000, max_features=log2, min_samples_leaf=15, min_samples_spli
t=20, n_estimators=347; total time=   0.7s
[CV] END criterion=squared_error, max_depth=166, max_features=log2, min_samples_leaf=7, min_samples_split=
2, n_estimators=347; total time=   0.7s
[CV] END criterion=absolute_error, max_depth=531, max_features=sqrt, min_samples_leaf=7, min_samples_split
=20, n_estimators=2410; total time=   7.0s
[CV] END criterion=poisson, max_depth=166, max_features=auto, min_samples_leaf=7, min_samples_split=10, n_
estimators=2410; total time=   6.8s
[CV] END criterion=absolute_error, max_depth=218, max_features=log2, min_samples_leaf=1, min_samples_split
=15, n_estimators=642; total time=   2.1s
[CV] END criterion=poisson, max_depth=635, max_features=auto, min_samples_leaf=5, min_samples_split=20, n_
estimators=1526; total time=   4.6s
[CV] END criterion=poisson, max_depth=114, max_features=auto, min_samples_leaf=9, min_samples_split=20, n_
estimators=2115; total time=   5.5s
[CV] END criterion=absolute_error, max_depth=478, max_features=auto, min_samples_leaf=7, min_samples_split
=15, n_estimators=200; total time=   0.9s
[CV] END criterion=absolute_error, max_depth=843, max_features=log2, min_samples_leaf=9, min_samples_split
=5, n_estimators=936; total time=   2.7s
[CV] END criterion=absolute_error, max_depth=843, max_features=log2, min_samples_leaf=9, min_samples_split
=5, n_estimators=936; total time=   3.2s
[CV] END criterion=absolute_error, max_depth=843, max_features=log2, min_samples_leaf=9, min_samples_split
=5, n_estimators=936; total time=   2.7s
[CV] END criterion=poisson, max_depth=895, max_features=auto, min_samples_leaf=9, min_samples_split=2, n_e
stimators=2705; total time=   7.1s
[CV] END criterion=squared_error, max_depth=739, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=642; total time=   1.4s
[CV] END criterion=squared_error, max_depth=739, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=642; total time=   1.4s
[CV] END criterion=squared_error, max_depth=322, max_features=log2, min_samples_leaf=15, min_samples_split
=15, n_estimators=1821; total time=   3.8s
[CV] END criterion=squared_error, max_depth=687, max_features=auto, min_samples_leaf=7, min_samples_split=
20, n_estimators=1673; total time=   3.8s
[CV] END criterion=absolute_error, max_depth=739, max_features=log2, min_samples_leaf=9, min_samples_split
=5, n_estimators=2115; total time=   6.1s
[CV] END criterion=absolute_error, max_depth=947, max_features=auto, min_samples_leaf=3, min_samples_split
=5, n_estimators=1378; total time=   7.6s
[CV] END criterion=poisson, max_depth=843, max_features=log2, min_samples_leaf=5, min_samples_split=10, n_
estimators=2115; total time=   4.9s
[CV] END criterion=squared_error, max_depth=270, max_features=log2, min_samples_leaf=5, min_samples_split=
2, n_estimators=1968; total time=   4.2s
[CV] END criterion=poisson, max_depth=1000, max_features=auto, min_samples_leaf=15, min_samples_split=15,
```

