```
import pandas as pd
import numpy as np
from matplotlib import pyplot as plt
%matplotlib inline
import matplotlib
matplotlib.rcParams["figure.figsize"] = (20,10)

df1 = pd.read_csv(r"C:\Users\hp\Downloads\Bengaluru_House_Data.csv")
df1.head()

              area_type   availability                  location       
size  \
0  Super built-up  Area         19-Dec  Electronic City Phase II       
2 BHK
1            Plot  Area  Ready To Move          Chikka Tirupathi  4 
Bedroom
2        Built-up  Area  Ready To Move               Uttarahalli       
3 BHK
3  Super built-up  Area  Ready To Move        Lingadheeranahalli       
3 BHK
4  Super built-up  Area  Ready To Move                  Kothanur       
2 BHK

   society total_sqft  bath  balcony   price
0  Coomee        1056   2.0      1.0   39.07
1  Theanmp       2600   5.0      3.0  120.00
2      NaN       1440   2.0      3.0   62.00
3  Soiewre       1521   3.0      1.0   95.00
4      NaN       1200   2.0      1.0   51.00
```

Data Cleaning:

```
df1.groupby('area_type')['area_type'].agg('count')

area_type
Built-up  Area          2418
Carpet  Area              87
Plot  Area              2025
Super built-up  Area    8790
Name: area_type, dtype: int64

df2 = df1.drop(['area_type','society','balcony','availability'],axis = 
'columns')
df2.head()

                   location       size total_sqft  bath   price
0  Electronic City Phase II      2 BHK       1056   2.0   39.07
1          Chikka Tirupathi  4 Bedroom       2600   5.0  120.00
2               Uttarahalli      3 BHK       1440   2.0   62.00
3        Lingadheeranahalli      3 BHK       1521   3.0   95.00
4                  Kothanur      2 BHK       1200   2.0   51.00
```

```
df2.isnull().sum()
```

```
location       1
size          16
total_sqft     0
bath          73
price          0
dtype: int64
```

```
df3 = df2.dropna()
df3.isnull().sum()
```

```
location      0
size          0
total_sqft    0
bath          0
price         0
dtype: int64
```

```
df3.shape
```

```
(13246, 5)
```

```
df3['bhk'] = df3['size'].apply(lambda x : int(x.split (' ')[0]))
df3.head()
```

```
C:\Users\hp\AppData\Local\Temp\ipykernel_10596\945158270.py:1:
SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy
  df3['bhk'] = df3['size'].apply(lambda x : int(x.split (' ')[0]))
```

```
                   location       size total_sqft  bath   price  bhk
0  Electronic City Phase II      2 BHK       1056   2.0   39.07    2
1          Chikka Tirupathi  4 Bedroom       2600   5.0  120.00    4
2               Uttarahalli      3 BHK       1440   2.0   62.00    3
3        Lingadheeranahalli      3 BHK       1521   3.0   95.00    3
4                  Kothanur      2 BHK       1200   2.0   51.00    2
```

```
df3['bhk'].unique()
```

```
array([ 2,  4,  3,  6,  1,  8,  7,  5, 11,  9, 27, 10, 19, 16, 43, 14,
12,
       13, 18], dtype=int64)
```

```
df3[df3.bhk>20]
```

```
                       location        size total_sqft  bath  price  
bhk
1718  2Electronic City Phase II      27 BHK       8000  27.0  230.0  
27
4684                Munnekollal  43 Bedroom       2400  40.0  660.0  
43
```

```
df3.total_sqft.unique()
```

```
array(['1056', '2600', '1440', ..., '1133 - 1384', '774', '4689'],
      dtype=object)
```

```
def is_float(x):
    try:
        float(x)
    except:
        return False
    return True
```

```
df3[~df3['total_sqft'].apply(is_float)].head(10)
```

```
               location       size      total_sqft  bath    price  bhk
30            Yelahanka      4 BHK     2100 - 2850   4.0  186.000    4
122              Hebbal      4 BHK     3067 - 8156   4.0  477.000    4
137  8th Phase JP Nagar      2 BHK     1042 - 1105   2.0   54.005    2
165            Sarjapur      2 BHK     1145 - 1340   2.0   43.490    2
188            KR Puram      2 BHK     1015 - 1540   2.0   56.800    2
410             Kengeri      1 BHK  34.46Sq. Meter   1.0   18.500    1
549         Hennur Road      2 BHK     1195 - 1440   2.0   63.770    2
648             Arekere  9 Bedroom       4125Perch   9.0  265.000    9
661           Yelahanka      2 BHK     1120 - 1145   2.0   48.130    2
672        Bettahalsoor  4 Bedroom     3090 - 5002   4.0  445.000    4
```

```
def sqft_to_num(x):
    tokens = x.split('-')
    if len(tokens) == 2:
        return(float(tokens[0]) + float(tokens[1])) / 2
    try:
        return float(x)
    except:
        return None
```

```
sqft_to_num('1230-2342')
```

```
1786.0
```

```
df4 = df3.copy()
df4['total_sqft'] = df4['total_sqft'].apply(sqft_to_num)
df4.head()
```

```
                  location       size  total_sqft  bath   price  bhk
0  Electronic City Phase II      2 BHK      1056.0   2.0   39.07    2
1          Chikka Tirupathi  4 Bedroom      2600.0   5.0  120.00    4
2               Uttarahalli      3 BHK      1440.0   2.0   62.00    3
3        Lingadheeranahalli      3 BHK      1521.0   3.0   95.00    3
4                  Kothanur      2 BHK      1200.0   2.0   51.00    2
```

```
df4.loc[30]
```

```
location      Yelahanka
size              4 BHK
total_sqft       2475.0
bath                4.0
price             186.0
bhk                   4
Name: 30, dtype: object
```

```
df4.head(3)
```

```
                  location       size  total_sqft  bath   price  bhk
0  Electronic City Phase II      2 BHK      1056.0   2.0   39.07    2
1          Chikka Tirupathi  4 Bedroom      2600.0   5.0  120.00    4
2               Uttarahalli      3 BHK      1440.0   2.0   62.00    3
```

```
df5 = df4.copy()
df5['price_per_sqft'] = df5['price']*100000/df5['total_sqft']
df5.head()
```

```
                  location       size  total_sqft  bath   price  bhk
\
0  Electronic City Phase II      2 BHK      1056.0   2.0   39.07    2

1          Chikka Tirupathi  4 Bedroom      2600.0   5.0  120.00    4

2               Uttarahalli      3 BHK      1440.0   2.0   62.00    3

3        Lingadheeranahalli      3 BHK      1521.0   3.0   95.00    3

4                  Kothanur      2 BHK      1200.0   2.0   51.00    2


   price_per_sqft
0     3699.810606
1     4615.384615
2     4305.555556
3     6245.890861
4     4250.000000
```

```
len(df5.location.unique())
```

```
1304
```

```
df5.location = df5.location.apply(lambda x : x.strip())

location_stats = df5.groupby('location')
['location'].agg('count').sort_values(ascending = False)

location_stats

location
Whitefield                535
Sarjapur  Road            392
Electronic City           304
Kanakpura Road            266
Thanisandra               236
                         ...
1 Giri Nagar                1
Kanakapura Road,            1
Kanakapura main  Road       1
Karnataka Shabarimala       1
whitefiled                  1
Name: location, Length: 1293, dtype: int64

len(location_stats[location_stats<=10])

1052

location_stats_less_than_10 = location_stats[location_stats<=10]
location_stats_less_than_10

location
Basapura                  10
1st Block Koramangala     10
Gunjur Palya              10
Kalkere                   10
Sector 1 HSR Layout       10
                          ..
1 Giri Nagar               1
Kanakapura Road,           1
Kanakapura main  Road      1
Karnataka Shabarimala      1
whitefiled                 1
Name: location, Length: 1052, dtype: int64

len(df5.location.unique())

1293

df5.location = df5.location.apply(lambda x : 'other' if x in
location_stats_less_than_10 else x)
len(df5.location.unique())

242
```

```
df5.head(10)
```

```
                   location       size  total_sqft  bath   price  bhk  
\
0  Electronic City Phase II      2 BHK      1056.0   2.0   39.07    2   

1          Chikka Tirupathi  4 Bedroom      2600.0   5.0  120.00    4   

2               Uttarahalli      3 BHK      1440.0   2.0   62.00    3   

3        Lingadheeranahalli      3 BHK      1521.0   3.0   95.00    3   

4                  Kothanur      2 BHK      1200.0   2.0   51.00    2   

5                Whitefield      2 BHK      1170.0   2.0   38.00    2   

6          Old Airport Road      4 BHK      2732.0   4.0  204.00    4   

7              Rajaji Nagar      4 BHK      3300.0   4.0  600.00    4   

8              Marathahalli      3 BHK      1310.0   3.0   63.25    3   

9                     other  6 Bedroom      1020.0   6.0  370.00    6   


   price_per_sqft  
0     3699.810606  
1     4615.384615  
2     4305.555556  
3     6245.890861  
4     4250.000000  
5     3247.863248  
6     7467.057101  
7    18181.818182  
8     4828.244275  
9    36274.509804  
```

Outlier Removal :

```
df5[df5.total_sqft / df5.bhk<300].head()
```

```
                location       size  total_sqft  bath  price  bhk  \
9                  other  6 Bedroom      1020.0   6.0  370.0    6   
45            HSR Layout  8 Bedroom       600.0   9.0  200.0    8   
58         Murugeshpalya  6 Bedroom      1407.0   4.0  150.0    6   
68  Devarachikkanahalli  8 Bedroom      1350.0   7.0   85.0    8   
70                 other  3 Bedroom       500.0   3.0  100.0    3   

    price_per_sqft  
9     36274.509804  
45    33333.333333  
```

```
58    10660.980810
68     6296.296296
70    20000.000000
```

```
df5.shape
```

```
(13246, 7)
```

```
df6 = df5[~(df5.total_sqft / df5.bhk<300)]
df6.shape
```

```
(12502, 7)
```

```
df6.price_per_sqft.describe()
```

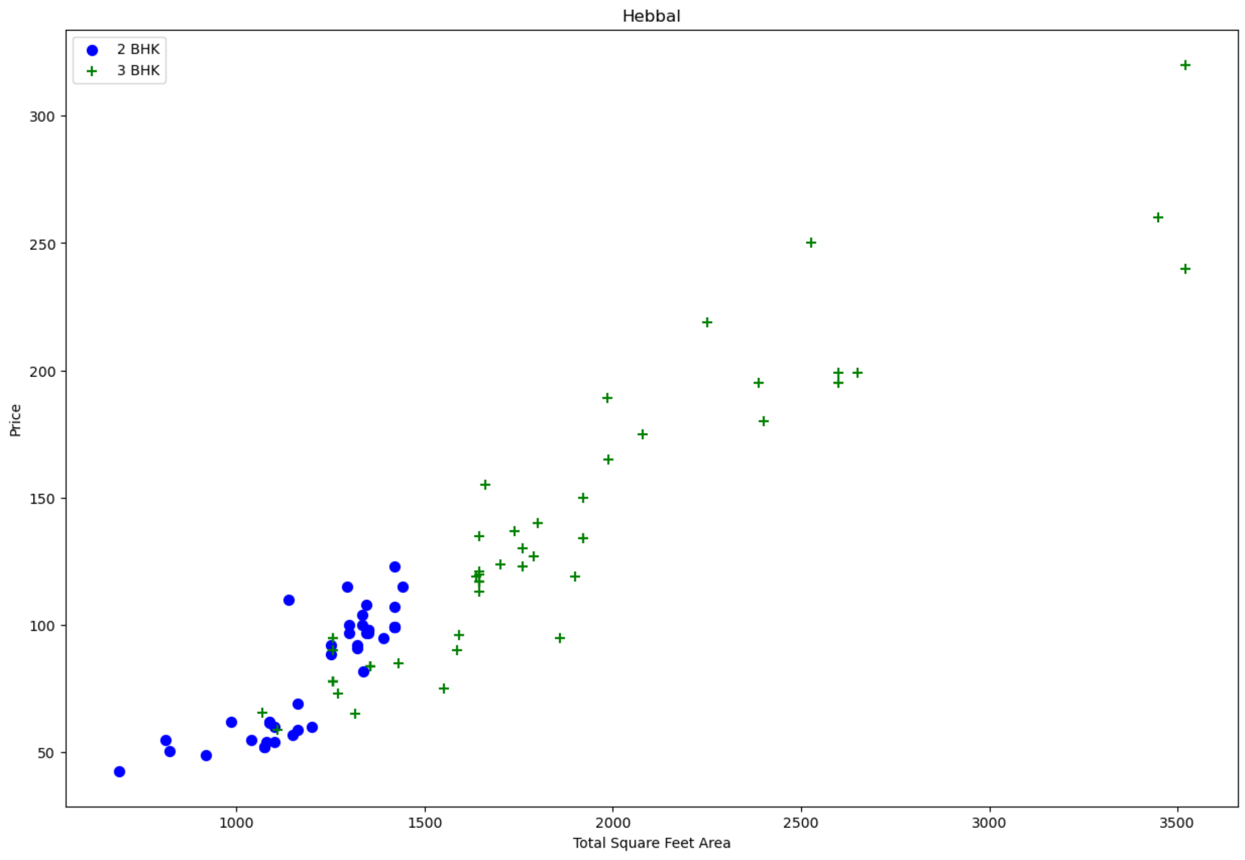
```
count     12456.000000
mean       6308.502826
std        4168.127339
min         267.829813
25%        4210.526316
50%        5294.117647
75%        6916.666667
max      176470.588235
Name: price_per_sqft, dtype: float64
```

```
def remove_pps_outliers(df):
    df_out = pd.DataFrame()
    for key, subdf in df.groupby('location'):
        m = np.mean(subdf.price_per_sqft)
        st = np.std(subdf.price_per_sqft)
        reduced_df = subdf[(subdf.price_per_sqft > (m-st)) &
(subdf.price_per_sqft <= (m+st))]
        df_out = pd.concat([df_out, reduced_df], ignore_index = True)
    return df_out
```

```
df7 = remove_pps_outliers(df6)
df7.shape
```

```
(10241, 7)
```

