schulzdLab2

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1 Lab 2: EDA Visualization

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1.1 Introduction

In the previous lab, we loaded and inspected a data set of real estate transactions. In this lab, we are going to perform exploratory data analysis (EDA) to identify and explain the relationships between dependent (output) and other independent variables.

1.2 Part I: Regression on Price

1.2.1 Continuous Variables

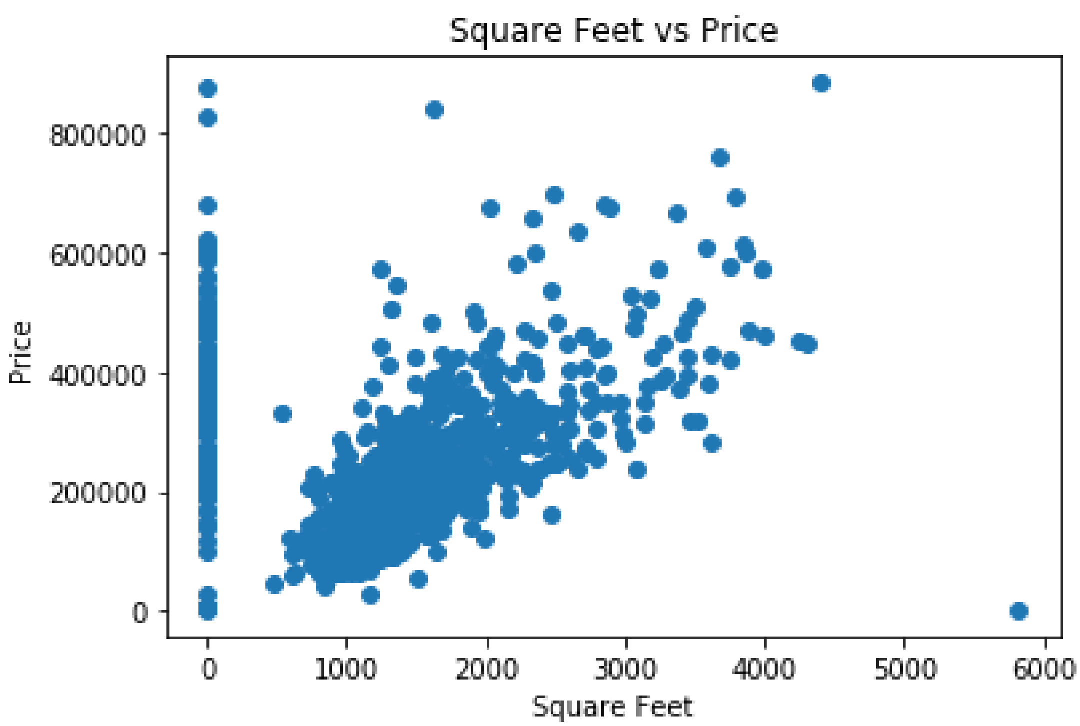
[1]:
```
import pandas as pd
import numpy as np

data = pd.read_csv("cleaned_Sacramentorealestatetransactions.csv")
price = data['price']
data = data.drop('price', axis=1)

data['city'] = data['city'].astype('category')
data['state'] = data['state'].astype('category')
data['zip'] = data['zip'].astype('category')
data['beds'] = data['beds'].astype('category')
data['baths'] = data['baths'].astype('category')
data['type'] = data['type'].astype('category')
print(data.info())
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 985 entries, 0 to 984
Data columns (total 13 columns):
street         985 non-null object
city           985 non-null category
zip            985 non-null category
state          985 non-null category
```

```
beds            985 non-null category
baths           985 non-null category
sq__ft          985 non-null int64
type            985 non-null category
sale_date       985 non-null object
latitude        985 non-null float64
longitude       985 non-null float64
empty_lot       985 non-null bool
street_type     985 non-null object
dtypes: bool(1), category(6), float64(2), int64(1), object(3)
memory usage: 58.4+ KB
None
```

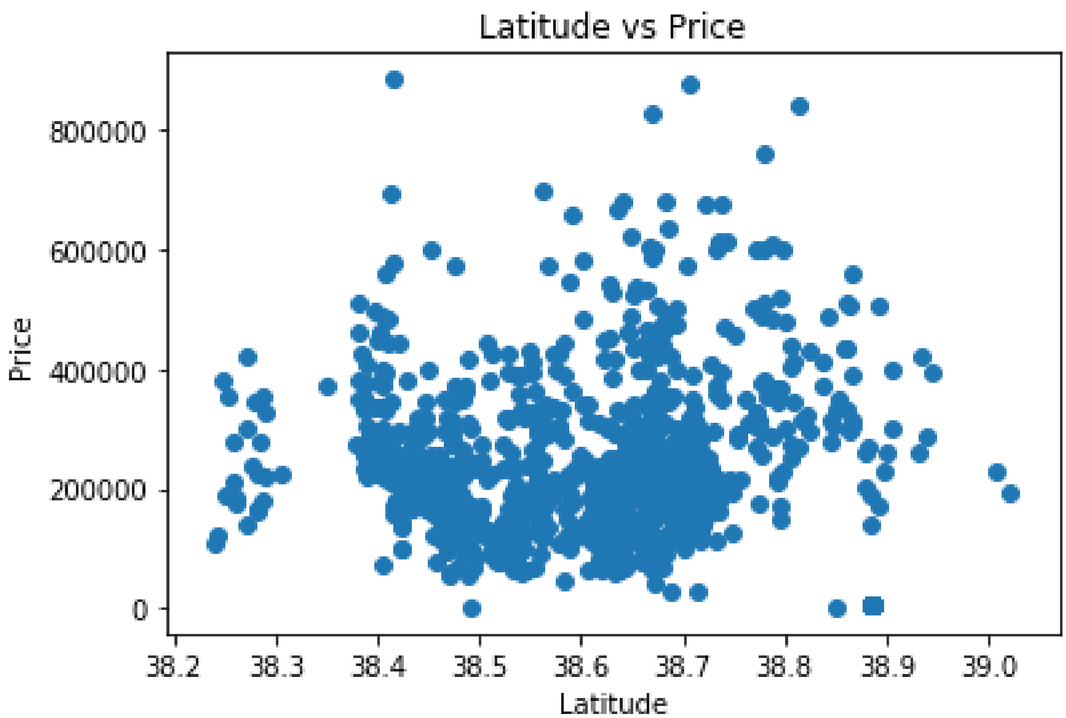
[2]:
```
import matplotlib.pyplot as plt

plt.title("Square Feet vs Price")
plt.xlabel("Square Feet")
plt.ylabel("Price")
plt.scatter(data['sq__ft'], price)
```