```
n_estimators=1673; total time=   4.5s
[CV] END criterion=poisson, max_depth=947, max_features=sqrt, min_samples_leaf=7, min_samples_split=15, n_
estimators=2852; total time=   6.5s
[CV] END criterion=squared_error, max_depth=10, max_features=log2, min_samples_leaf=15, min_samples_split=
5, n_estimators=2852; total time=   6.4s
[CV] END criterion=absolute_error, max_depth=114, max_features=log2, min_samples_leaf=3, min_samples_split
=15, n_estimators=2705; total time=   8.5s
[CV] END criterion=poisson, max_depth=947, max_features=sqrt, min_samples_leaf=15, min_samples_split=5, n_
estimators=936; total time=   2.0s
[CV] END criterion=absolute_error, max_depth=1000, max_features=log2, min_samples_leaf=7, min_samples_spli
t=10, n_estimators=1378; total time=   4.1s
[CV] END criterion=poisson, max_depth=739, max_features=sqrt, min_samples_leaf=9, min_samples_split=5, n_e
stimators=1084; total time=   2.5s
[CV] END criterion=squared_error, max_depth=583, max_features=auto, min_samples_leaf=1, min_samples_split=
2, n_estimators=642; total time=   1.8s
[CV] END criterion=squared_error, max_depth=583, max_features=auto, min_samples_leaf=1, min_samples_split=
2, n_estimators=642; total time=   1.8s
[CV] END criterion=squared_error, max_depth=895, max_features=auto, min_samples_leaf=1, min_samples_split=
15, n_estimators=2410; total time=   5.7s
[CV] END criterion=poisson, max_depth=583, max_features=sqrt, min_samples_leaf=9, min_samples_split=10, n_
estimators=2115; total time=   4.9s
[CV] END criterion=absolute_error, max_depth=322, max_features=sqrt, min_samples_leaf=15, min_samples_spli
t=10, n_estimators=1673; total time=   4.5s
[CV] END criterion=absolute_error, max_depth=322, max_features=log2, min_samples_leaf=3, min_samples_split
=5, n_estimators=1378; total time=   4.5s
[CV] END criterion=poisson, max_depth=843, max_features=log2, min_samples_leaf=9, min_samples_split=2, n_e
stimators=2115; total time=   5.1s[CV] END criterion=absolute_error, max_depth=583, max_features=auto, min
_samples_leaf=5, min_samples_split=20, n_estimators=1378; total time=   6.9s
[CV] END criterion=poisson, max_depth=218, max_features=auto, min_samples_leaf=9, min_samples_split=20, n_
estimators=642; total time=   1.6s
[CV] END criterion=poisson, max_depth=166, max_features=auto, min_samples_leaf=5, min_samples_split=10, n_
estimators=2410; total time=   7.1s
[CV] END criterion=absolute_error, max_depth=843, max_features=sqrt, min_samples_leaf=5, min_samples_split
=2, n_estimators=2410; total time=   7.3s
[CV] END criterion=absolute_error, max_depth=791, max_features=auto, min_samples_leaf=7, min_samples_split
=15, n_estimators=1673; total time=   7.7s
[CV] END criterion=poisson, max_depth=114, max_features=auto, min_samples_leaf=1, min_samples_split=2, n_e
stimators=2852; total time=  12.7s
[CV] END criterion=squared_error, max_depth=374, max_features=log2, min_samples_leaf=1, min_samples_split=
20, n_estimators=1673; total time=   3.8s
[CV] END criterion=poisson, max_depth=1000, max_features=auto, min_samples_leaf=1, min_samples_split=2, n_
estimators=1673; total time=   7.5s
[CV] END criterion=poisson, max_depth=166, max_features=log2, min_samples_leaf=5, min_samples_split=5, n_e
stimators=2115; total time=   4.7s
[CV] END criterion=poisson, max_depth=166, max_features=log2, min_samples_leaf=5, min_samples_split=5, n_e
stimators=2115; total time=   5.0s
[CV] END criterion=poisson, max_depth=531, max_features=log2, min_samples_leaf=15, min_samples_split=20, n
_estimators=1821; total time=   3.8s
[CV] END criterion=absolute_error, max_depth=635, max_features=log2, min_samples_leaf=9, min_samples_split
=10, n_estimators=642; total time=   1.8s
[CV] END criterion=absolute_error, max_depth=635, max_features=log2, min_samples_leaf=9, min_samples_split
=10, n_estimators=642; total time=   1.9s
[CV] END criterion=squared_error, max_depth=218, max_features=auto, min_samples_leaf=15, min_samples_split
=5, n_estimators=2852; total time=   6.1s
[CV] END criterion=absolute_error, max_depth=166, max_features=sqrt, min_samples_leaf=9, min_samples_split
=20, n_estimators=1821; total time=   5.3s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=3, min_samples_split=
5, n_estimators=2705; total time=   9.3s
[CV] END criterion=poisson, max_depth=322, max_features=log2, min_samples_leaf=7, min_samples_split=10, n_
estimators=2263; total time=   5.1s
[CV] END criterion=poisson, max_depth=322, max_features=sqrt, min_samples_leaf=9, min_samples_split=5, n_e
stimators=200; total time=   0.4s
[CV] END criterion=poisson, max_depth=322, max_features=sqrt, min_samples_leaf=9, min_samples_split=5, n_e
```