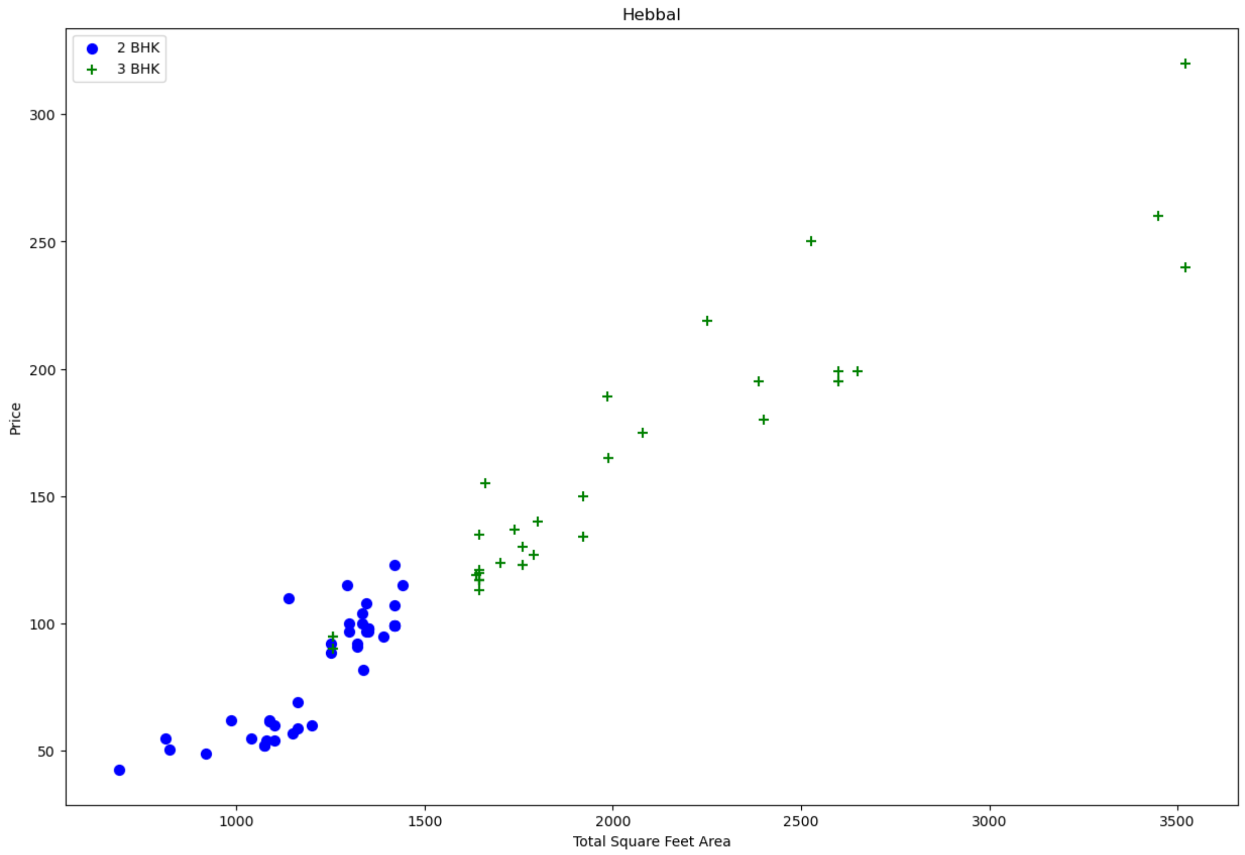
```
def plot_scatter_chart(df,location):
    bhk2 = df[(df.location==location) & (df.bhk==2)]
    bhk3 = df[(df.location==location) & (df.bhk==3)]
    matplotlib.rcParams['figure.figsize'] = (15,10)
    plt.scatter(bhk2.total_sqft, bhk2.price, color = 'blue', label =
'2 BHK', s = 50)
    plt.scatter(bhk3.total_sqft, bhk3.price, marker = '+', color =
'green', label = '3 BHK', s = 50)
    plt.xlabel("Total Square Feet Area")
    plt.ylabel("Price")
    plt.title(location)
    plt.legend()

plot_scatter_chart(df7,"Hebbal")
```



```
# We should also remove properties where for same location, the price of (for example) 3 bedroom apartment is less than
# 2 bedroom apartment (with same sqft area). What we will do for given location, we will build a dictionary of stats per bhk,i.e.

def remove_bhk_outliers(df):
    exclude_indices = np.array([])
    for location, location_df in df.groupby('location'):
        bhk_stats = {}
        for bhk, bhk_df in location_df.groupby('bhk'):
            bhk_stats[bhk] = {
                'mean' : np.mean(bhk_df.price_per_sqft),
                'std' : np.std(bhk_df.price_per_sqft),
                'count' : bhk_df.shape[0]
            }
        for bhk, bhk_df in location_df.groupby('bhk'):
            stats = bhk_stats.get(bhk-1)
            if stats and stats['count']>5:
                exclude_indices = np.append(exclude_indices,
bhk_df[bhk_df.price_per_sqft<(stats['mean'])].index.values)
    return df.drop(exclude_indices, axis = 'index')

df8 = remove_bhk_outliers(df7)7
df8.shape
```

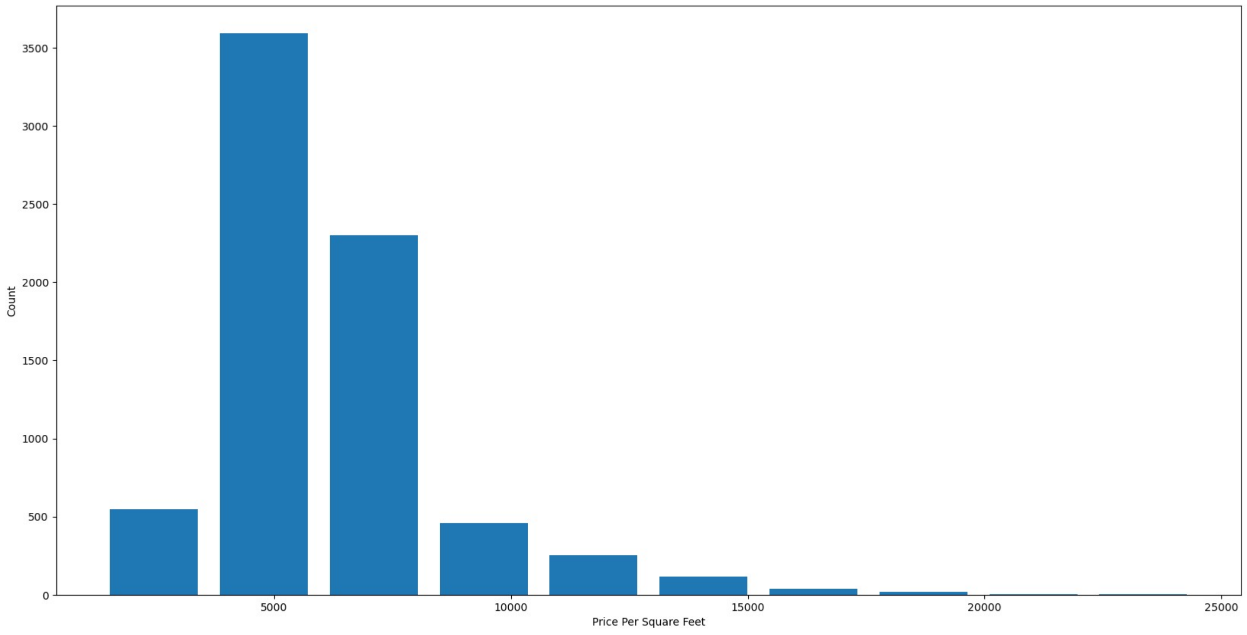
```
(7329, 7)
```

```
plot_scatter_chart(df8,"Hebbal")
```