[2]: <matplotlib.collections.PathCollection at 0x7f979592e690>



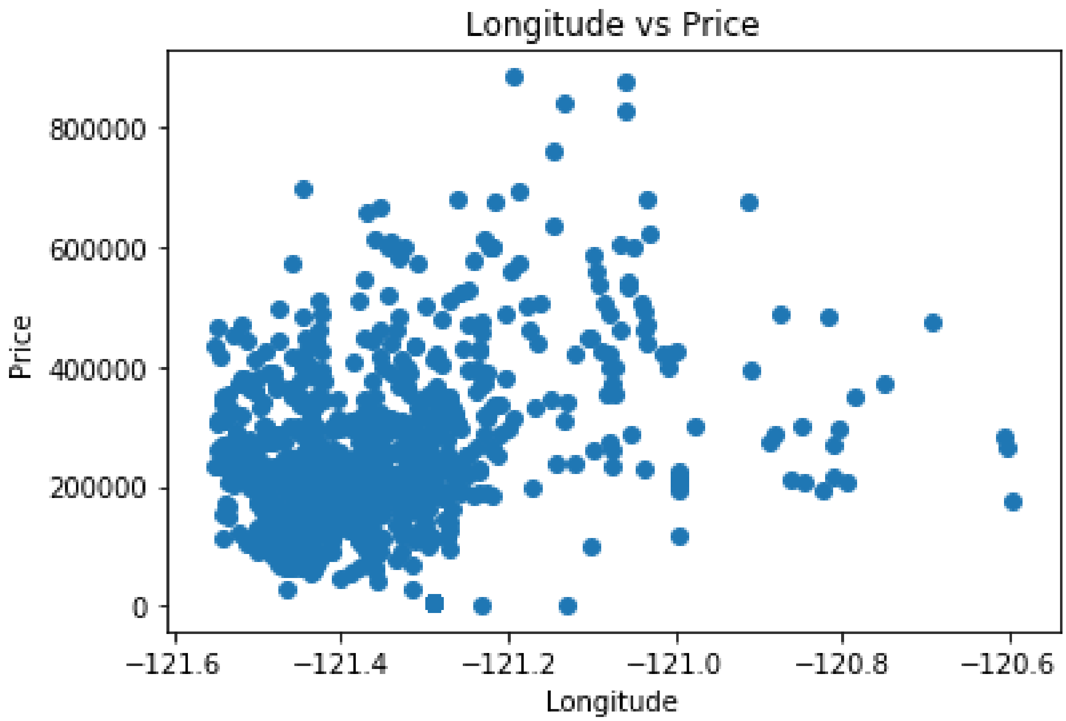
[3]:
```python
plt.title("Latitude vs Price")
plt.xlabel("Latitude")
plt.ylabel("Price")
plt.scatter(data['latitude'], price)
```

[3]: <matplotlib.collections.PathCollection at 0x7f97682fd550>



[4]:
```python
plt.title("Longitude vs Price")
plt.xlabel("Longitude")
plt.ylabel("Price")
plt.scatter(data['longitude'], price)
```

[4]: <matplotlib.collections.PathCollection at 0x7f97682738d0>



Independent Variable	Predictive
Square Feet	Yes
Latitude	No
Longitude	No

1.2.2 Categorical Variables

[5]:
```
plt.title("City vs Price")
plt.xlabel("City")
plt.ylabel("Price")

cities = data['city'].unique()

values_per_city = []
for city in cities:
    mask = data['city'] == city
    pos = np.flatnonzero(mask)
    values_per_city.append(price.iloc[pos])

plt.xticks(rotation=90)
plt.boxplot(values_per_city, labels=cities)
```

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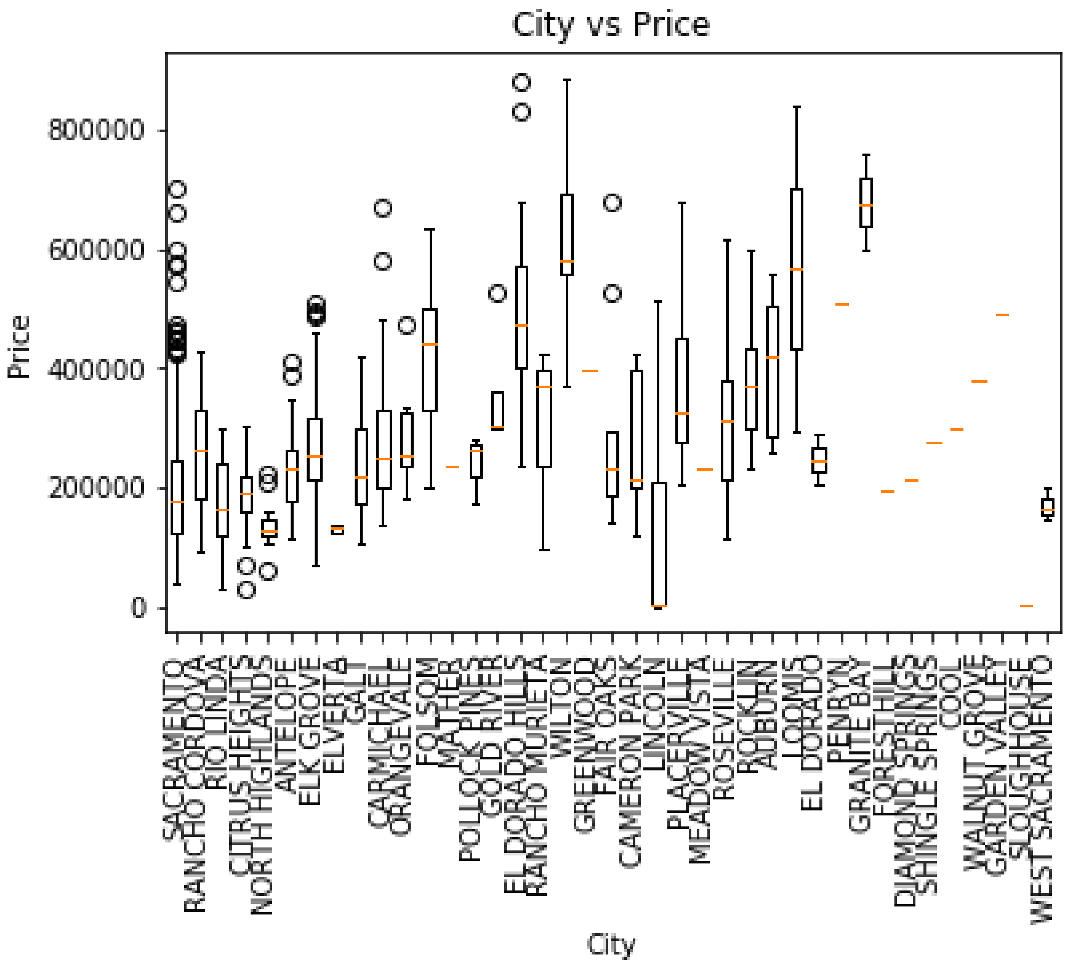

