Recommendation_system

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1 Price Recommendation System

In this notebook, our objective is to construct a straightforward recommendation system. Initially, the user defines specific conditions, such as the number of bedrooms, and so on. The program then, based on the user-provided conditions, filters and selects all rows that meet these criteria. Following this, we employ linear regression, using the price and area of a building, to propose an optimal price for a new building.

The suggested price will be presented within an interval defined by subtracting and adding the Z-score from the model estimates.

```
[ ]: import numpy as np
     import pandas as pd
     import seaborn as sns
     import matplotlib.pyplot as plt
```

importing Data and creating dataframe

```
[ ]: data = pd.read_csv("housing_price_dataset.csv")
     df = pd.DataFrame(data=data)
     df[:2]
```

```
[ ]:    SquareFeet  Bedrooms  Bathrooms Neighborhood  YearBuilt          Price
     0        2126         4          1        Rural       1969  215355.283618
     1        2459         3          2        Rural       1980  195014.221626
```

rename columns and convert all prices to absolute values (a few rows have negative prices):

```
[ ]: df.Price = df.Price.abs()
     df.columns = ["squarefeet", "bedrooms", "bathrooms", "neighborhood",␣
      ↪"yearbuilt", "price"]
```

1.1 a Summery about the dataset:

Bathrooms : maximum = 3, minimum = 1

Bedrooms : maximum = 5, minimum = 2

Built Year : newest building belongs to 2021, oldest building belongs to 1950

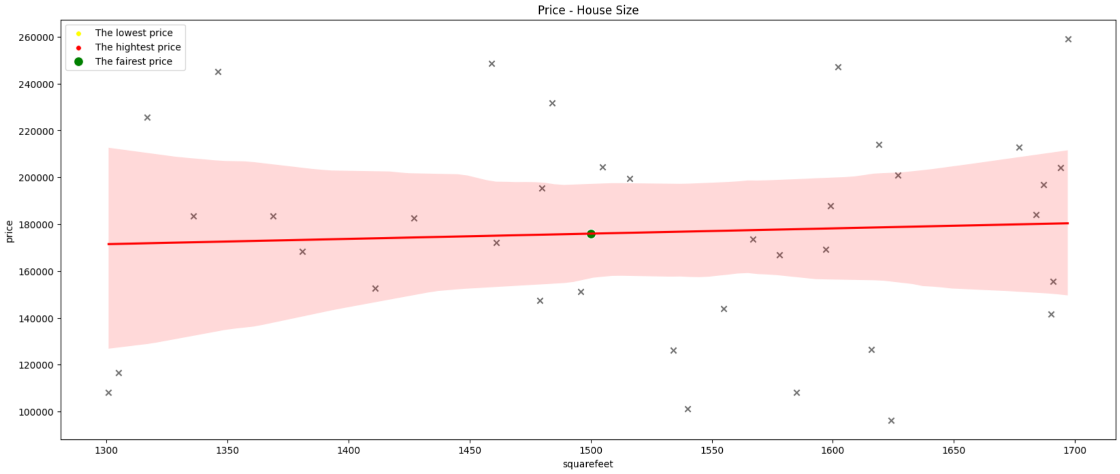
Building Area : smallest building 1000 squarefeet, largest building 2999 squarefeet

```
[ ]: def price_recommendation():



    # getting factors and features of house
    area = float(input("Enter area of house (in square feet) (max: 2999, min: 1000): "))
    neighborhood = input("Enter neighborhood ('Rural','Suburb','Urban'):" )
    year = int(input("Enter the year the building construction, (max: 2021, min: 1950): "))
    bath = int(input("enter number of bathrooms (max: 3, min: 1): "))
    bed = int(input("enter number of bedrooms (max: 5, min: 2): "))


    # selecting data from our main dataframe
    condition = ((df.bathrooms == bath)
             & (df.bedrooms == bed)
             & (df.neighborhood == neighborhood)
             & (df.yearbuilt.between(year-5, year+5)
             & (df.squarefeet.between(area-200, area+200) ))) # for year condition, it is better to consider an year interval


    # create a new dataframe based on the given conditions
    data_cluster = df.loc[condition]

    # create a linear regression
    a, b = np.polyfit(x=data_cluster["squarefeet"], y=data_cluster["price"], deg=1)


    # calculate Z-score, to calculate Z-score i must find Mean, standard deviation of population.
    # calculate exact price from linear regression, after that we must plus or minus z-score to get fair points.
    fairest price = round(a,2)*(house_area) + round(b, 2)


    # calculate Z-score
    mean = data_cluster.price.mean()
    std_dev = data_cluster.price.std()

    std_error = data_cluster.price.std()/np.sqrt(len(data_cluster.price))

    value_x = fairest price
```

```python
z_score = (value_x - mean) / std_dev

lower_limit = fairest price - (z_score*std_error)
upper_limit = fairest price + (z_score*std_error)




# create a diagram
plt.figure(figsize=(20,8))

# Create the regplot
sns.regplot(
    data=data_cluster, x="squarefeet", y="price",
    ci=99, marker="x", color=".3", line_kws=dict(color="r"),
)


# Add a new data point
lower_limit_df = pd.DataFrame({"squarefeet": [house_area], "price": [lower_limit]})
sns.scatterplot(data=lower_limit_df, x="squarefeet", y="price",
                marker="o", color="yellow", s=30, label="The lowest price")

# Add a new data point
lower_limit_df = pd.DataFrame({"squarefeet": [house_area], "price": [upper_limit]})
sns.scatterplot(data=lower_limit_df, x="squarefeet", y="price",
                marker="o", color="red", s=30, label="The hightest price")

# Add a new data point
lower_limit_df = pd.DataFrame({"squarefeet": [house_area], "price": [fairest price]})
sns.scatterplot(data=lower_limit_df, x="squarefeet", y="price",
                marker="o", color="green", s=100, label="The fairest price")


# Set plot title
plt.title("Price - House Size")

# Show the plot
plt.legend()
plt.show()
```

```
    #   f(x) is equal to
    print(f"f(x) = {round(a,2)}x + {round(b, 2)}")

    # final massage for user
    print(f"""for a {area} SquareFeet house with {bath} bathrooms and {bed}␣
↪bedrooms and built in year {year} at {neighborhood}
        Based on linear regression model,
        fairest price is: {fairest price},
        lowest price is: {lower_limit},
        highest price is: {upper_limit}""")
```

[ ]:
```
price_recommendation()
```



```
f(x) = 22.43x + 142310.44
for a 1500.0 SquareFeet house with 2 bathrooms and 3 bedrooms and built in year
1975 at Suburb
        Based on linear regression model,
        fairest price is: 175955.44,
        lowest price is: 176057.80206779495,
        highest price is: 175853.07793220505
```