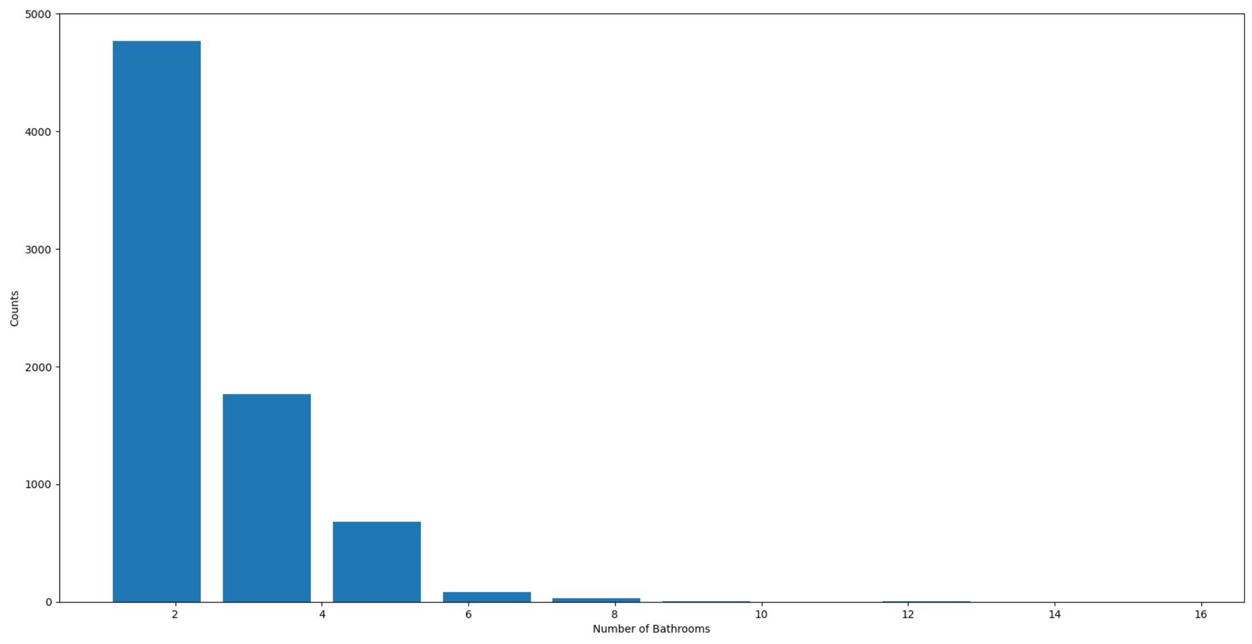


```
matplotlib.rcParams["figure.figsize"] = (20,10)
plt.hist(df8.price_per_sqft,rwidth=0.8)
plt.xlabel("Price Per Square Feet")
plt.ylabel("Count")
```

```
Text(0, 0.5, 'Count')
```



```
df8.bath.unique()

array([ 4.,  3.,  2.,  5.,  8.,  1.,  6.,  7.,  9., 12., 16., 13.])

df8[df8.bath>10]

            location    size  total_sqft  bath  price  bhk
price_per_sqft
5277  Neeladri Nagar  10 BHK      4000.0  12.0  160.0   10
4000.000000
8486           other  10 BHK     12000.0  12.0  525.0   10
4375.000000
8575           other  16 BHK     10000.0  16.0  550.0   16
5500.000000
9308           other  11 BHK      6000.0  12.0  150.0   11
2500.000000
9639           other  13 BHK      5425.0  13.0  275.0   13
5069.124424

plt.hist(df8.bath,rwidth=0.8)
plt.xlabel("Number of Bathrooms")
plt.ylabel("Counts")

Text(0, 0.5, 'Counts')
```



```
df8[df8.bath>df8.bhk+2]

           location       size  total_sqft  bath   price  bhk
price_per_sqft
1626  Chikkabanavar  4 Bedroom      2460.0   7.0    80.0    4
3252.032520
5238     Nagasandra  4 Bedroom      7000.0   8.0   450.0    4
6428.571429
6711    Thanisandra      3 BHK      1806.0   6.0   116.0    3
6423.034330
8411          other      6 BHK     11338.0   9.0  1000.0    6
8819.897689

df9 = df8[df8.bath<df8.bhk+2]
df9.shape

(7251, 7)

df10 = df9.drop(['size','price_per_sqft'],axis = 'columns')
df10

                  location  total_sqft  bath  price  bhk
0      1st Block Jayanagar      2850.0   4.0  428.0    4
1      1st Block Jayanagar      1630.0   3.0  194.0    3
2      1st Block Jayanagar      1875.0   2.0  235.0    3
3      1st Block Jayanagar      1200.0   2.0  130.0    3
4      1st Block Jayanagar      1235.0   2.0  148.0    2
...                    ...         ...   ...    ...  ...
10232                other      1200.0   2.0   70.0    2
10233                other      1800.0   1.0  200.0    1
10236                other      1353.0   2.0  110.0    2
```

```
10237                other       812.0   1.0   26.0    1
10240                other      3600.0   5.0  400.0    4

[7251 rows x 5 columns]

dummies = pd.get_dummies(df10.location).astype(int)
dummies

       1st Block Jayanagar  1st Phase JP Nagar  2nd Phase Judicial
Layout  \
0                        1                   0
0
1                        1                   0
0
2                        1                   0
0
3                        1                   0
0
4                        1                   0
0
...                    ...                 ...
...
10232                    0                   0
0
10233                    0                   0
0
10236                    0                   0
0
10237                    0                   0
0
10240                    0                   0
0

       2nd Stage Nagarbhavi  5th Block Hbr Layout  5th Phase JP Nagar
\
0                         0                     0                   0

1                         0                     0                   0

2                         0                     0                   0

3                         0                     0                   0

4                         0                     0                   0

...                     ...                   ...                 ...

10232                     0                     0                   0

10233                     0                     0                   0
```

```
10236                      0                      0                    0

10237                      0                      0                    0

10240                      0                      0                    0


       6th Phase JP Nagar  7th Phase JP Nagar  8th Phase JP Nagar  \
0                       0                   0                   0
1                       0                   0                   0
2                       0                   0                   0
3                       0                   0                   0
4                       0                   0                   0
...                   ...                 ...                 ...
10232                   0                   0                   0
10233                   0                   0                   0
10236                   0                   0                   0
10237                   0                   0                   0
10240                   0                   0                   0

       9th Phase JP Nagar  ...  Vishveshwarya Layout  Vishwapriya
Layout  \
0                       0  ...                     0
0
1                       0  ...                     0
0
2                       0  ...                     0
0
3                       0  ...                     0
0
4                       0  ...                     0
0
...                   ...  ...                   ...                 .
..
10232                   0  ...                     0
0
10233                   0  ...                     0
0
10236                   0  ...                     0
0
10237                   0  ...                     0
0
10240                   0  ...                     0
0

       Vittasandra  Whitefield  Yelachenahalli  Yelahanka  Yelahanka
New Town  \
0                0           0               0          0
0
1                0           0               0          0
```

```
0
2                0           0                0          0
0
3                0           0                0          0
0
4                0           0                0          0
0
...            ...         ...              ...        ...
...
10232            0           0                0          0
0
10233            0           0                0          0
0
10236            0           0                0          0
0
10237            0           0                0          0
0
10240            0           0                0          0
0

       Yelenahalli  Yeshwanthpur  other
0                0             0      0
1                0             0      0
2                0             0      0
3                0             0      0
4                0             0      0
...            ...           ...    ...
10232            0             0      1
10233            0             0      1
10236            0             0      1
10237            0             0      1
10240            0             0      1

[7251 rows x 242 columns]
```

```
df11 = pd.concat([df10,dummies.drop('other',axis='columns')], axis =
'columns')
df11.head(3)
```

```
              location  total_sqft  bath  price  bhk  1st Block
Jayanagar  \
0  1st Block Jayanagar      2850.0   4.0  428.0    4
1
1  1st Block Jayanagar      1630.0   3.0  194.0    3
1
2  1st Block Jayanagar      1875.0   2.0  235.0    3
1

   1st Phase JP Nagar  2nd Phase Judicial Layout  2nd Stage Nagarbhavi
\
0                   0                           0                     0

1                   0                           0                     0

2                   0                           0                     0


   5th Block Hbr Layout  ...  Vijayanagar  Vishveshwarya Layout  \
0                     0  ...            0                     0
1                     0  ...            0                     0
2                     0  ...            0                     0

   Vishwapriya Layout  Vittasandra  Whitefield  Yelachenahalli
Yelahanka  \
0                   0            0           0               0
0
1                   0            0           0               0
0
2                   0            0           0               0
0

   Yelahanka New Town  Yelenahalli  Yeshwanthpur
0                   0            0             0
1                   0            0             0
2                   0            0             0

[3 rows x 246 columns]
```

```
df12 = df11.drop(['location'],axis='columns')
df12.head(2)
```

```
   total_sqft  bath  price  bhk  1st Block Jayanagar  1st Phase JP
Nagar  \
0      2850.0   4.0  428.0    4                    1
0
1      1630.0   3.0  194.0    3                    1
0

   2nd Phase Judicial Layout  2nd Stage Nagarbhavi  5th Block Hbr
Layout  \
0                          0                     0
0
1                          0                     0
0

   5th Phase JP Nagar  ...  Vijayanagar  Vishveshwarya Layout  \
0                   0  ...            0                     0
1                   0  ...            0                     0

   Vishwapriya Layout  Vittasandra  Whitefield  Yelachenahalli
Yelahanka  \
0                    0            0           0                0
0
1                    0            0           0                0
0

   Yelahanka New Town  Yelenahalli  Yeshwanthpur
0                    0            0             0
1                    0            0             0

[2 rows x 245 columns]

X = df12.drop('price',axis='columns')              # X => independent 
variables.
X.head()

   total_sqft  bath  bhk  1st Block Jayanagar  1st Phase JP Nagar  \
0      2850.0   4.0    4                    1                   0
1      1630.0   3.0    3                    1                   0
2      1875.0   2.0    3                    1                   0
3      1200.0   2.0    3                    1                   0
4      1235.0   2.0    2                    1                   0

   2nd Phase Judicial Layout  2nd Stage Nagarbhavi  5th Block Hbr 
Layout  \
0                          0                     0
0
1                          0                     0
0
2                          0                     0
0
3                          0                     0
0
4                          0                     0
0

   5th Phase JP Nagar  6th Phase JP Nagar  ...  Vijayanagar  \
0                   0                   0  ...            0
1                   0                   0  ...            0
2                   0                   0  ...            0
3                   0                   0  ...            0
4                   0                   0  ...            0

   Vishveshwarya Layout  Vishwapriya Layout  Vittasandra 
Whitefield  \
0                     0                   0            0            0

1                     0                   0            0            0

2                     0                   0            0            0
```

```
3                      0                   0            0           0

4                      0                   0            0           0


   Yelachenahalli  Yelahanka  Yelahanka New Town  Yelenahalli
Yeshwanthpur
0               0          0                   0            0
0
1               0          0                   0            0
0
2               0          0                   0            0
0
3               0          0                   0            0
0
4               0          0                   0            0
0

[5 rows x 244 columns]
```

```
y = df12.price               # y => dependent variable
y.head()
```

```
0    428.0
1    194.0
2    235.0
3    130.0
4    148.0
Name: price, dtype: float64
```

```
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=10)
```

```
from sklearn.linear_model import LinearRegression
lr_clf = LinearRegression()
lr_clf.fit(X_train,y_train)
lr_clf.score(X_test,y_test)
```

```
0.8452277697874324
```

```
from sklearn.model_selection import ShuffleSplit
from sklearn.model_selection import cross_val_score

cv = ShuffleSplit(n_splits=5, test_size=0.2, random_state=0)
cross_val_score(LinearRegression(), X, y, cv=cv)
```

```
array([0.82430186, 0.77166234, 0.85089567, 0.80837764, 0.83653286])
```

```
from sklearn.linear_model import Lasso, LinearRegression
from sklearn.tree import DecisionTreeRegressor
from sklearn.model_selection import GridSearchCV, ShuffleSplit
from sklearn.preprocessing import StandardScaler
import pandas as pd

def find_best_model_using_gridsearchcv(X, y):
    algos = {
        'linear_regression': {
            'model': LinearRegression(),
            'params': {
                # Removed 'normalize' parameter
                'fit_intercept': [True, False]
            }
        },
        'lasso': {
            'model': Lasso(),
            'params': {
                'alpha': [1, 2],
                'selection': ['random', 'cyclic']
            }
        },
        'decision_tree': {
            'model': DecisionTreeRegressor(),
            'params': {
                'criterion': ['mse', 'friedman_mse'],
                'splitter': ['best', 'random']
            }
        }
    }

    scores = []
    cv = ShuffleSplit(n_splits=5, test_size=0.2, random_state=0)

    for algo_name, config in algos.items():
        gs = GridSearchCV(config['model'], config['params'], cv=cv,
return_train_score=False)
        gs.fit(X, y)
        scores.append({
            'model': algo_name,
            'best_score': gs.best_score_,
            'best_params': gs.best_params_
        })

    return pd.DataFrame(scores, columns=['model', 'best_score',
'best_params'])

# Example usage: assuming X and y are defined
find_best_model_using_gridsearchcv(X, y)
```

```
C:\ProgramData\anaconda3\Lib\site-packages\sklearn\model_selection\
_validation.py:378: FitFailedWarning:
10 fits failed out of a total of 20.
```

```
The score on these train-test partitions for these parameters will be
set to nan.
If these failures are not expected, you can try to debug them by
setting error_score='raise'.

Below are more details about the failures:
----------------------------------------------------------------------
----------
10 fits failed with the following error:
Traceback (most recent call last):
  File "C:\ProgramData\anaconda3\Lib\site-packages\sklearn\
model_selection\_validation.py", line 686, in _fit_and_score
    estimator.fit(X_train, y_train, **fit_params)
  File "C:\ProgramData\anaconda3\Lib\site-packages\sklearn\tree\
_classes.py", line 1247, in fit
    super().fit(
  File "C:\ProgramData\anaconda3\Lib\site-packages\sklearn\tree\
_classes.py", line 177, in fit
    self._validate_params()
  File "C:\ProgramData\anaconda3\Lib\site-packages\sklearn\base.py",
line 600, in _validate_params
    validate_parameter_constraints(
  File "C:\ProgramData\anaconda3\Lib\site-packages\sklearn\utils\
_param_validation.py", line 97, in validate_parameter_constraints
    raise InvalidParameterError(
sklearn.utils._param_validation.InvalidParameterError: The 'criterion'
parameter of DecisionTreeRegressor must be a str among {'poisson',
'squared_error', 'absolute_error', 'friedman_mse'}. Got 'mse' instead.

  warnings.warn(some_fits_failed_message, FitFailedWarning)
C:\ProgramData\anaconda3\Lib\site-packages\sklearn\model_selection\
_search.py:952: UserWarning: One or more of the test scores are non-
finite: [       nan        nan 0.70935255 0.68931782]
  warnings.warn(

               model  best_score  \
0  linear_regression    0.819001
1              lasso    0.687436
2      decision_tree    0.709353

                                     best_params
0                        {'fit_intercept': False}
1              {'alpha': 2, 'selection': 'random'}
2  {'criterion': 'friedman_mse', 'splitter': 'best'}
```

```
def predict_price(location,sqft,bath,bhk):
    loc_index = np.where(X.columns==location)[0][0]
    x = np.zeros(len(X.columns))
    x[0] = sqft
    x[1] = bath
    x[2] = bhk
    if loc_index > 0:
        x[loc_index] = 1

    return lr_clf.predict([x])[0]
```

```
X.columns
```

```
Index(['total_sqft', 'bath', 'bhk', '1st Block Jayanagar',
       '1st Phase JP Nagar', '2nd Phase Judicial Layout',
       '2nd Stage Nagarbhavi', '5th Block Hbr Layout', '5th Phase JP
Nagar',
       '6th Phase JP Nagar',
       ...
       'Vijayanagar', 'Vishveshwarya Layout', 'Vishwapriya Layout',
       'Vittasandra', 'Whitefield', 'Yelachenahalli', 'Yelahanka',
       'Yelahanka New Town', 'Yelenahalli', 'Yeshwanthpur'],
      dtype='object', length=244)
```

```
predict_price('1st Phase JP Nagar',1000,2,2)
```