[6]:

```
plt.title("Zip Code vs Price")
plt.xlabel("Zip Code")
plt.ylabel("Price")

zips = data['zip'].unique()

values_per_zip = []
for zip in zips:
    mask = data['zip'] == zip
    pos = np.flatnonzero(mask)
    values_per_zip.append(price.iloc[pos])

plt.xticks(rotation=90)
plt.boxplot(values_per_zip, labels=zips)
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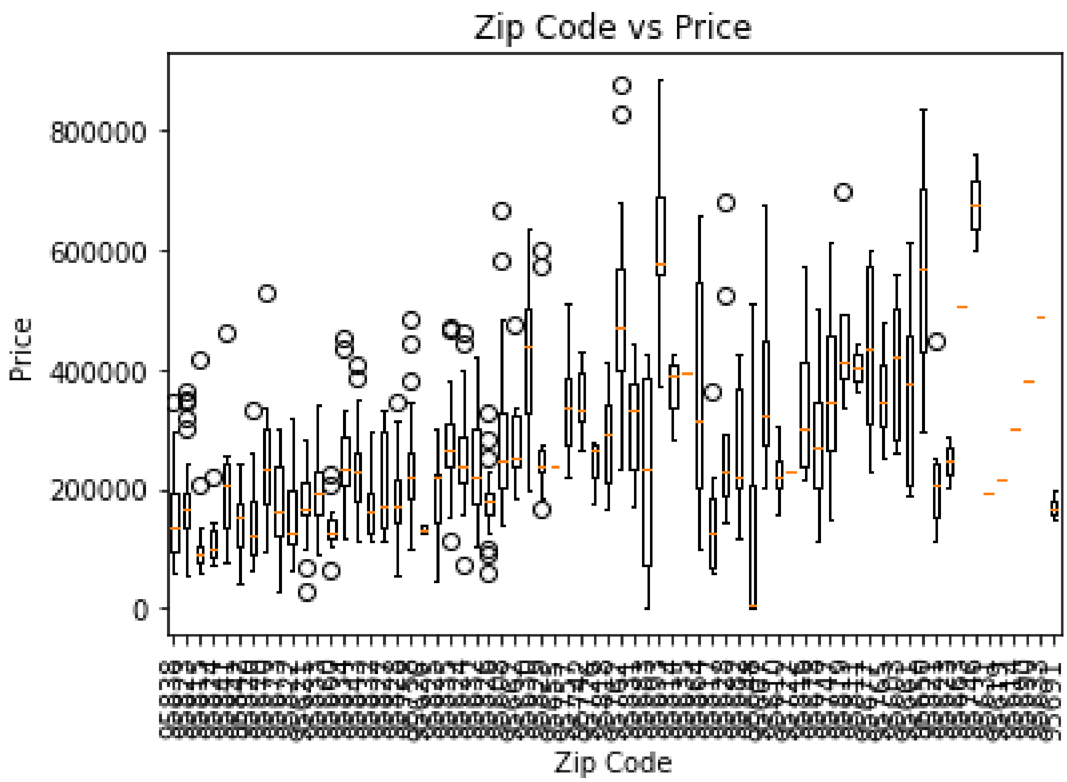

[7]:
```
plt.title("State vs Price")
plt.xlabel("State")
plt.ylabel("Price")

states = data['state'].unique()

values_per_state = []
for state in states:
    mask = data['state'] == state
    pos = np.flatnonzero(mask)
    values_per_state.append(price.iloc[pos])

plt.xticks(rotation=90)
plt.boxplot(values_per_state, labels=states)
```

[7]:
```
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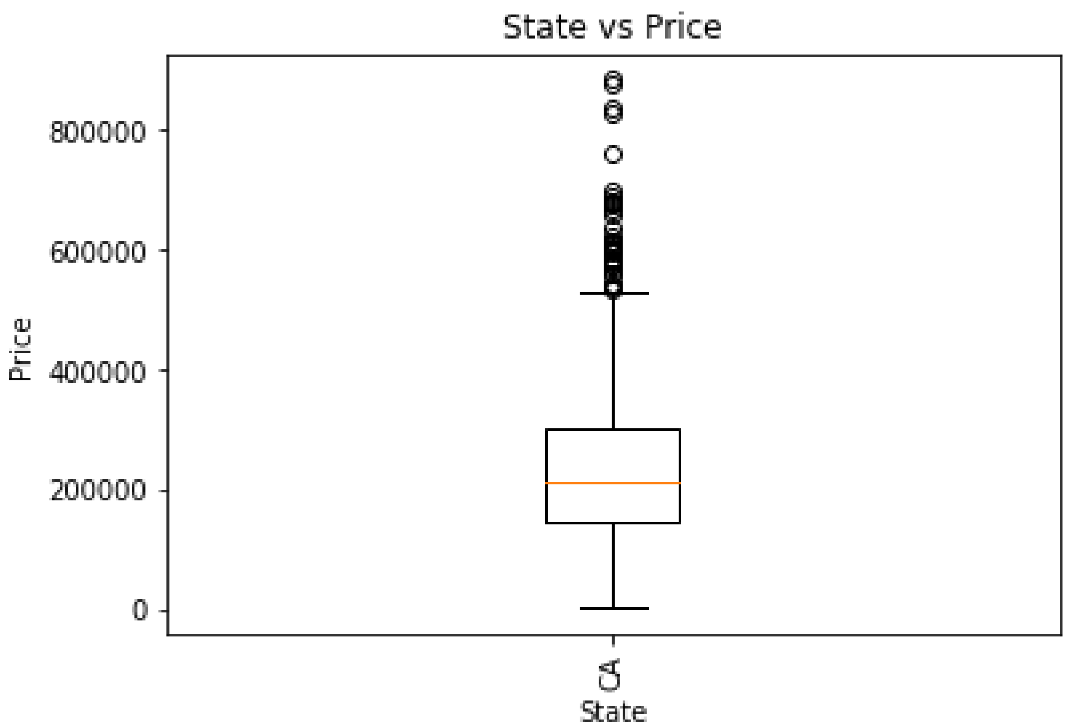