```
stimators=200; total time=   0.4s
[CV] END criterion=squared_error, max_depth=843, max_features=log2, min_samples_leaf=15, min_samples_split
=20, n_estimators=2557; total time=   5.4s
[CV] END criterion=squared_error, max_depth=583, max_features=log2, min_samples_leaf=7, min_samples_split=
15, n_estimators=2705; total time=   5.8s
[CV] END criterion=squared_error, max_depth=583, max_features=log2, min_samples_leaf=7, min_samples_split=
15, n_estimators=2705; total time=   5.8s
[CV] END criterion=squared_error, max_depth=322, max_features=auto, min_samples_leaf=1, min_samples_split=
10, n_estimators=642; total time=   1.6s
[CV] END criterion=squared_error, max_depth=322, max_features=auto, min_samples_leaf=1, min_samples_split=
10, n_estimators=642; total time=   1.5s
[CV] END criterion=squared_error, max_depth=322, max_features=auto, min_samples_leaf=1, min_samples_split=
10, n_estimators=642; total time=   1.5s
[CV] END criterion=poisson, max_depth=166, max_features=auto, min_samples_leaf=7, min_samples_split=10, n_
estimators=2410; total time=   6.8s
[CV] END criterion=poisson, max_depth=635, max_features=auto, min_samples_leaf=5, min_samples_split=20, n_
estimators=1526; total time=   4.5s
[CV] END criterion=poisson, max_depth=114, max_features=auto, min_samples_leaf=9, min_samples_split=20, n_
estimators=2115; total time=   5.6s
[CV] END criterion=squared_error, max_depth=583, max_features=log2, min_samples_leaf=5, min_samples_split=
10, n_estimators=642; total time=   1.4s
[CV] END criterion=squared_error, max_depth=583, max_features=log2, min_samples_leaf=5, min_samples_split=
10, n_estimators=642; total time=   1.4s
[CV] END criterion=absolute_error, max_depth=374, max_features=auto, min_samples_leaf=15, min_samples_spli
t=10, n_estimators=2263; total time=   9.2s
[CV] END criterion=poisson, max_depth=895, max_features=auto, min_samples_leaf=9, min_samples_split=2, n_e
stimators=2705; total time=   7.1s
[CV] END criterion=squared_error, max_depth=739, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=642; total time=   1.4s
[CV] END criterion=squared_error, max_depth=322, max_features=log2, min_samples_leaf=15, min_samples_split
=15, n_estimators=1821; total time=   3.8s
[CV] END criterion=absolute_error, max_depth=739, max_features=auto, min_samples_leaf=1, min_samples_split
=10, n_estimators=200; total time=   1.3s
[CV] END criterion=squared_error, max_depth=687, max_features=auto, min_samples_leaf=7, min_samples_split=
20, n_estimators=1673; total time=   3.8s
[CV] END criterion=squared_error, max_depth=583, max_features=auto, min_samples_leaf=15, min_samples_split
=20, n_estimators=494; total time=   1.1s
[CV] END criterion=squared_error, max_depth=583, max_features=auto, min_samples_leaf=15, min_samples_split
=20, n_estimators=494; total time=   1.1s
[CV] END criterion=squared_error, max_depth=583, max_features=auto, min_samples_leaf=15, min_samples_split
=20, n_estimators=494; total time=   1.1s
[CV] END criterion=absolute_error, max_depth=947, max_features=auto, min_samples_leaf=3, min_samples_split
=5, n_estimators=1378; total time=   7.8s
[CV] END criterion=squared_error, max_depth=947, max_features=auto, min_samples_leaf=1, min_samples_split=
5, n_estimators=642; total time=   1.7s
[CV] END criterion=poisson, max_depth=843, max_features=log2, min_samples_leaf=5, min_samples_split=10, n_
estimators=2115; total time=   4.9s
[CV] END criterion=squared_error, max_depth=270, max_features=log2, min_samples_leaf=5, min_samples_split=
2, n_estimators=1968; total time=   4.3s
[CV] END criterion=poisson, max_depth=1000, max_features=auto, min_samples_leaf=15, min_samples_split=15,
n_estimators=1673; total time=   4.4s
[CV] END criterion=squared_error, max_depth=687, max_features=auto, min_samples_leaf=1, min_samples_split=
20, n_estimators=200; total time=   0.5s
[CV] END criterion=poisson, max_depth=947, max_features=sqrt, min_samples_leaf=7, min_samples_split=15, n_
estimators=2852; total time=   6.3s
[CV] END criterion=squared_error, max_depth=10, max_features=log2, min_samples_leaf=15, min_samples_split=
5, n_estimators=2852; total time=   6.2s
[CV] END criterion=poisson, max_depth=62, max_features=log2, min_samples_leaf=5, min_samples_split=15, n_e
stimators=2705; total time=   6.4s
[CV] END criterion=absolute_error, max_depth=114, max_features=log2, min_samples_leaf=3, min_samples_split
=15, n_estimators=2705; total time=   8.4s
[CV] END criterion=poisson, max_depth=739, max_features=sqrt, min_samples_leaf=9, min_samples_split=5, n_e
stimators=1084; total time=   2.4s
```

```
[CV] END criterion=squared_error, max_depth=10, max_features=auto, min_samples_leaf=9, min_samples_split=2
0, n_estimators=1378; total time=   3.2s
[CV] END criterion=squared_error, max_depth=895, max_features=auto, min_samples_leaf=15, min_samples_split
=20, n_estimators=2410; total time=   5.4s
[CV] END criterion=poisson, max_depth=583, max_features=sqrt, min_samples_leaf=9, min_samples_split=10, n_
estimators=2115; total time=   5.2s
[CV] END criterion=poisson, max_depth=583, max_features=sqrt, min_samples_leaf=9, min_samples_split=10, n_
estimators=2115; total time=   4.6s
[CV] END criterion=absolute_error, max_depth=322, max_features=log2, min_samples_leaf=3, min_samples_split
=5, n_estimators=1378; total time=   4.5s
[CV] END criterion=poisson, max_depth=843, max_features=log2, min_samples_leaf=9, min_samples_split=2, n_e
stimators=2115; total time=   4.8s
[CV] END criterion=squared_error, max_depth=843, max_features=log2, min_samples_leaf=3, min_samples_split=
10, n_estimators=2557; total time=   5.4s
```

Out[25]:

```
RandomizedSearchCV(cv=3, estimator=RandomForestRegressor(), n_iter=100,
                   n_jobs=-1,
                   param_distributions={'criterion': ['squared_error',
                                                      'absolute_error',
                                                      'poisson'],
                                        'max_depth': [10, 62, 114, 166, 218,
                                                      270, 322, 374, 426, 478,
                                                      531, 583, 635, 687, 739,
                                                      791, 843, 895, 947,
                                                      1000],
                                        'max_features': ['auto', 'sqrt',
                                                         'log2'],
                                        'min_samples_leaf': [1, 3, 5, 7, 9, 15],
                                        'min_samples_split': [2, 5, 10, 15, 20],
                                        'n_estimators': [200, 347, 494, 642,
                                                         789, 936, 1084, 1231,
                                                         1378, 1526, 1673, 1821,
                                                         1968, 2115, 2263, 2410,
                                                         2557, 2705, 2852,
                                                         3000]},
                   random_state=100, verbose=2)
```

In [26]:

```
best_random_grid=rf_randomcv.best_estimator_
```

In [27]:

```
best_random_grid
```

Out[27]:

```
RandomForestRegressor(criterion='absolute_error', max_depth=62,
                      max_features='sqrt', n_estimators=1378)
```

In [28]:

```
y_pred=best_random_grid.predict(X_test)
```

In [29]:

```
r2_score(y_test, y_pred)
```

Out[29]:

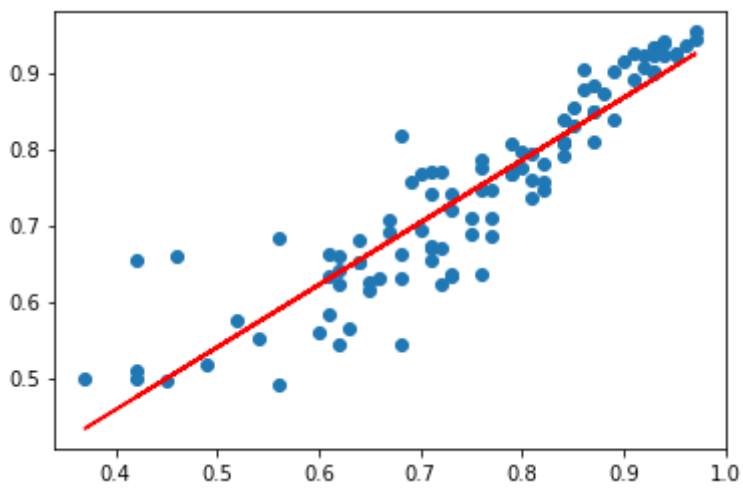
```
0.8289172234558222
```

In [30]:
```
plt.scatter(y_test,y_pred)

m, b = np.polyfit(y_test, y_pred, 1)

plt.plot(y_test, m*y_test+b, color = 'red')
```

Out[30]:
```
[<matplotlib.lines.Line2D at 0x7faa31c06f50>]
```



In [31]:
```
rf_randomcv.best_params_
```

Out[31]:
```
{'n_estimators': 1378,
 'min_samples_split': 2,
 'min_samples_leaf': 1,
 'max_features': 'sqrt',
 'max_depth': 62,
 'criterion': 'absolute_error'}
```

In [32]:

```
from sklearn.model_selection import GridSearchCV

param_grid = {
    'criterion': [rf_randomcv.best_params_['criterion']],
    'max_depth': [rf_randomcv.best_params_['max_depth']],
    'max_features': [rf_randomcv.best_params_['max_features']],
    'min_samples_leaf': [rf_randomcv.best_params_['min_samples_leaf'],
                         rf_randomcv.best_params_['min_samples_leaf']+2,
                         rf_randomcv.best_params_['min_samples_leaf'] + 4],
    'min_samples_split': [rf_randomcv.best_params_['min_samples_split'] +4,
                          rf_randomcv.best_params_['min_samples_split'] +1,
                          rf_randomcv.best_params_['min_samples_split'],
                          rf_randomcv.best_params_['min_samples_split'] +2,
                          rf_randomcv.best_params_['min_samples_split'] + 3],
    'n_estimators': [rf_randomcv.best_params_['n_estimators'] - 200, rf_randomcv.best_params_['n_estimators']
- 100,
                     rf_randomcv.best_params_['n_estimators'],
                     rf_randomcv.best_params_['n_estimators'] + 100, rf_randomcv.best_params_['n_estimators']
+ 200,
    rf_randomcv.best_params_['n_estimators'] + 400,rf_randomcv.best_params_['n_estimators'] + 600, rf_randomcv
.best_params_['n_estimators'] + 800]
}

print(param_grid)
```

```
{'criterion': ['absolute_error'], 'max_depth': [62], 'max_features': ['sqrt'], 'min_samples_leaf': [1, 3,
5], 'min_samples_split': [6, 3, 2, 4, 5], 'n_estimators': [1178, 1278, 1378, 1478, 1578, 1778, 1978, 217
8]}
```

In [33]:

```
rf=RandomForestRegressor()
grid_search=GridSearchCV(estimator=rf,param_grid=param_grid,cv=10,n_jobs=-1,verbose=2)
grid_search.fit(X_train,y_train)
```