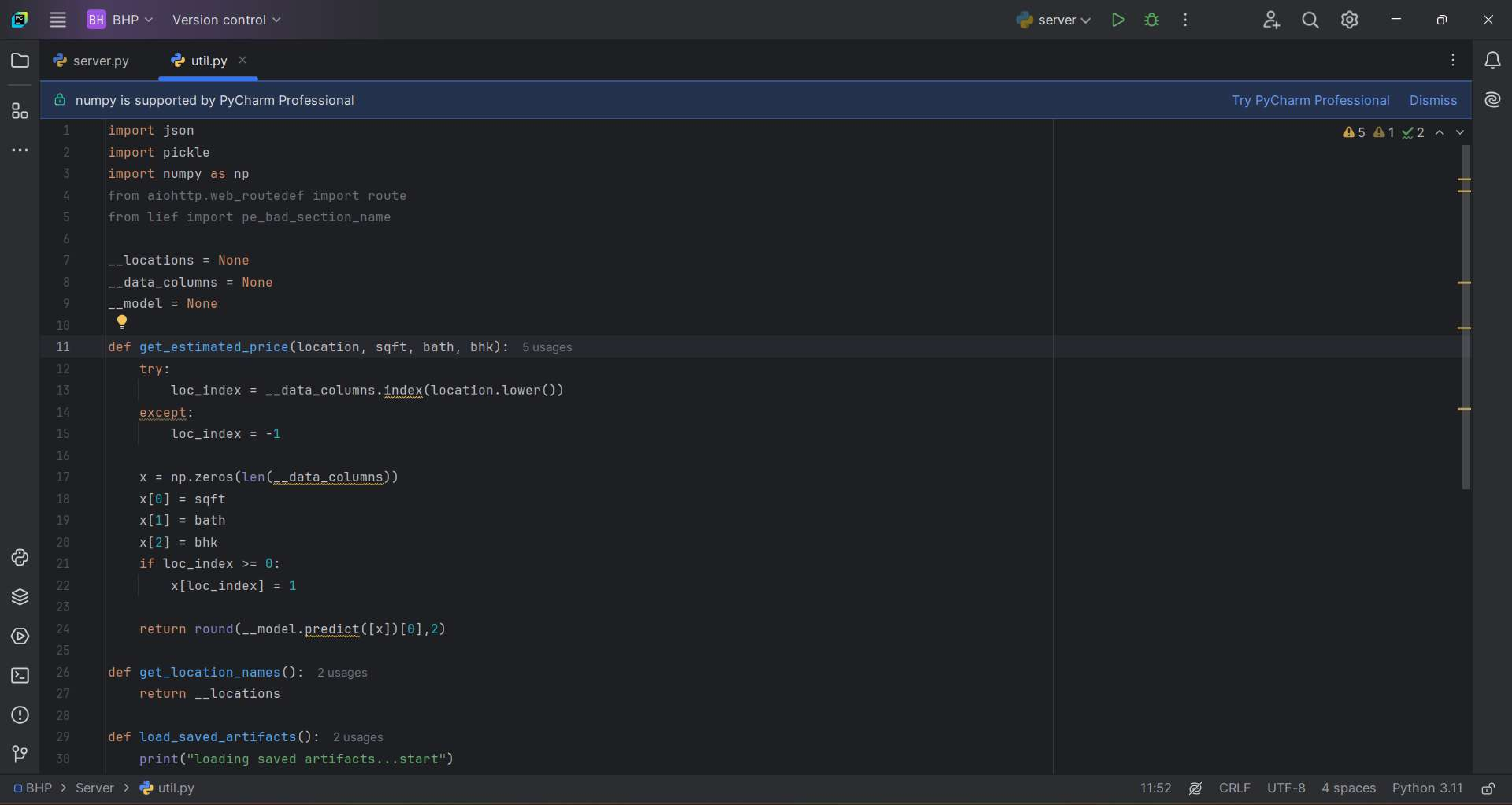
```
C:\ProgramData\anaconda3\Lib\site-packages\sklearn\base.py:439:
UserWarning: X does not have valid feature names, but LinearRegression
was fitted with feature names
  warnings.warn(

83.49904677185246
```

```
predict_price('Indira Nagar',1000,2,2)
```

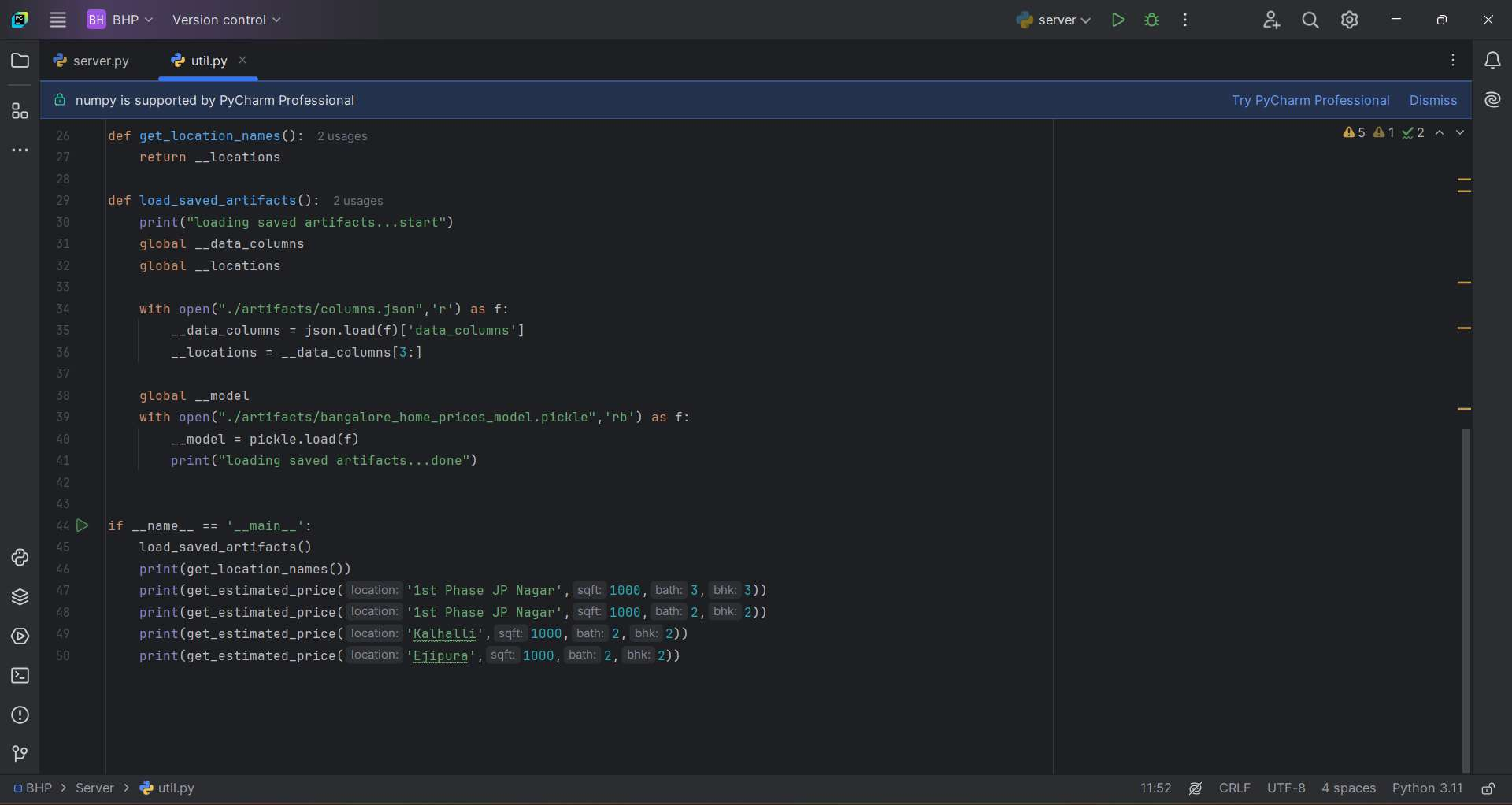
```
C:\ProgramData\anaconda3\Lib\site-packages\sklearn\base.py:439:
UserWarning: X does not have valid feature names, but LinearRegression
was fitted with feature names
  warnings.warn(

181.2781548400676
```

```
import pickle
with open('bangalore_home_prices_model.pickle','wb') as f:
    pickle.dump(lr_clf,f)
```

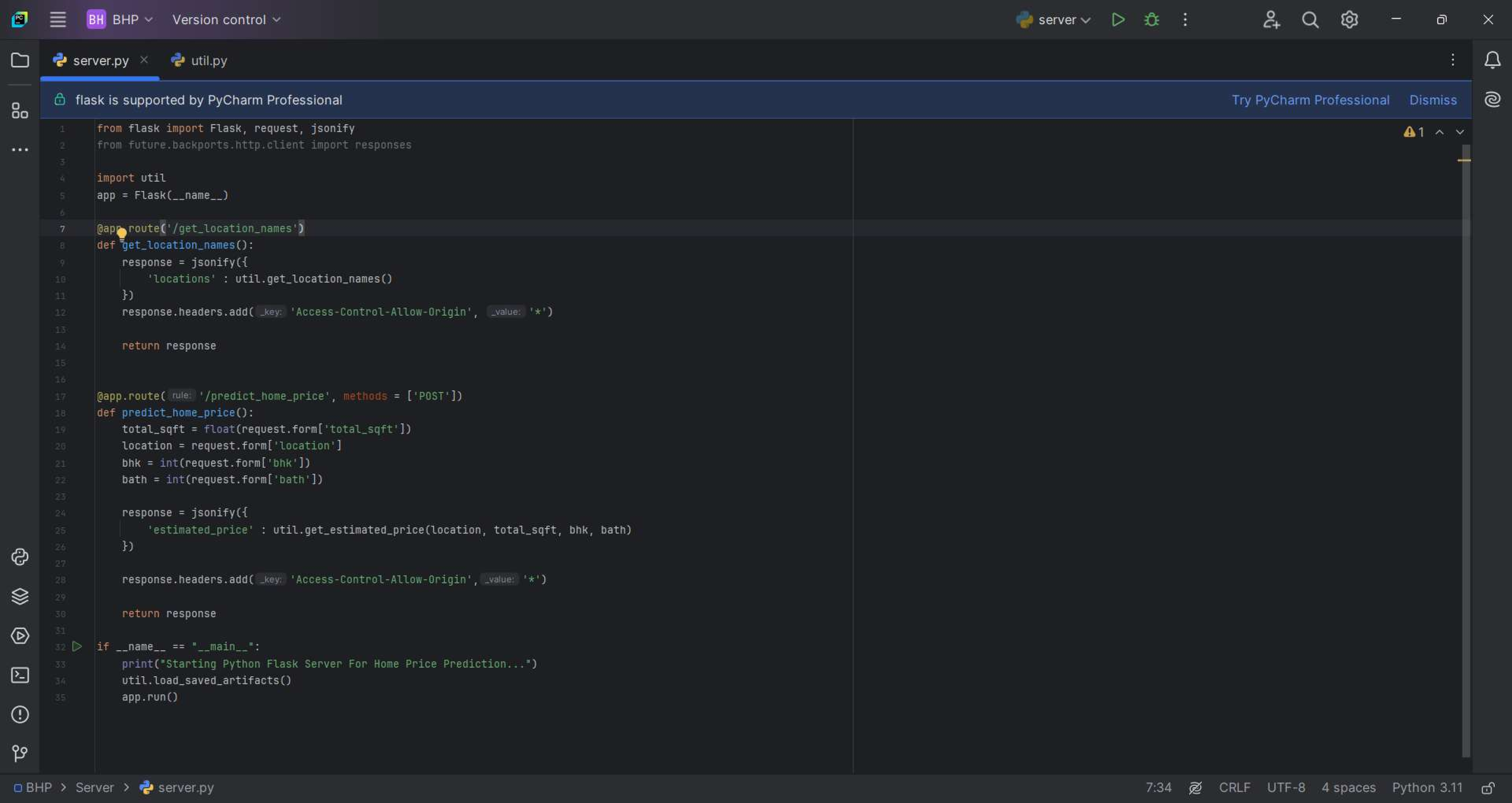
```
import json
columns = {
    'data_columns' : [col.lower() for col in X.columns]
}
with open("columns.json","w") as f:
    f.write(json.dumps(columns))
```