[8]:
```
plt.title("Beds vs Price")
plt.xlabel("Beds")
plt.ylabel("Price")

bed_vals = data['beds'].unique()

values_per_beds = []
for beds in bed_vals:
    mask = data['beds'] == beds
    pos = np.flatnonzero(mask)
    values_per_beds.append(price.iloc[pos])

plt.xticks(rotation=90)
plt.boxplot(values_per_beds, labels=bed_vals)
```

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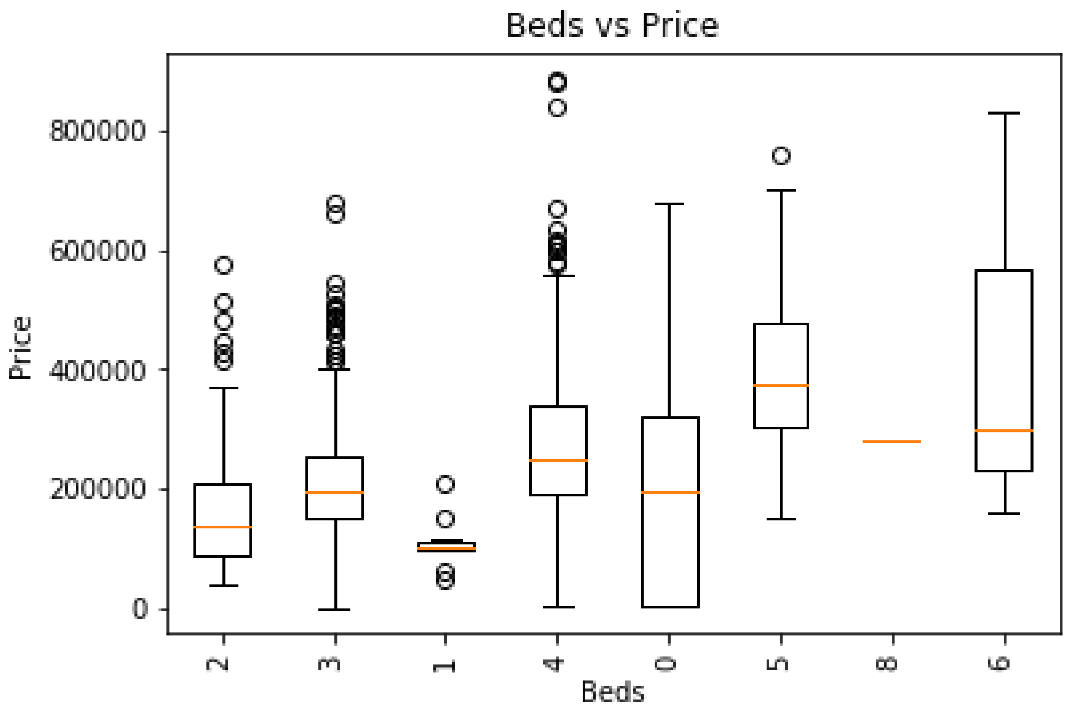

[9]:
```
plt.title("Baths vs Price")
plt.xlabel("Baths")
plt.ylabel("Price")

bath_vals = data['baths'].unique()

values_per_baths = []
for baths in bath_vals:
    mask = data['baths'] == baths
    pos = np.flatnonzero(mask)
    values_per_baths.append(price.iloc[pos])

plt.xticks(rotation=90)
```

```python
plt.boxplot(values_per_baths, labels=bath_vals)
```

[9]:
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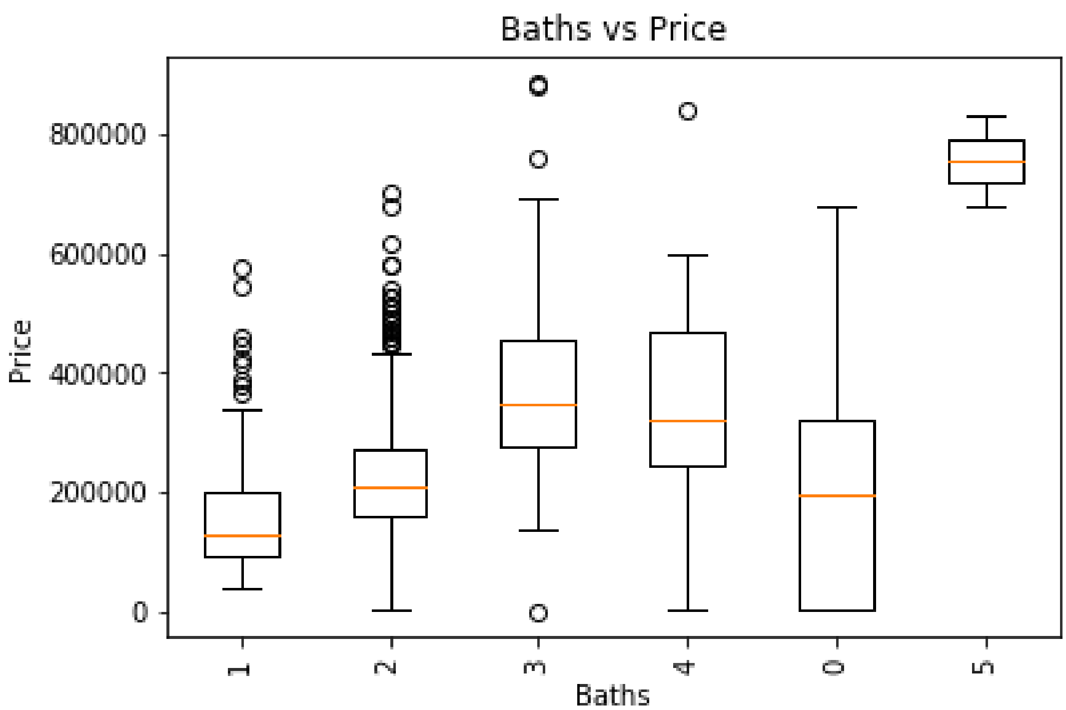

[10]:
```
plt.title("Type vs Price")
plt.xlabel("Type")
plt.ylabel("Price")

types = data['type'].unique()

values_per_type = []
for type in types:
    mask = data['type'] == type
    pos = np.flatnonzero(mask)
    values_per_type.append(price.iloc[pos])

plt.xticks(rotation=90)
plt.boxplot(values_per_type, labels=types)
```