```
Fitting 10 folds for each of 120 candidates, totalling 1200 fits

[CV] END criterion=squared_error, max_depth=10, max_features=auto, min_samples_leaf=9, min_samples_split=2
0, n_estimators=1378; total time=   3.1s
[CV] END criterion=squared_error, max_depth=583, max_features=auto, min_samples_leaf=1, min_samples_split=
2, n_estimators=642; total time=   1.8s
[CV] END criterion=squared_error, max_depth=895, max_features=auto, min_samples_leaf=15, min_samples_split
=20, n_estimators=2410; total time=   5.4s
[CV] END criterion=squared_error, max_depth=895, max_features=auto, min_samples_leaf=1, min_samples_split=
15, n_estimators=2410; total time=   6.2s
[CV] END criterion=absolute_error, max_depth=322, max_features=sqrt, min_samples_leaf=15, min_samples_spli
t=10, n_estimators=1673; total time=   4.6s
[CV] END criterion=poisson, max_depth=843, max_features=log2, min_samples_leaf=9, min_samples_split=2, n_e
stimators=2115; total time=   4.6s
[CV] END criterion=absolute_error, max_depth=1000, max_features=sqrt, min_samples_leaf=1, min_samples_spli
t=10, n_estimators=347; total time=   1.3s
[CV] END criterion=squared_error, max_depth=843, max_features=log2, min_samples_leaf=3, min_samples_split=
10, n_estimators=2557; total time=   5.6s
[CV] END criterion=poisson, max_depth=114, max_features=auto, min_samples_leaf=15, min_samples_split=5, n_
estimators=2852; total time=   6.8s
[CV] END criterion=absolute_error, max_depth=10, max_features=sqrt, min_samples_leaf=7, min_samples_split=
20, n_estimators=2410; total time=   6.9s
[CV] END criterion=squared_error, max_depth=10, max_features=log2, min_samples_leaf=9, min_samples_split=1
5, n_estimators=1231; total time=   2.7s
[CV] END criterion=absolute_error, max_depth=635, max_features=auto, min_samples_leaf=3, min_samples_split
=5, n_estimators=2852; total time=  15.8s
[CV] END criterion=absolute_error, max_depth=270, max_features=log2, min_samples_leaf=1, min_samples_split
=20, n_estimators=2410; total time=   8.0s
[CV] END criterion=squared_error, max_depth=947, max_features=auto, min_samples_leaf=7, min_samples_split=
2, n_estimators=200; total time=   0.5s
[CV] END criterion=squared_error, max_depth=947, max_features=auto, min_samples_leaf=7, min_samples_split=
2, n_estimators=200; total time=   0.4s
[CV] END criterion=absolute_error, max_depth=426, max_features=log2, min_samples_leaf=9, min_samples_split
=15, n_estimators=2115; total time=   6.0s
[CV] END criterion=absolute_error, max_depth=270, max_features=log2, min_samples_leaf=1, min_samples_split
=10, n_estimators=2557; total time=   8.6s
[CV] END criterion=poisson, max_depth=791, max_features=sqrt, min_samples_leaf=15, min_samples_split=2, n_
estimators=347; total time=   0.7s
[CV] END criterion=poisson, max_depth=791, max_features=sqrt, min_samples_leaf=15, min_samples_split=2, n_
estimators=347; total time=   0.7s
[CV] END criterion=poisson, max_depth=791, max_features=sqrt, min_samples_leaf=15, min_samples_split=2, n_
estimators=347; total time=   0.8s
[CV] END criterion=poisson, max_depth=270, max_features=log2, min_samples_leaf=15, min_samples_split=10, n
_estimators=3000; total time=   6.5s
[CV] END criterion=squared_error, max_depth=166, max_features=sqrt, min_samples_leaf=3, min_samples_split=
20, n_estimators=494; total time=   1.0s
[CV] END criterion=poisson, max_depth=843, max_features=sqrt, min_samples_leaf=3, min_samples_split=20, n_
estimators=1673; total time=   3.9s
[CV] END criterion=squared_error, max_depth=114, max_features=log2, min_samples_leaf=9, min_samples_split=
20, n_estimators=1673; total time=   3.6s
[CV] END criterion=squared_error, max_depth=166, max_features=sqrt, min_samples_leaf=5, min_samples_split=
5, n_estimators=3000; total time=   5.3s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1178; total time=   5.1s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1178; total time=   5.2s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1278; total time=   5.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1278; total time=   5.6s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1278; total time=   5.5s
```

```
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1378; total time=   6.0s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1378; total time=   6.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1478; total time=   6.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1478; total time=   6.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1478; total time=   6.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1578; total time=   6.9s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1578; total time=   6.8s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1778; total time=   7.7s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1778; total time=   8.2s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1778; total time=   7.8s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1978; total time=   8.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1978; total time=   8.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=2178; total time=   9.3s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=2178; total time=   9.9s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=2178; total time=   9.3s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1178; total time=   5.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1178; total time=   5.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1278; total time=   5.9s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1278; total time=   5.9s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1278; total time=   6.7s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1378; total time=   6.3s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1378; total time=   6.3s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1478; total time=   6.8s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1478; total time=   6.8s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1478; total time=   6.7s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1578; total time=   7.3s
[CV] END criterion=absolute_error, max_depth=322, max_features=log2, min_samples_leaf=3, min_samples_split
=5, n_estimators=1378; total time=   4.5s
[CV] END criterion=absolute_error, max_depth=1000, max_features=sqrt, min_samples_leaf=1, min_samples_spli
t=10, n_estimators=347; total time=   1.3s
[CV] END criterion=absolute_error, max_depth=1000, max_features=sqrt, min_samples_leaf=1, min_samples_spli
t=10, n_estimators=347; total time=   1.3s
[CV] END criterion=squared_error, max_depth=843, max_features=log2, min_samples_leaf=3, min_samples_split=
10, n_estimators=2557; total time=   5.7s
[CV] END criterion=poisson, max_depth=114, max_features=auto, min_samples_leaf=15, min_samples_split=5, n_
estimators=2852; total time=   6.9s
[CV] END criterion=poisson, max_depth=322, max_features=log2, min_samples_leaf=15, min_samples_split=10, n
```