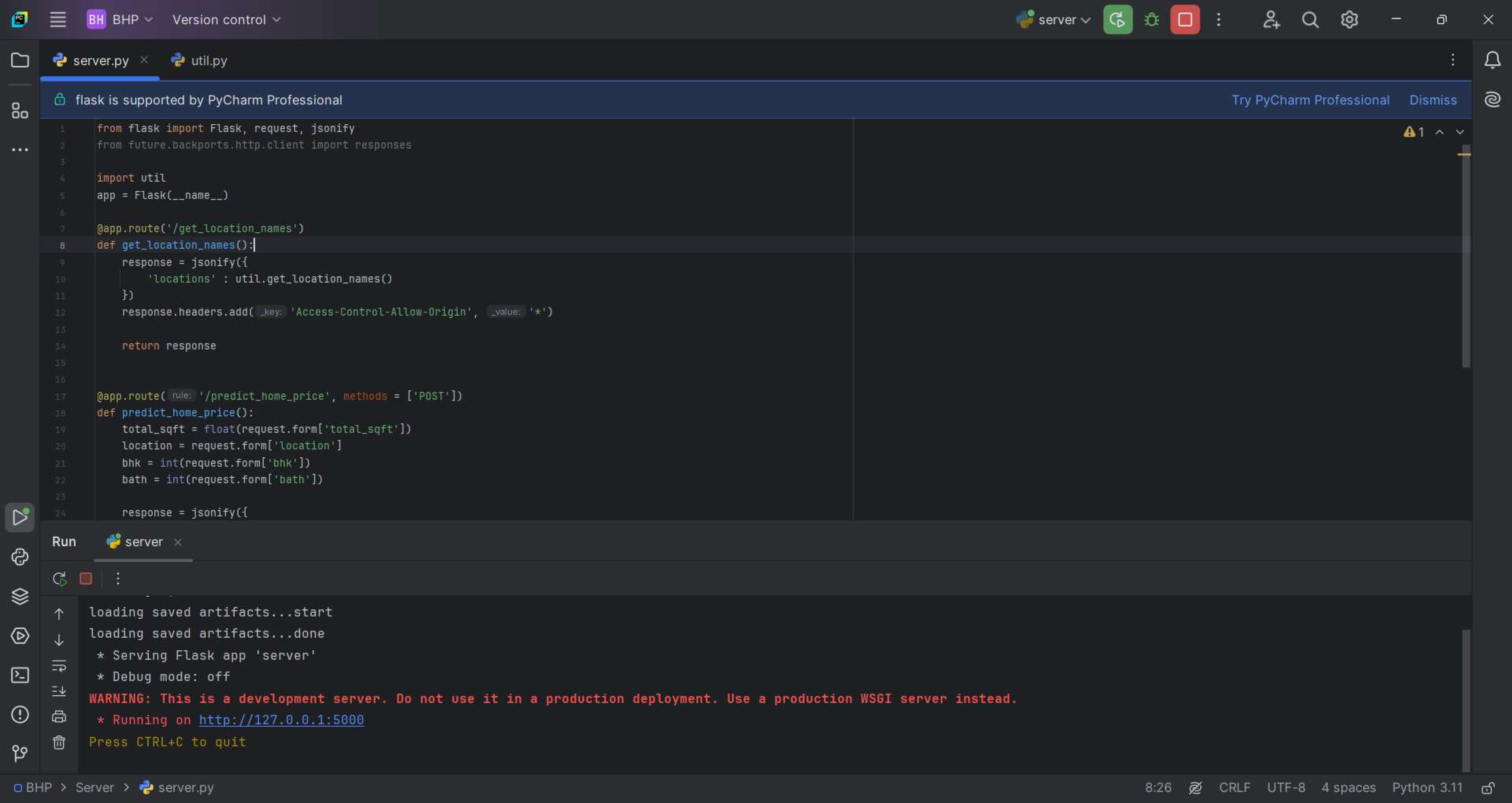
```
import json
import pickle
import numpy as np
from aiohttp.web_routedef import route
from lief import pe_bad_section_name

__locations = None
__data_columns = None
__model = None

def get_estimated_price(location, sqft, bath, bhk):  5 usages
    try:
        loc_index = __data_columns.index(location.lower())
    except:
        loc_index = -1

    x = np.zeros(len(__data_columns))
    x[0] = sqft
    x[1] = bath
    x[2] = bhk
    if loc_index >= 0:
        x[loc_index] = 1

    return round(__model.predict([x])[0],2)

def get_location_names():  2 usages
    return __locations

def load_saved_artifacts():  2 usages
    print("loading saved artifacts...start")
```



```python
def get_location_names():  2 usages
    return __locations

def load_saved_artifacts():  2 usages
    print("loading saved artifacts...start")
    global __data_columns
    global __locations

    with open("./artifacts/columns.json",'r') as f:
        __data_columns = json.load(f)['data_columns']
        __locations = __data_columns[3:]

    global __model
    with open("./artifacts/bangalore_home_prices_model.pickle",'rb') as f:
        __model = pickle.load(f)
        print("loading saved artifacts...done")


if __name__ == '__main__':
    load_saved_artifacts()
    print(get_location_names())
    print(get_estimated_price( location: '1st Phase JP Nagar', sqft: 1000, bath: 3, bhk: 3))
    print(get_estimated_price( location: '1st Phase JP Nagar', sqft: 1000, bath: 2, bhk: 2))
    print(get_estimated_price( location: 'Kalhalli', sqft: 1000, bath: 2, bhk: 2))
    print(get_estimated_price( location: 'Ejipura', sqft: 1000, bath: 2, bhk: 2))
```

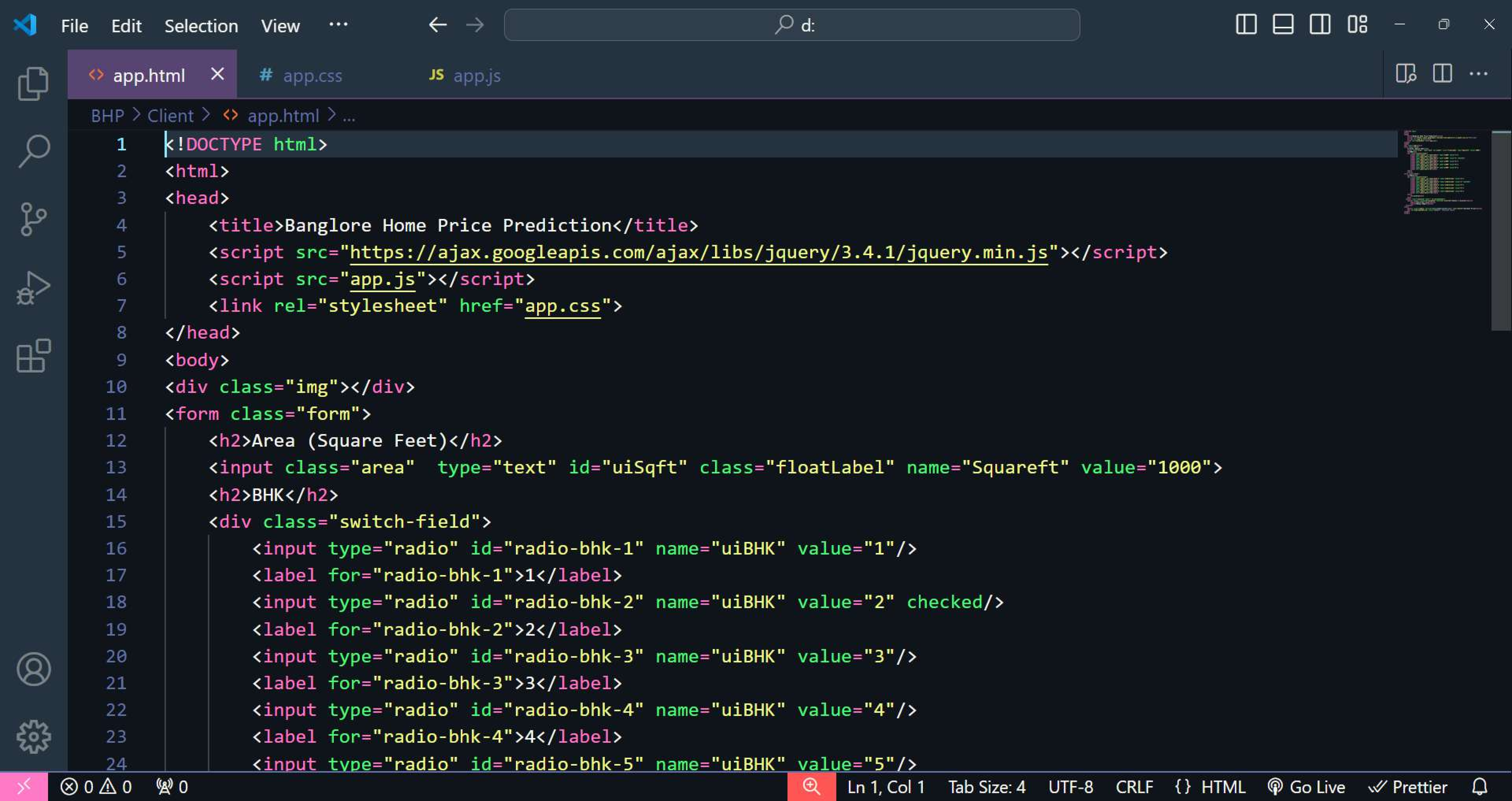


```python
from flask import Flask, request, jsonify
from future.backports.http.client import responses

import util
app = Flask(__name__)

@app.route('/get_location_names')
def get_location_names():
    response = jsonify({
        'locations' : util.get_location_names()
    })
    response.headers.add( _key: 'Access-Control-Allow-Origin', _value: '*')

    return response


@app.route( rule: '/predict_home_price', methods = ['POST'])
def predict_home_price():
    total_sqft = float(request.form['total_sqft'])
    location = request.form['location']
    bhk = int(request.form['bhk'])
    bath = int(request.form['bath'])

    response = jsonify({
        'estimated_price' : util.get_estimated_price(location, total_sqft, bhk, bath)
    })

    response.headers.add( _key: 'Access-Control-Allow-Origin', _value: '*')

    return response

if __name__ == "__main__":
    print("Starting Python Flask Server For Home Price Prediction...")
    util.load_saved_artifacts()
    app.run()
```

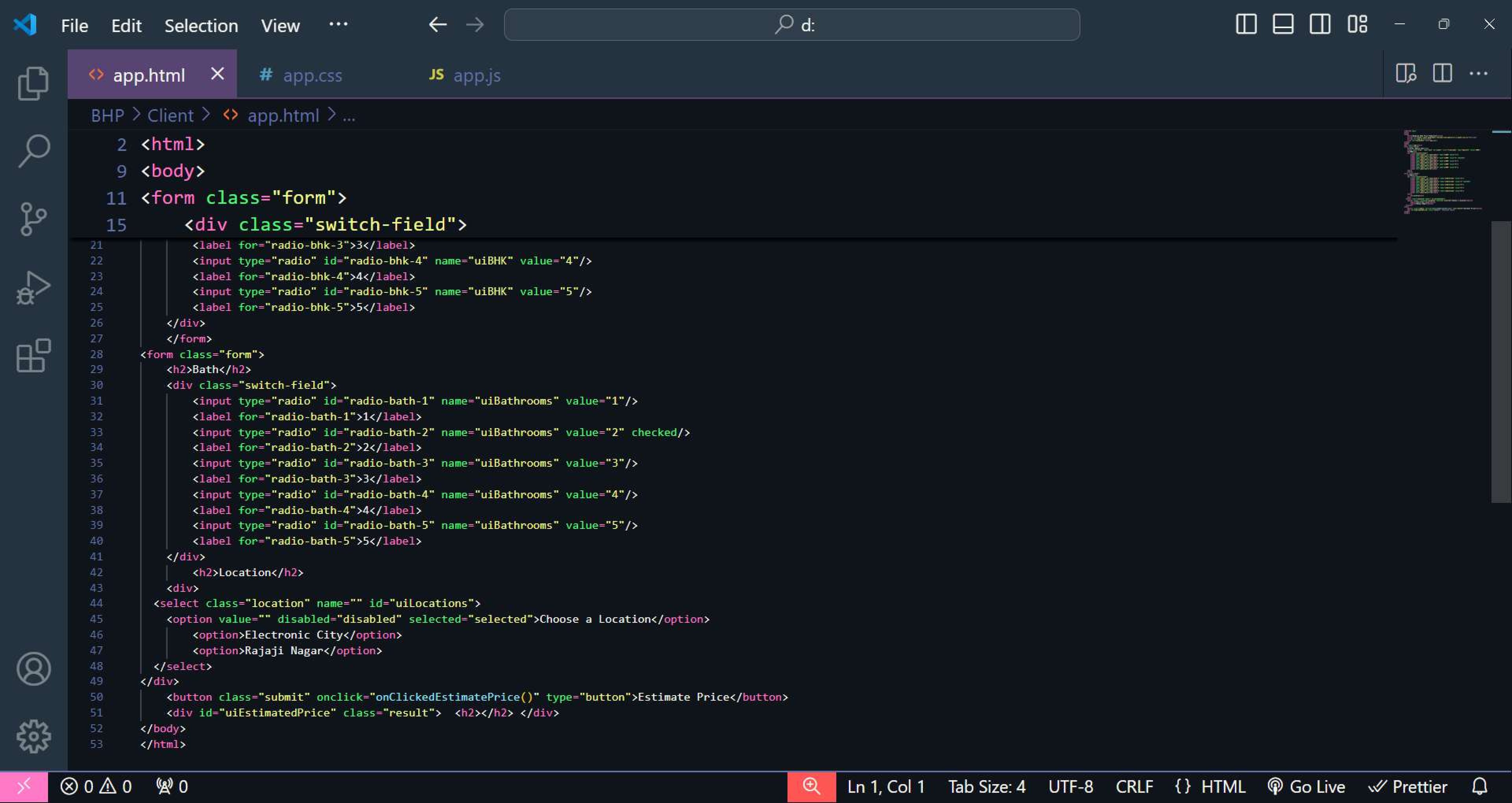


```
from flask import Flask, request, jsonify
from future.backports.http.client import responses

import util
app = Flask(__name__)

@app.route('/get_location_names')
def get_location_names():
    response = jsonify({
        'locations' : util.get_location_names()
    })
    response.headers.add( _key: 'Access-Control-Allow-Origin', _value: '*')

    return response


@app.route( rule: '/predict_home_price', methods = ['POST'])
def predict_home_price():
    total_sqft = float(request.form['total_sqft'])
    location = request.form['location']
    bhk = int(request.form['bhk'])
    bath = int(request.form['bath'])

    response = jsonify({
```