[10]:
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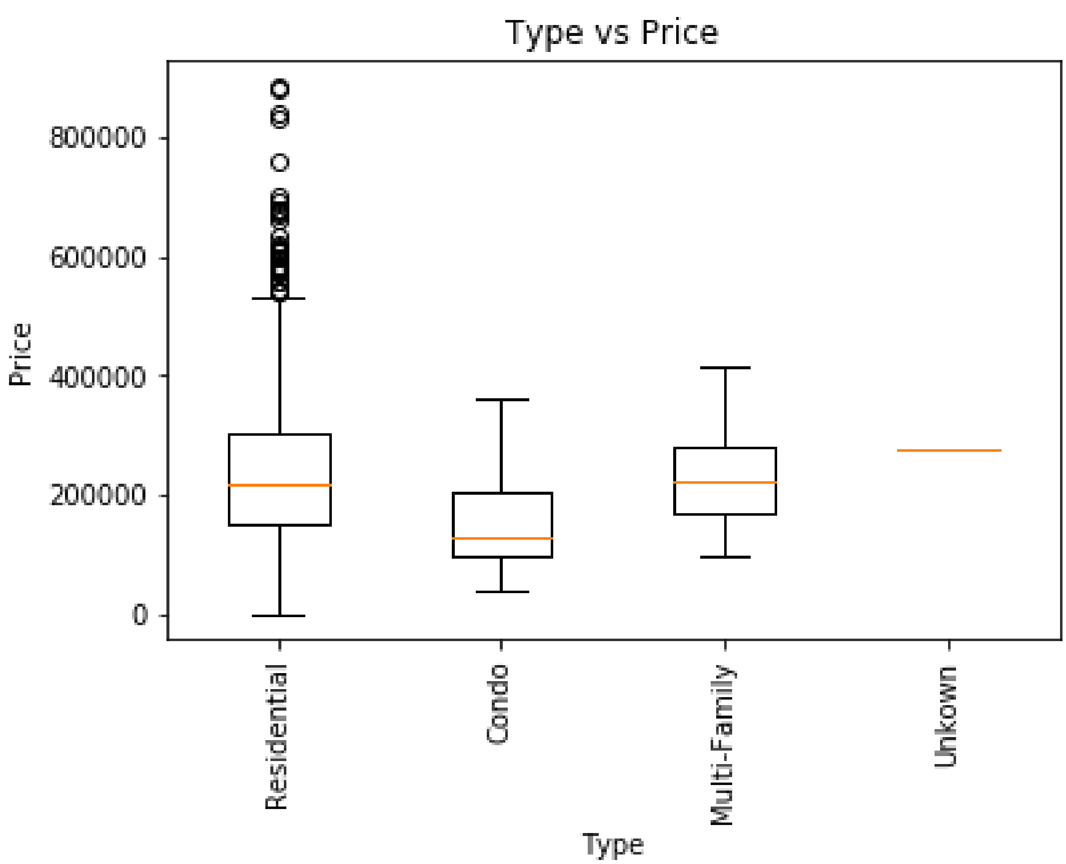

Independent Variable	Predictive
City	No. It would be more predictive for some cities, but most cities have prices with large ranges that greatly overlap.
Zip Code	Possibly, yes. There seems to be a small upward trend.
State	No. They're all in the same state.
Beds	Yes. There seems to be somewhat of a rough upward trend as the number of beds increases.
Baths	Yes. There seems to be an upward trend of price as the number of baths increases, but the IQR of properties with 3 and 4 baths are about the same.
Type	No. The condos are a little different, but not by much.

1.3 Part II: Classification on Property Type

1.3.1 Continuous Variables

[11]:
```
plt.title("Type vs Square Feet")
plt.xlabel("Type")
plt.ylabel("Square Feet")

types = data['type'].unique()

values_per_type = []
for type in types:
    mask = data['type'] == type
    pos = np.flatnonzero(mask)
    values_per_type.append(data['sq__ft'].iloc[pos])

plt.xticks(rotation=90)
plt.boxplot(values_per_type, labels=types)
```

[11]:
```
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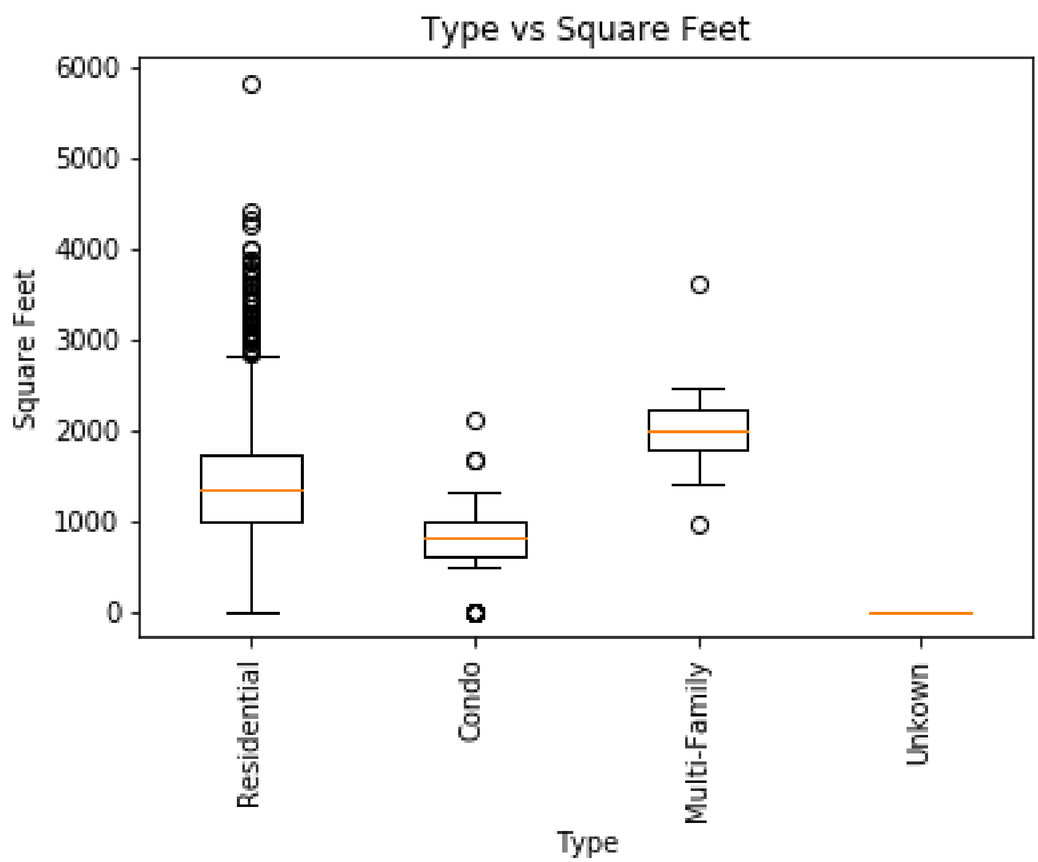

[12]:
```
plt.title("Type vs Latitude")
plt.xlabel("Type")
plt.ylabel("Latitude")