```
_estimators=1673; total time=   3.6s
[CV] END criterion=squared_error, max_depth=10, max_features=log2, min_samples_leaf=9, min_samples_split=1
5, n_estimators=1231; total time=   2.6s
[CV] END criterion=squared_error, max_depth=739, max_features=sqrt, min_samples_leaf=1, min_samples_split=
2, n_estimators=1968; total time=   4.7s
[CV] END criterion=absolute_error, max_depth=635, max_features=auto, min_samples_leaf=3, min_samples_split
=5, n_estimators=2852; total time=  15.7s
[CV] END criterion=squared_error, max_depth=791, max_features=sqrt, min_samples_leaf=15, min_samples_split
=10, n_estimators=1673; total time=   3.6s
[CV] END criterion=absolute_error, max_depth=478, max_features=log2, min_samples_leaf=7, min_samples_split
=10, n_estimators=642; total time=   1.9s
[CV] END criterion=squared_error, max_depth=947, max_features=auto, min_samples_leaf=7, min_samples_split=
2, n_estimators=200; total time=   0.5s
[CV] END criterion=absolute_error, max_depth=426, max_features=log2, min_samples_leaf=9, min_samples_split
=15, n_estimators=2115; total time=   6.1s
[CV] END criterion=absolute_error, max_depth=270, max_features=log2, min_samples_leaf=1, min_samples_split
=10, n_estimators=2557; total time=   8.7s
[CV] END criterion=absolute_error, max_depth=322, max_features=auto, min_samples_leaf=1, min_samples_split
=20, n_estimators=1821; total time=   9.8s
[CV] END criterion=squared_error, max_depth=166, max_features=sqrt, min_samples_leaf=3, min_samples_split=
20, n_estimators=494; total time=   1.1s
[CV] END criterion=poisson, max_depth=843, max_features=sqrt, min_samples_leaf=3, min_samples_split=20, n_
estimators=1673; total time=   4.0s
[CV] END criterion=squared_error, max_depth=166, max_features=sqrt, min_samples_leaf=5, min_samples_split=
5, n_estimators=3000; total time=   5.6s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1178; total time=   5.1s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1178; total time=   5.2s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1178; total time=   5.1s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1278; total time=   5.6s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1278; total time=   5.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1378; total time=   6.1s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1378; total time=   6.3s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1378; total time=   6.1s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1478; total time=   6.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1478; total time=   6.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1578; total time=   6.9s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1578; total time=   6.8s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1578; total time=   6.8s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1778; total time=   8.2s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1778; total time=   7.9s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1978; total time=   8.6s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1978; total time=   8.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1978; total time=   8.6s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=2178; total time=   9.6s
```