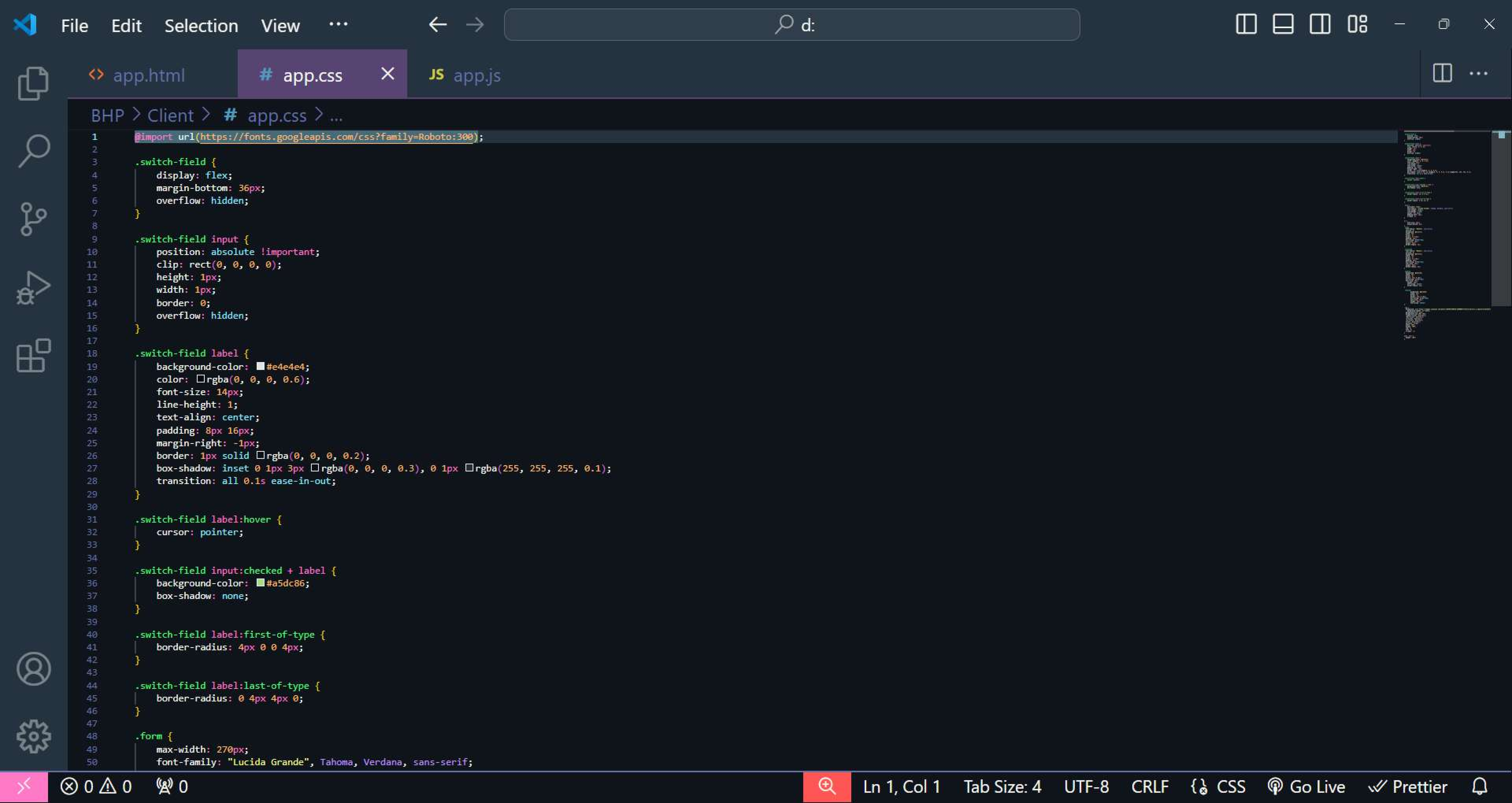
```
loading saved artifacts...start
loading saved artifacts...done
 * Serving Flask app 'server'
 * Debug mode: off
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
 * Running on http://127.0.0.1:5000
Press CTRL+C to quit
```



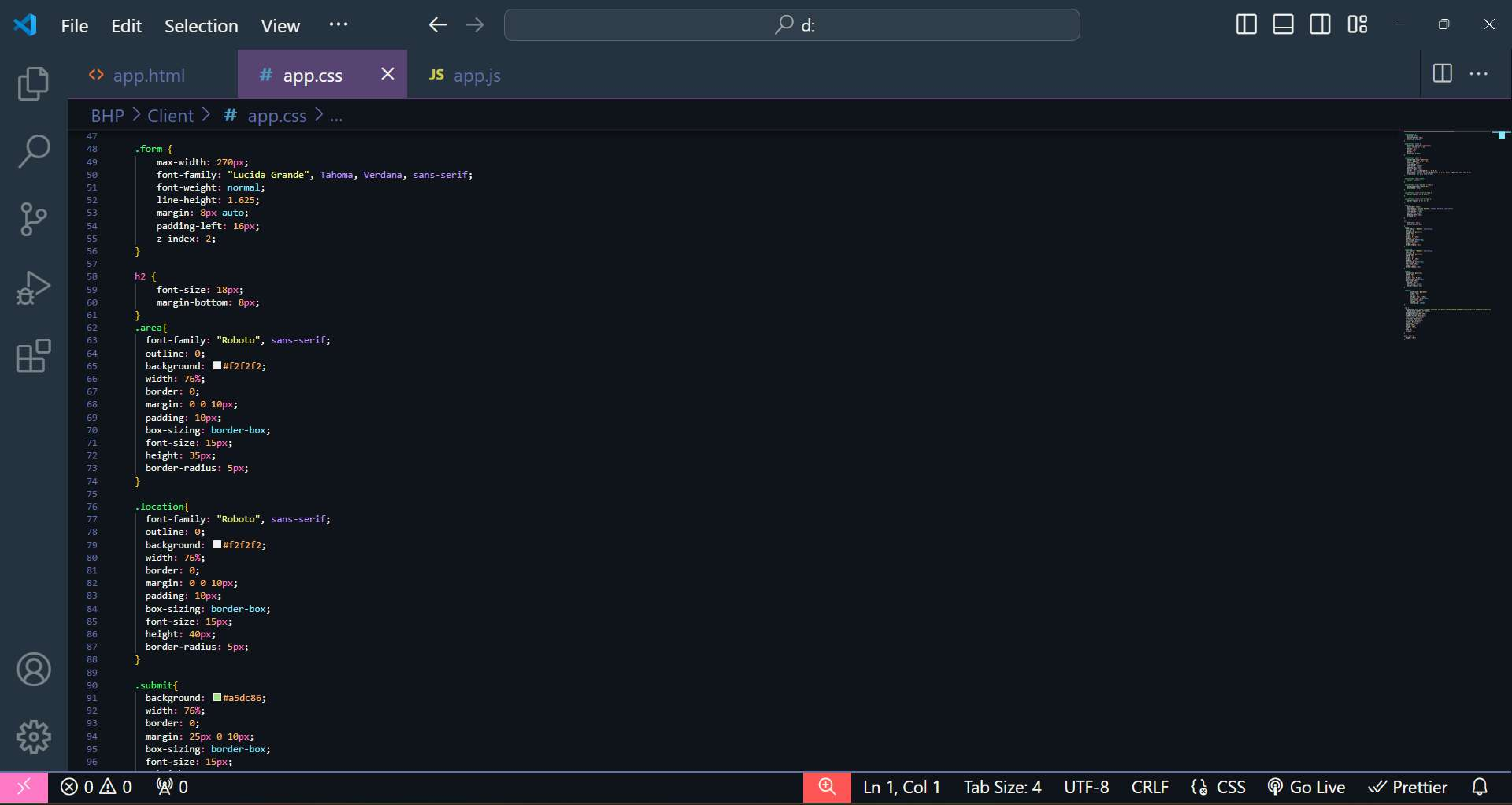
```
<!DOCTYPE html>
<html>
<head>
    <title>Banglore Home Price Prediction</title>
    <script src="https://ajax.googleapis.com/ajax/libs/jquery/3.4.1/jquery.min.js"></script>
    <script src="app.js"></script>
    <link rel="stylesheet" href="app.css">
</head>
<body>
<div class="img"></div>
<form class="form">
    <h2>Area (Square Feet)</h2>
    <input class="area"  type="text" id="uiSqft" class="floatLabel" name="Squareft" value="1000">
    <h2>BHK</h2>
    <div class="switch-field">
        <input type="radio" id="radio-bhk-1" name="uiBHK" value="1"/>
        <label for="radio-bhk-1">1</label>
        <input type="radio" id="radio-bhk-2" name="uiBHK" value="2" checked/>
        <label for="radio-bhk-2">2</label>
        <input type="radio" id="radio-bhk-3" name="uiBHK" value="3"/>
        <label for="radio-bhk-3">3</label>
        <input type="radio" id="radio-bhk-4" name="uiBHK" value="4"/>
        <label for="radio-bhk-4">4</label>
        <input type="radio" id="radio-bhk-5" name="uiBHK" value="5"/>
```