types = data['type'].unique()

values_per_type = []
for type in types:
    mask = data['type'] == type
    pos = np.flatnonzero(mask)
    values_per_type.append(data['latitude'].iloc[pos])

plt.xticks(rotation=90)
plt.boxplot(values_per_type, labels=types)
```

[12]:
```
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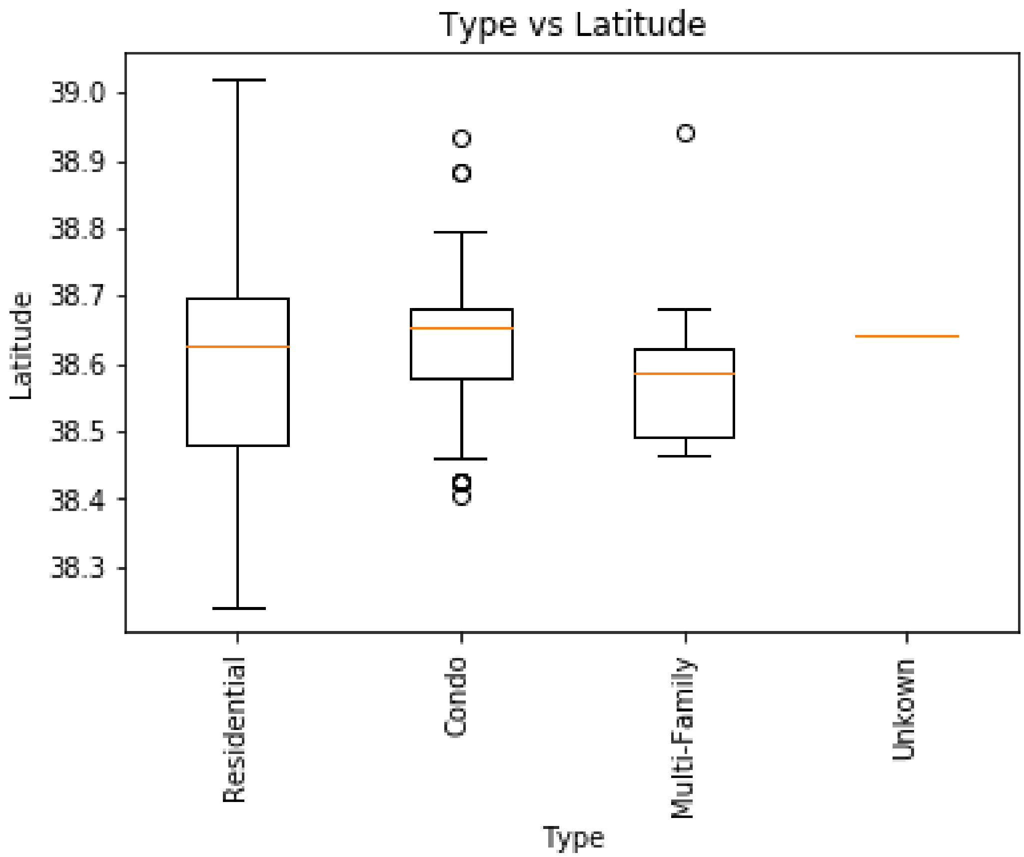
'means': []}
```



[13]:
```
plt.title("Type vs Longitude")
plt.xlabel("Type")
plt.ylabel("Longitude")

types = data['type'].unique()

values_per_type = []
for type in types:
    mask = data['type'] == type
    pos = np.flatnonzero(mask)
    values_per_type.append(data['longitude'].iloc[pos])