```
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=2178; total time=   9.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1178; total time=   5.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1178; total time=   5.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1178; total time=   5.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1278; total time=   5.9s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1278; total time=   6.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1378; total time=   6.7s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1378; total time=   6.3s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1378; total time=   6.3s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1478; total time=   6.7s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1478; total time=   6.9s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1578; total time=   7.3s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1578; total time=   7.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1578; total time=   7.2s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1778; total time=   8.2s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1778; total time=   8.1s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1978; total time=   9.0s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1978; total time=   9.1s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1978; total time=  10.0s
[CV] END criterion=absolute_error, max_depth=10, max_features=sqrt, min_samples_leaf=7, min_samples_split=
20, n_estimators=2410; total time=   6.9s
[CV] END criterion=poisson, max_depth=322, max_features=log2, min_samples_leaf=15, min_samples_split=10, n
_estimators=1673; total time=   3.5s
[CV] END criterion=squared_error, max_depth=10, max_features=log2, min_samples_leaf=9, min_samples_split=1
5, n_estimators=1231; total time=   2.7s
[CV] END criterion=squared_error, max_depth=739, max_features=sqrt, min_samples_leaf=1, min_samples_split=
2, n_estimators=1968; total time=   4.6s
[CV] END criterion=absolute_error, max_depth=270, max_features=log2, min_samples_leaf=1, min_samples_split
=20, n_estimators=2410; total time=   7.3s
[CV] END criterion=absolute_error, max_depth=270, max_features=log2, min_samples_leaf=1, min_samples_split
=20, n_estimators=2410; total time=   7.9s
[CV] END criterion=squared_error, max_depth=791, max_features=sqrt, min_samples_leaf=15, min_samples_split
=10, n_estimators=1673; total time=   3.6s
[CV] END criterion=absolute_error, max_depth=478, max_features=log2, min_samples_leaf=7, min_samples_split
=10, n_estimators=642; total time=   1.9s
[CV] END criterion=absolute_error, max_depth=426, max_features=log2, min_samples_leaf=9, min_samples_split
=15, n_estimators=2115; total time=   6.2s
[CV] END criterion=poisson, max_depth=114, max_features=log2, min_samples_leaf=3, min_samples_split=20, n_
estimators=200; total time=   0.5s
[CV] END criterion=poisson, max_depth=114, max_features=log2, min_samples_leaf=3, min_samples_split=20, n_
estimators=200; total time=   0.5s
[CV] END criterion=poisson, max_depth=114, max_features=log2, min_samples_leaf=3, min_samples_split=20, n_
estimators=200; total time=   0.5s
[CV] END criterion=absolute_error, max_depth=322, max_features=auto, min_samples_leaf=1, min_samples_split
```

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=20, n_estimators=1821; total time=   9.3s
[CV] END criterion=poisson, max_depth=270, max_features=log2, min_samples_leaf=15, min_samples_split=10, n
_estimators=3000; total time=   6.6s
[CV] END criterion=squared_error, max_depth=166, max_features=sqrt, min_samples_leaf=3, min_samples_split=
20, n_estimators=494; total time=   1.0s
[CV] END criterion=poisson, max_depth=843, max_features=sqrt, min_samples_leaf=3, min_samples_split=20, n_
estimators=1673; total time=   3.9s
[CV] END criterion=squared_error, max_depth=114, max_features=log2, min_samples_leaf=9, min_samples_split=
20, n_estimators=1673; total time=   3.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1178; total time=   5.1s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1178; total time=   5.2s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1278; total time=   5.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1278; total time=   5.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1278; total time=   5.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1378; total time=   6.0s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1378; total time=   6.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1478; total time=   6.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1478; total time=   6.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1478; total time=   6.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1578; total time=   6.9s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1578; total time=   6.8s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1778; total time=   7.6s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1778; total time=   8.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1778; total time=   7.9s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1978; total time=   8.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1978; total time=   8.6s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=2178; total time=   9.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=2178; total time=   9.9s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=2178; total time=   9.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1178; total time=   5.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1178; total time=   5.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1278; total time=   5.9s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1278; total time=   6.1s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1278; total time=   6.3s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1378; total time=   6.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1378; total time=   6.3s
```

```
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
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3, n_estimators=1478; total time=   6.8s
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3, n_estimators=1478; total time=   6.8s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1578; total time=   7.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1578; total time=   7.8s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1778; total time=   8.3s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1778; total time=   8.1s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1778; total time=   8.2s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1978; total time=   9.0s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1978; total time=   9.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=2178; total time=  10.6s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=2178; total time=  10.3s
[CV] END criterion=poisson, max_depth=114, max_features=auto, min_samples_leaf=15, min_samples_split=5, n_
estimators=2852; total time=   6.8s
[CV] END criterion=absolute_error, max_depth=10, max_features=sqrt, min_samples_leaf=7, min_samples_split=
20, n_estimators=2410; total time=   7.0s
[CV] END criterion=poisson, max_depth=322, max_features=log2, min_samples_leaf=15, min_samples_split=10, n
_estimators=1673; total time=   3.6s
[CV] END criterion=squared_error, max_depth=739, max_features=sqrt, min_samples_leaf=1, min_samples_split=
2, n_estimators=1968; total time=   4.6s
[CV] END criterion=absolute_error, max_depth=635, max_features=auto, min_samples_leaf=3, min_samples_split
=5, n_estimators=2852; total time=  16.2s
[CV] END criterion=squared_error, max_depth=791, max_features=sqrt, min_samples_leaf=15, min_samples_split
=10, n_estimators=1673; total time=   3.4s
[CV] END criterion=absolute_error, max_depth=478, max_features=log2, min_samples_leaf=7, min_samples_split
=10, n_estimators=642; total time=   1.9s
[CV] END criterion=absolute_error, max_depth=270, max_features=log2, min_samples_leaf=1, min_samples_split
=10, n_estimators=2557; total time=   8.7s
[CV] END criterion=absolute_error, max_depth=322, max_features=auto, min_samples_leaf=1, min_samples_split
=20, n_estimators=1821; total time=   9.5s
[CV] END criterion=poisson, max_depth=270, max_features=log2, min_samples_leaf=15, min_samples_split=10, n
_estimators=3000; total time=   6.8s
[CV] END criterion=squared_error, max_depth=114, max_features=log2, min_samples_leaf=9, min_samples_split=
20, n_estimators=1673; total time=   3.5s
[CV] END criterion=squared_error, max_depth=166, max_features=sqrt, min_samples_leaf=5, min_samples_split=
5, n_estimators=3000; total time=   6.3s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1178; total time=   5.1s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1178; total time=   5.1s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1178; total time=   5.1s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1278; total time=   5.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1278; total time=   5.6s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1378; total time=   6.1s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1378; total time=   6.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
```

```
6, n_estimators=1378; total time=   6.0s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1478; total time=   6.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1578; total time=   6.9s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1578; total time=   6.8s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1578; total time=   6.9s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1778; total time=   8.2s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1778; total time=   7.8s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1978; total time=   8.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1978; total time=   8.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=1978; total time=   8.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=2178; total time=   9.9s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
6, n_estimators=2178; total time=   9.3s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1178; total time=   5.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1178; total time=   5.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1178; total time=   5.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1278; total time=   5.8s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1278; total time=   6.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1378; total time=   6.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1378; total time=   6.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1378; total time=   6.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1478; total time=   6.7s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1478; total time=   6.8s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1578; total time=   7.3s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1578; total time=   7.6s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1578; total time=   7.2s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1778; total time=   8.1s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
3, n_estimators=1778; total time=   8.1s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
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```

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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
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```

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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=3, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=3, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=3, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=1, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
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```

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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
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```

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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=1478; total time=   5.3s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=1478; total time=   5.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=1478; total time=   6.2s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=1978; total time=   7.2s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=2178; total time=   7.8s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
4, n_estimators=1178; total time=   4.2s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
4, n_estimators=1278; total time=   4.6s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
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[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
6, n_estimators=1778; total time=   6.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
6, n_estimators=1778; total time=   6.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
6, n_estimators=1778; total time=   6.6s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
6, n_estimators=1978; total time=   7.3s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
```

```
6, n_estimators=1978; total time=   7.1s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
6, n_estimators=2178; total time=   7.8s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
6, n_estimators=2178; total time=   8.1s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
6, n_estimators=2178; total time=   7.9s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
3, n_estimators=1178; total time=   4.3s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
3, n_estimators=1178; total time=   4.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
3, n_estimators=1278; total time=   4.6s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
3, n_estimators=1278; total time=   4.6s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
3, n_estimators=1378; total time=   4.9s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
3, n_estimators=1378; total time=   5.0s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
3, n_estimators=1378; total time=   5.3s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
3, n_estimators=1478; total time=   5.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
3, n_estimators=1478; total time=   5.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
3, n_estimators=1578; total time=   5.7s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
3, n_estimators=1578; total time=   5.6s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
3, n_estimators=1578; total time=   5.7s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
3, n_estimators=1778; total time=   6.3s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
3, n_estimators=1778; total time=   6.6s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
3, n_estimators=1978; total time=   7.2s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
3, n_estimators=1978; total time=   7.1s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
3, n_estimators=1978; total time=   7.1s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
3, n_estimators=2178; total time=   7.7s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
3, n_estimators=2178; total time=   7.8s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=1178; total time=   4.9s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=1178; total time=   4.6s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=1178; total time=   4.2s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=1278; total time=   4.7s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=1278; total time=   4.6s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=1278; total time=   4.7s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=1378; total time=   4.9s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=1378; total time=   5.0s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=1478; total time=   5.3s
```

```
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=1478; total time=   5.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=1478; total time=   5.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=1578; total time=   5.7s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=1578; total time=   5.6s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=1778; total time=   6.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=1778; total time=   6.3s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=1778; total time=   6.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=1978; total time=   7.0s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=1978; total time=   7.4s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=2178; total time=   7.8s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=2178; total time=   7.8s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
2, n_estimators=2178; total time=   7.9s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
4, n_estimators=1178; total time=   4.3s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
4, n_estimators=1178; total time=   4.2s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
4, n_estimators=1278; total time=   4.6s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
4, n_estimators=1278; total time=   4.7s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
4, n_estimators=1378; total time=   5.5s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
4, n_estimators=1378; total time=   5.3s
[CV] END criterion=absolute_error, max_depth=62, max_features=sqrt, min_samples_leaf=5, min_samples_split=
4, n_estimators=1378; total time=   4.9s
```