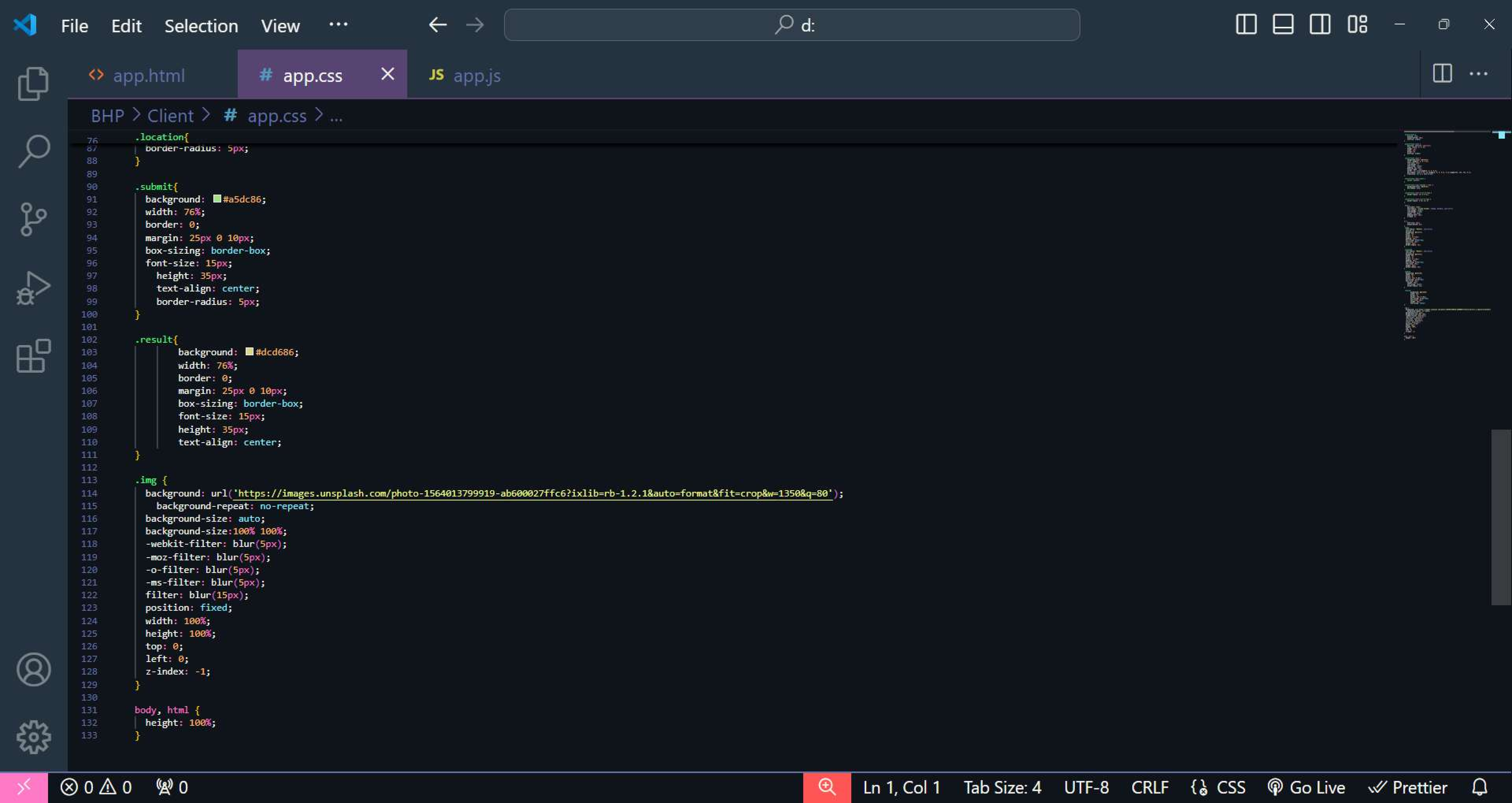
```html
<html>
<body>
<form class="form">
    <div class="switch-field">
            <label for="radio-bhk-3">3</label>
            <input type="radio" id="radio-bhk-4" name="uiBHK" value="4"/>
            <label for="radio-bhk-4">4</label>
            <input type="radio" id="radio-bhk-5" name="uiBHK" value="5"/>
            <label for="radio-bhk-5">5</label>
        </div>
        </form>
<form class="form">
        <h2>Bath</h2>
        <div class="switch-field">
            <input type="radio" id="radio-bath-1" name="uiBathrooms" value="1"/>
            <label for="radio-bath-1">1</label>
            <input type="radio" id="radio-bath-2" name="uiBathrooms" value="2" checked/>
            <label for="radio-bath-2">2</label>
            <input type="radio" id="radio-bath-3" name="uiBathrooms" value="3"/>
            <label for="radio-bath-3">3</label>
            <input type="radio" id="radio-bath-4" name="uiBathrooms" value="4"/>
            <label for="radio-bath-4">4</label>
            <input type="radio" id="radio-bath-5" name="uiBathrooms" value="5"/>
            <label for="radio-bath-5">5</label>
        </div>
            <h2>Location</h2>
        <div>
    <select class="location" name="" id="uiLocations">
        <option value="" disabled="disabled" selected="selected">Choose a Location</option>
            <option>Electronic City</option>
            <option>Rajaji Nagar</option>
    </select>
</div>
        <button class="submit" onclick="onClickedEstimatePrice()" type="button">Estimate Price</button>
        <div id="uiEstimatedPrice" class="result">  <h2></h2> </div>
</body>
</html>
```



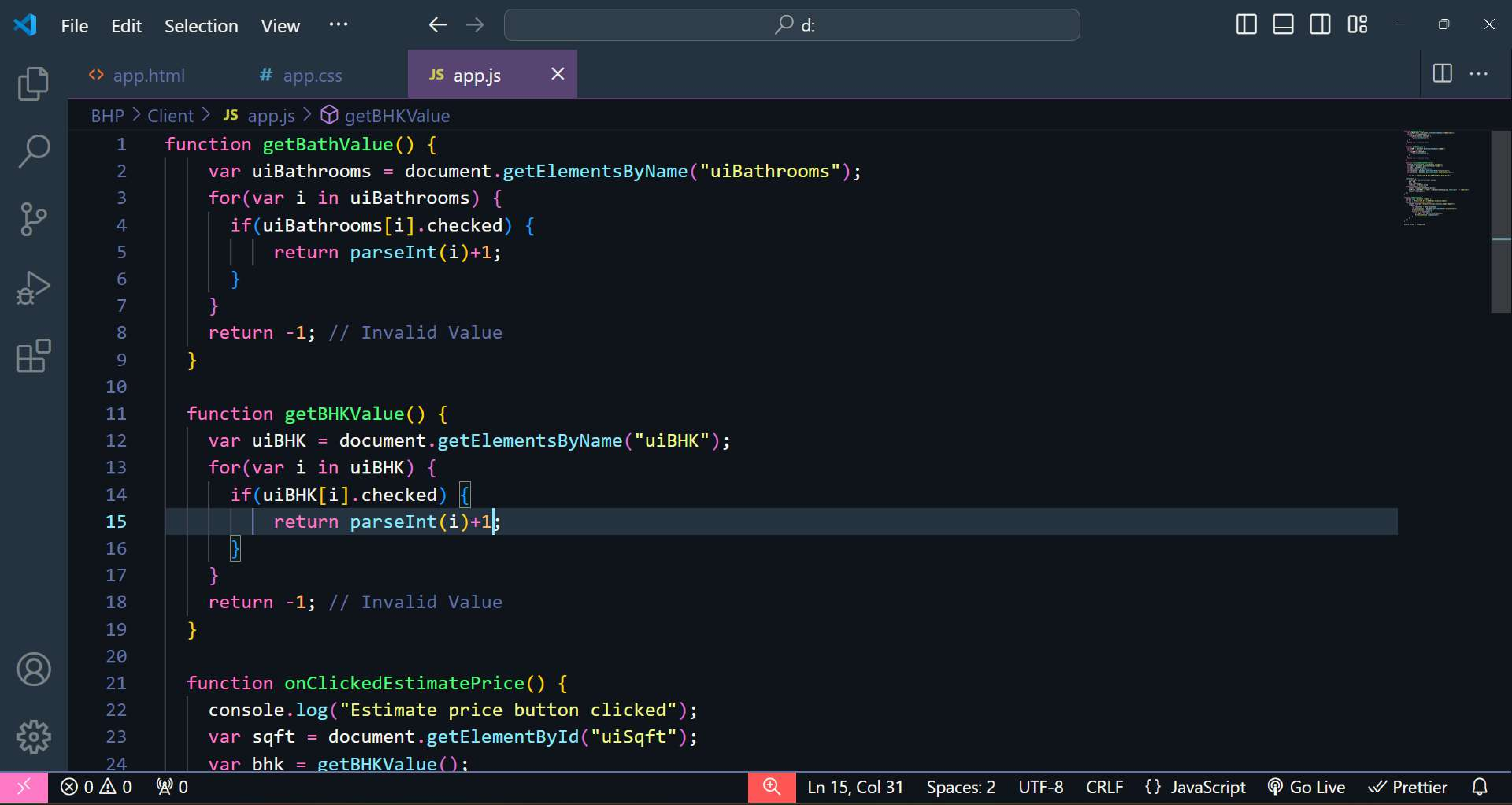
```css
@import url(https://fonts.googleapis.com/css?family=Roboto:300);

.switch-field {
    display: flex;
    margin-bottom: 36px;
    overflow: hidden;
}

.switch-field input {
    position: absolute !important;
    clip: rect(0, 0, 0, 0);
    height: 1px;
    width: 1px;
    border: 0;
    overflow: hidden;
}

.switch-field label {
    background-color: #e4e4e4;
    color: rgba(0, 0, 0, 0.6);
    font-size: 14px;
    line-height: 1;
    text-align: center;
    padding: 8px 16px;
    margin-right: -1px;
    border: 1px solid rgba(0, 0, 0, 0.2);
    box-shadow: inset 0 1px 3px rgba(0, 0, 0, 0.3), 0 1px rgba(255, 255, 255, 0.1);
    transition: all 0.1s ease-in-out;
}

.switch-field label:hover {
    cursor: pointer;
}

.switch-field input:checked + label {
    background-color: #a5dc86;
    box-shadow: none;
}

.switch-field label:first-of-type {
    border-radius: 4px 0 0 4px;
}

.switch-field label:last-of-type {
    border-radius: 0 4px 4px 0;
}

.form {
    max-width: 270px;
    font-family: "Lucida Grande", Tahoma, Verdana, sans-serif;
```


File Edit Selection View
d:
app.html
app.css
app.js
BHP > Client > app.css > ...
0 0 0
Ln 1, Col 1 Tab Size: 4 UTF-8 CRLF CSS Go Live Prettier

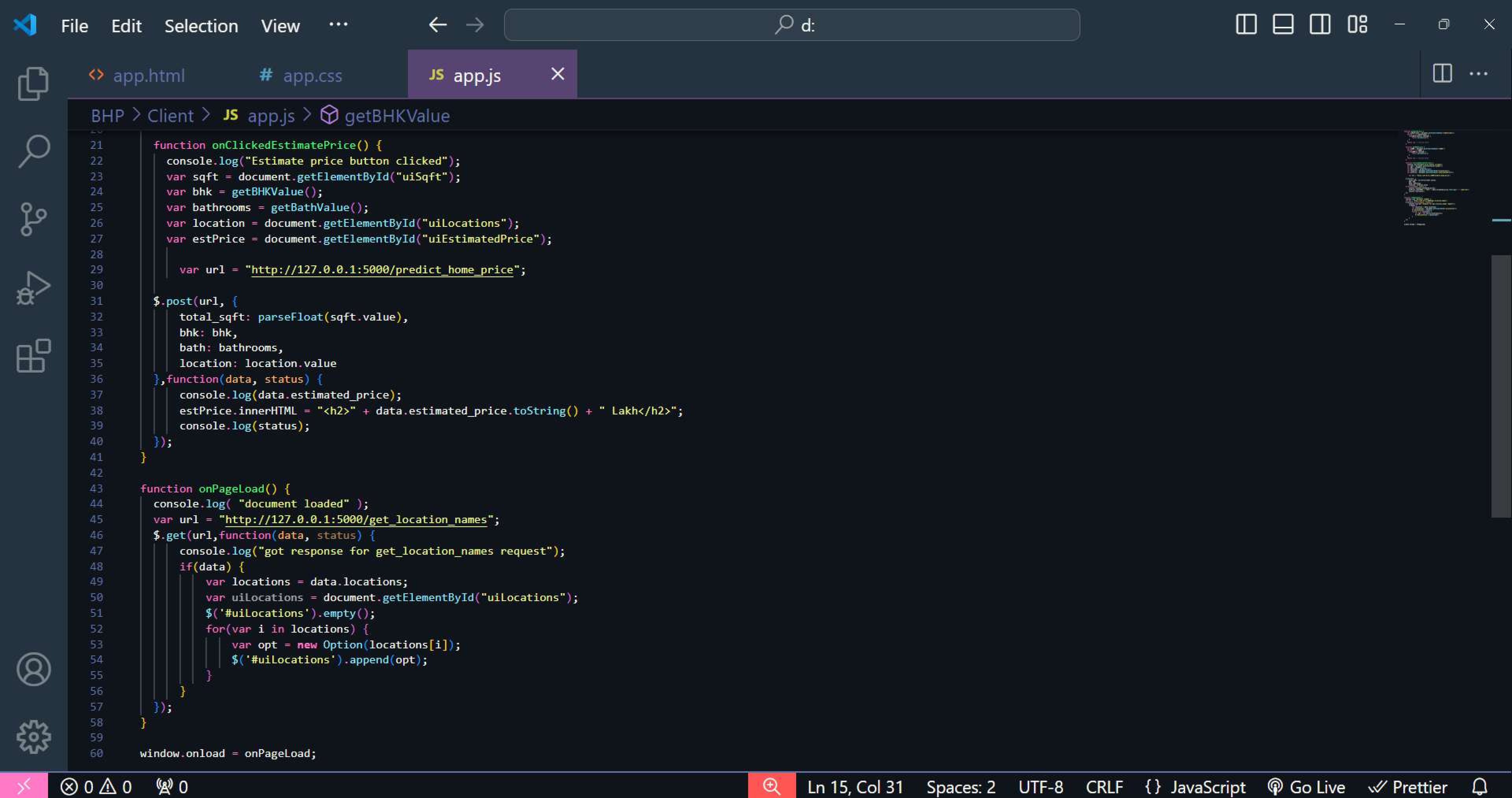
```css

    .form {
        max-width: 270px;
        font-family: "Lucida Grande", Tahoma, Verdana, sans-serif;
        font-weight: normal;
        line-height: 1.625;
        margin: 8px auto;
        padding-left: 16px;
        z-index: 2;
    }

    h2 {
        font-size: 18px;
        margin-bottom: 8px;
    }
    .area{
      font-family: "Roboto", sans-serif;
      outline: 0;
      background: #f2f2f2;
      width: 76%;
      border: 0;
      margin: 0 0 10px;
      padding: 10px;
      box-sizing: border-box;
      font-size: 15px;
      height: 35px;
      border-radius: 5px;
    }

    .location{
      font-family: "Roboto", sans-serif;
      outline: 0;
      background: #f2f2f2;
      width: 76%;
      border: 0;
      margin: 0 0 10px;
      padding: 10px;
      box-sizing: border-box;
      font-size: 15px;
      height: 40px;
      border-radius: 5px;
    }

    .submit{
      background: #a5dc86;
      width: 76%;
      border: 0;
      margin: 25px 0 10px;
      box-sizing: border-box;
      font-size: 15px;
```