plt.xticks(rotation=90)
plt.boxplot(values_per_type, labels=types)
```

[13]:
```
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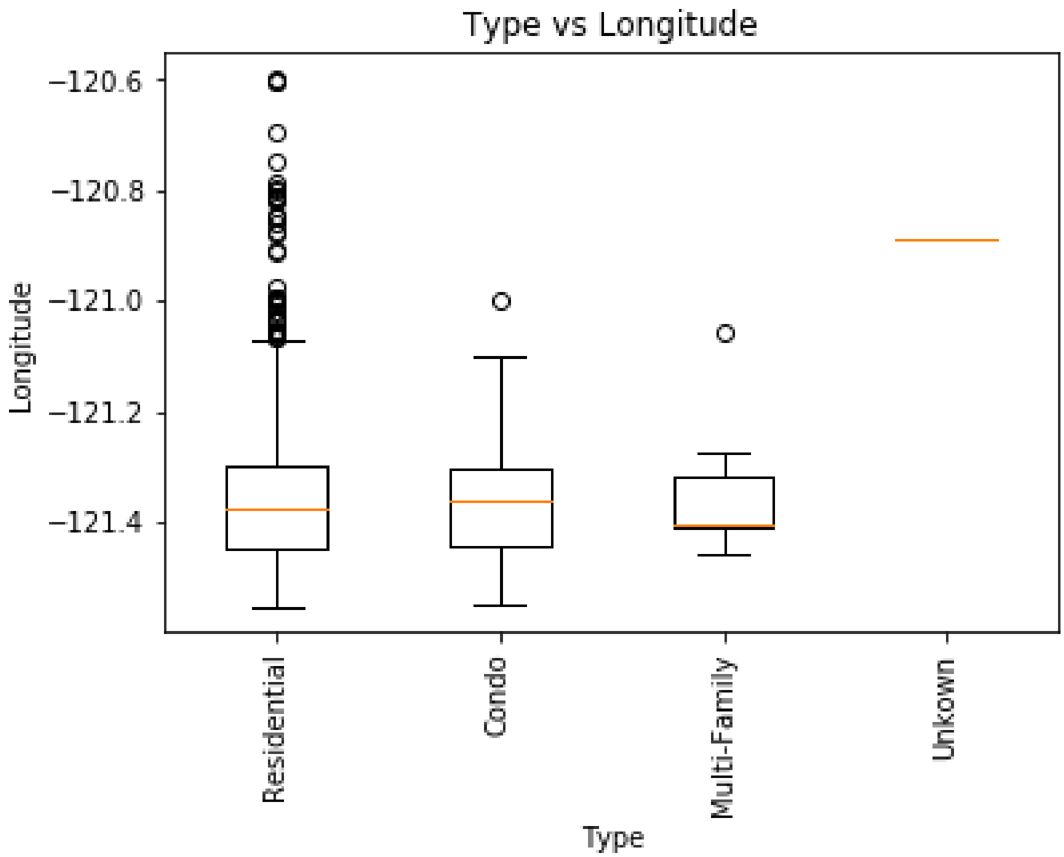
'means': []}
```

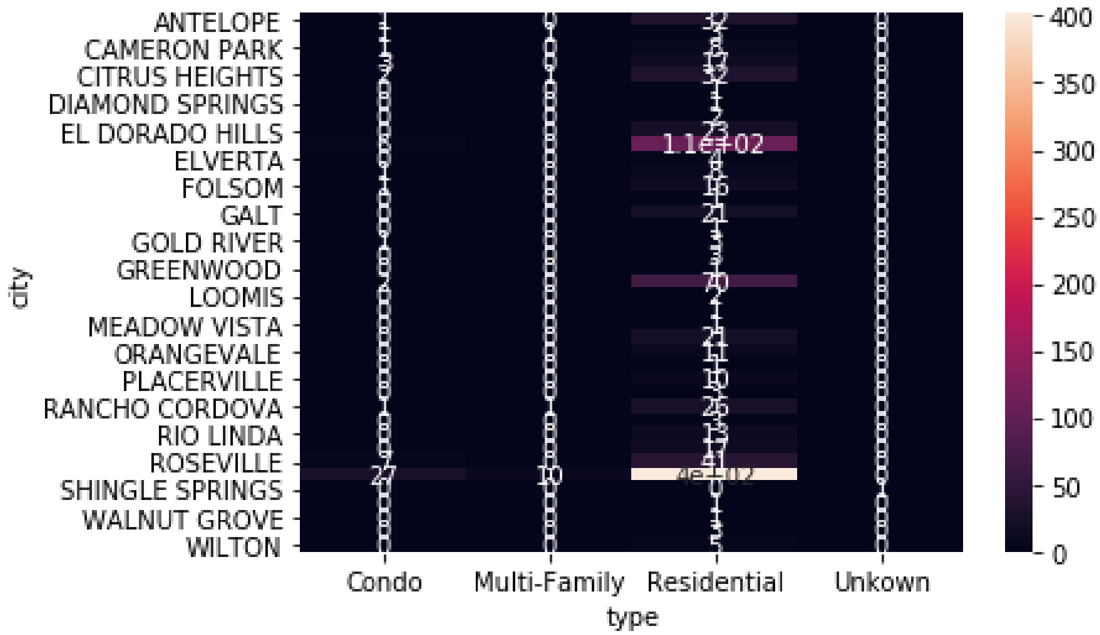


Independent Variable	Predictive
Square Feet	Yes. Looking at the interquartile ranges, the condos generally seem to have the smallest square footage, followed by residentials, followed by multi-family buildings, which makes sense.
Latitude	No. It might be predictive for residentials that are more towards the min or max, but other than that, everything is about the same.
Longitude	No. Again, it might be predictive for residentials that are in the upper outlier range since there are a lot of them, but it's all the same besides that.

1.3.2 Categorical Variables

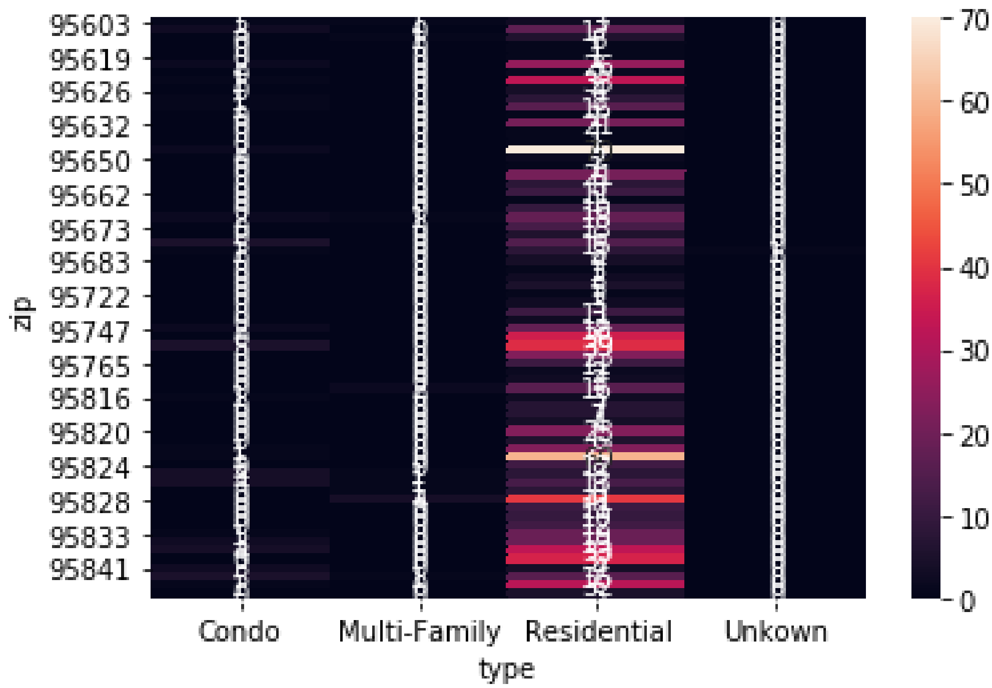
[14]:
```python
from seaborn import heatmap