Out[33]:

```
GridSearchCV(cv=10, estimator=RandomForestRegressor(), n_jobs=-1,
             param_grid={'criterion': ['absolute_error'], 'max_depth': [62],
                         'max_features': ['sqrt'],
                         'min_samples_leaf': [1, 3, 5],
                         'min_samples_split': [6, 3, 2, 4, 5],
                         'n_estimators': [1178, 1278, 1378, 1478, 1578, 1778,
                                          1978, 2178]},
             verbose=2)
```

In [34]:

```
grid_search.best_estimator_
```

Out[34]:

```
RandomForestRegressor(criterion='absolute_error', max_depth=62,
                      max_features='sqrt', min_samples_split=5,
                      n_estimators=1178)
```

In [35]:

```
best_grid=grid_search.best_estimator_
```

In [36]:
```
best_grid
```

Out[36]:
```
RandomForestRegressor(criterion='absolute_error', max_depth=62,
                      max_features='sqrt', min_samples_split=5,
                      n_estimators=1178)
```

In [37]:
```
y_pred=best_grid.predict(X_test)
r2_score(y_test, y_pred)
```

Out[37]:
```
0.8318219724942063
```

In [38]:
```
best_random_grid
```

Out[38]:
```
RandomForestRegressor(criterion='absolute_error', max_depth=62,
                      max_features='sqrt', n_estimators=1378)
```

In [39]:
```
best_grid
```

Out[39]:
```
RandomForestRegressor(criterion='absolute_error', max_depth=62,
                      max_features='sqrt', min_samples_split=5,
                      n_estimators=1178)
```

In [40]:
```
plt.scatter(y_test,y_pred)

m, b = np.polyfit(y_test, y_pred, 1)

plt.plot(y_test, m*y_test+b, color = 'red')
```

Out[40]:
```
[<matplotlib.lines.Line2D at 0x7faa31c48190>]
```