File Edit Selection View ···
d:
app.html
app.css
app.js
BHP > Client > # app.css > ...
⊗ 0 ⚠ 0 0
Ln 1, Col 1 Tab Size: 4 UTF-8 CRLF CSS Go Live Prettier

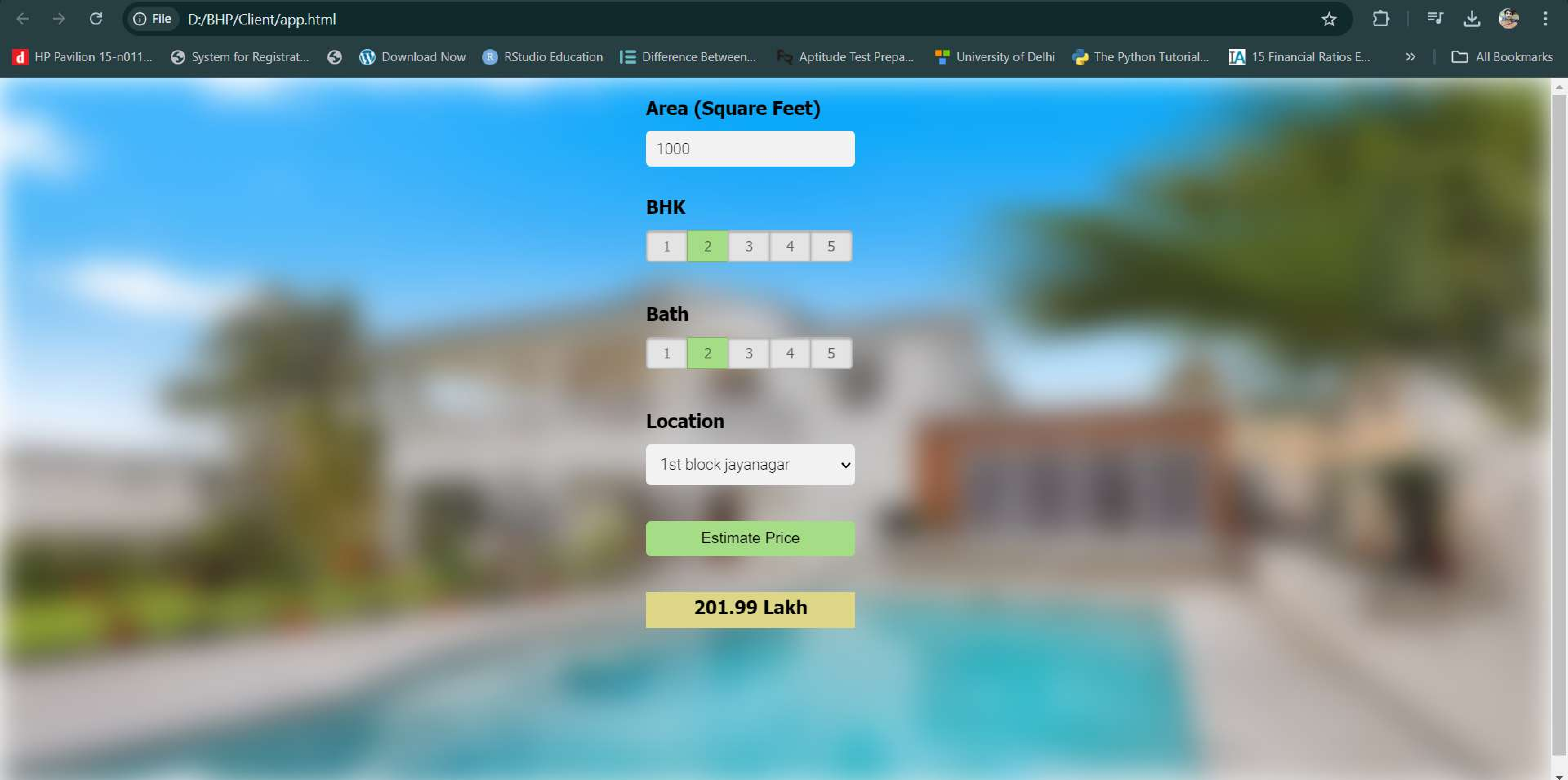
```css
.location{
  border-radius: 5px;
}

.submit{
  background: #a5dc86;
  width: 76%;
  border: 0;
  margin: 25px 0 10px;
  box-sizing: border-box;
  font-size: 15px;
    height: 35px;
    text-align: center;
    border-radius: 5px;
}

.result{
        background: #dcd686;
        width: 76%;
        border: 0;
        margin: 25px 0 10px;
        box-sizing: border-box;
        font-size: 15px;
        height: 35px;
        text-align: center;
}

.img {
  background: url('https://images.unsplash.com/photo-1564013799919-ab600027ffc6?ixlib=rb-1.2.1&auto=format&fit=crop&w=1350&q=80');
    background-repeat: no-repeat;
  background-size: auto;
  background-size:100% 100%;
  -webkit-filter: blur(5px);
  -moz-filter: blur(5px);
  -o-filter: blur(5px);
  -ms-filter: blur(5px);
  filter: blur(15px);
  position: fixed;
  width: 100%;
  height: 100%;
  top: 0;
  left: 0;
  z-index: -1;
}

body, html {
  height: 100%;
}
```



```javascript
function getBathValue() {
    var uiBathrooms = document.getElementsByName("uiBathrooms");
    for(var i in uiBathrooms) {
      if(uiBathrooms[i].checked) {
          return parseInt(i)+1;
      }
    }
    return -1; // Invalid Value
  }

  function getBHKValue() {
    var uiBHK = document.getElementsByName("uiBHK");
    for(var i in uiBHK) {
      if(uiBHK[i].checked) {
          return parseInt(i)+1;
      }
    }
    return -1; // Invalid Value
  }

  function onClickedEstimatePrice() {
    console.log("Estimate price button clicked");
    var sqft = document.getElementById("uiSqft");
    var bhk = getBHKValue();
```



```
    function onClickedEstimatePrice() {
      console.log("Estimate price button clicked");
      var sqft = document.getElementById("uiSqft");
      var bhk = getBHKValue();
      var bathrooms = getBathValue();
      var location = document.getElementById("uiLocations");
      var estPrice = document.getElementById("uiEstimatedPrice");

        var url = "http://127.0.0.1:5000/predict_home_price";

    $.post(url, {
        total_sqft: parseFloat(sqft.value),
        bhk: bhk,
        bath: bathrooms,
        location: location.value
    },function(data, status) {
        console.log(data.estimated_price);
        estPrice.innerHTML = "<h2>" + data.estimated_price.toString() + " Lakh</h2>";
        console.log(status);
    });
  }

  function onPageLoad() {
    console.log( "document loaded" );
    var url = "http://127.0.0.1:5000/get_location_names";
    $.get(url,function(data, status) {
        console.log("got response for get_location_names request");
        if(data) {
            var locations = data.locations;
            var uiLocations = document.getElementById("uiLocations");
            $('#uiLocations').empty();
            for(var i in locations) {
                var opt = new Option(locations[i]);
                $('#uiLocations').append(opt);
            }
        }
    });
  }

  window.onload = onPageLoad;
```



Area (Square Feet)

1000

BHK

1 [✓ 2] 3 4 5

Bath

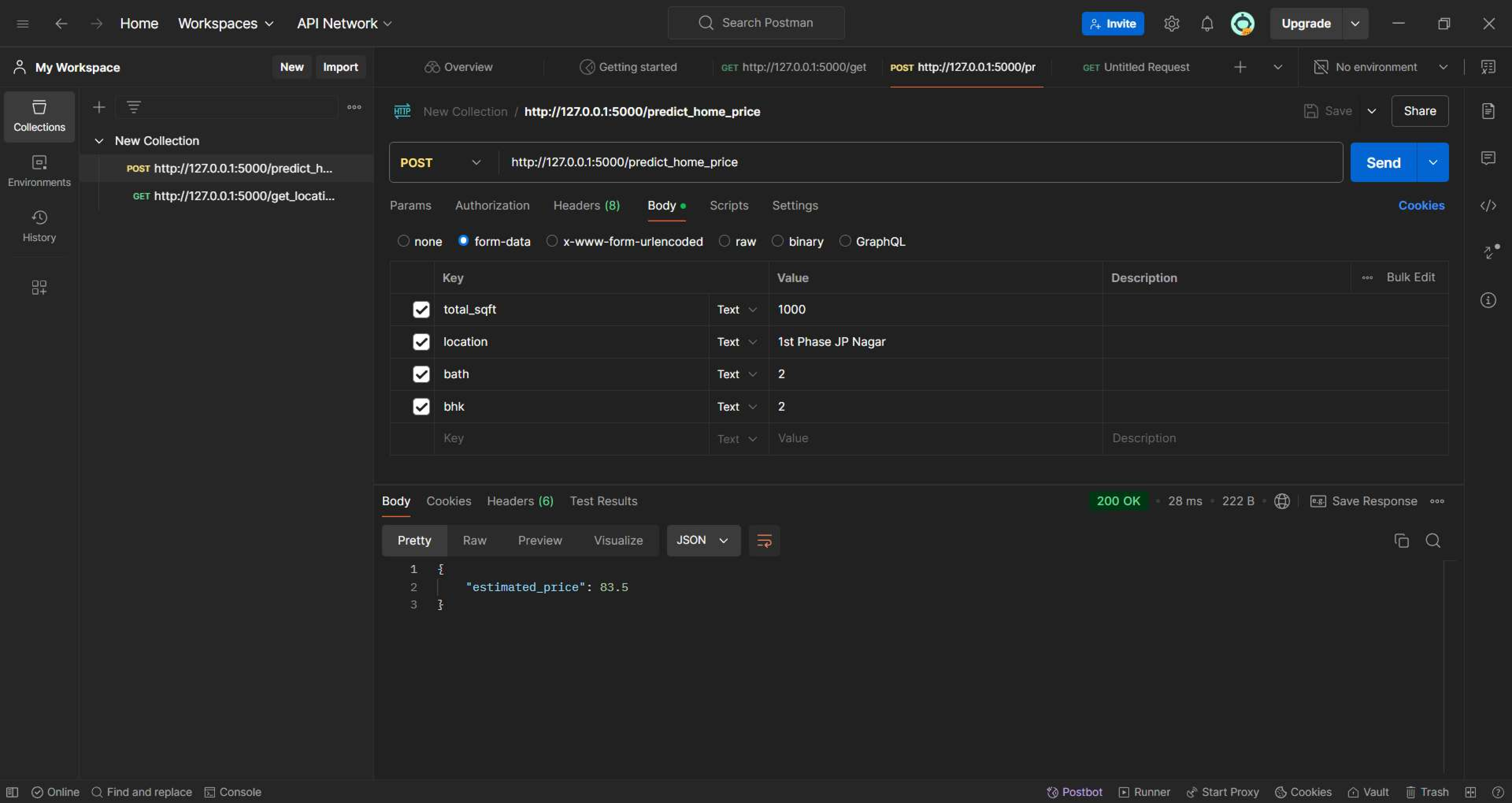
1 [✓ 2] 3 4 5

Location

1st block jayanagar

Estimate Price

201.99 Lakh



New Collection / http://127.0.0.1:5000/predict_home_price

POST http://127.0.0.1:5000/predict_home_price

Body: none [✓ form-data] x-www-form-urlencoded raw binary GraphQL

	Key		Value	Description
✓	total_sqft	Text	1000	
✓	location	Text	1st Phase JP Nagar	
✓	bath	Text	2	
✓	bhk	Text	2	
	Key	Text	Value	Description

Body Cookies Headers (6) Test Results — 200 OK • 28 ms • 222 B

```
{
    "estimated_price": 83.5
}
```