heatmap_df = pd.DataFrame({'type': data['type'],
                           'city': data['city'],
                           'count': 1})
heatmap_df = pd.pivot_table(heatmap_df, values='count', index='city',␣
 ↪columns='type', aggfunc=np.sum)
heatmap_df = heatmap_df.fillna(0)
heatmap(heatmap_df,annot=True)
```

[14]: <matplotlib.axes._subplots.AxesSubplot at 0x7f9764e14e50>



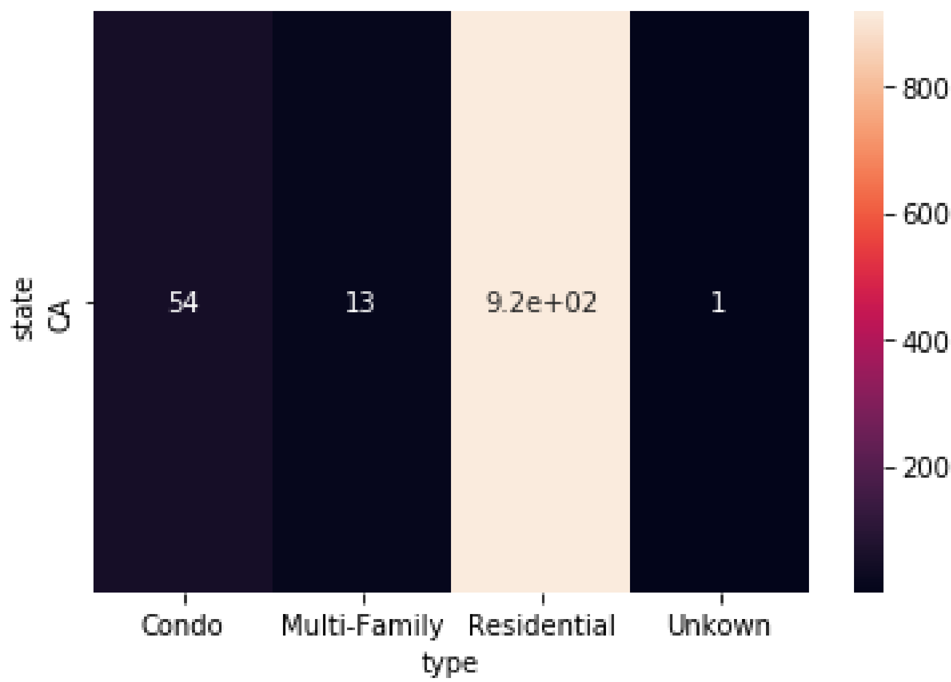
[15]:
```python
heatmap_df = pd.DataFrame({'type': data['type'],
                           'zip': data['zip'],
                           'count': 1})
heatmap_df = pd.pivot_table(heatmap_df, values='count', index='zip',␣
 ↪columns='type', aggfunc=np.sum)
heatmap_df = heatmap_df.fillna(0)
heatmap(heatmap_df,annot=True)
```

[15]: <matplotlib.axes._subplots.AxesSubplot at 0x7f9760b355d0>



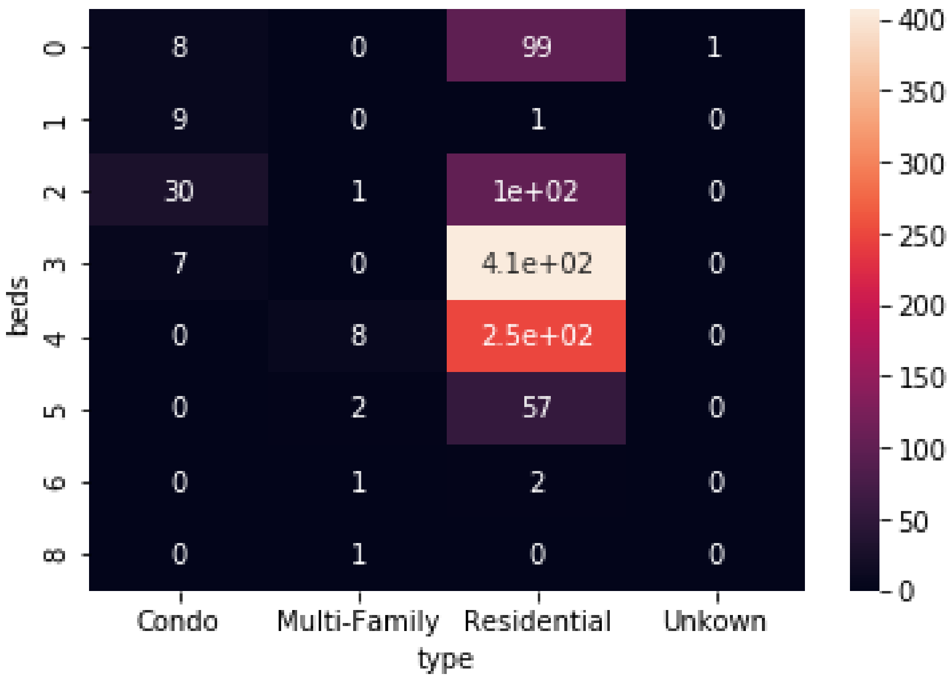

```
[16]: heatmap_df = pd.DataFrame({'type': data['type'],
                                'state': data['state'],
                                'count': 1})
      heatmap_df = pd.pivot_table(heatmap_df, values='count', index='state',␣
       ↪columns='type', aggfunc=np.sum)
      heatmap_df = heatmap_df.fillna(0)
      heatmap(heatmap_df,annot=True)
```

```
[16]: <matplotlib.axes._subplots.AxesSubplot at 0x7f9760856310>
```



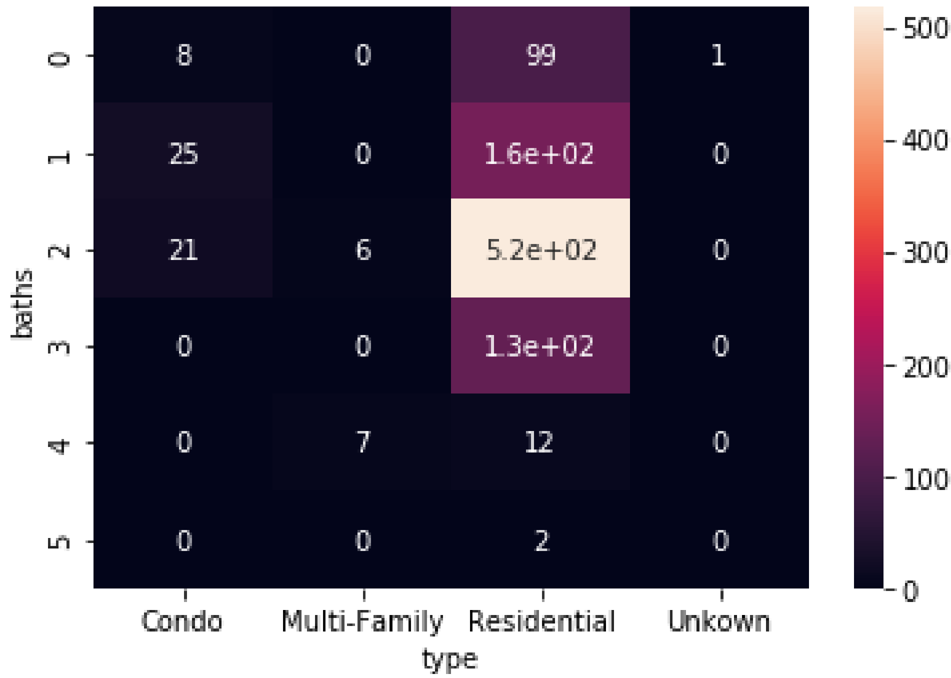
[17]:
```
heatmap_df = pd.DataFrame({'type': data['type'],
                           'beds': data['beds'],
                           'count': 1})
heatmap_df = pd.pivot_table(heatmap_df, values='count', index='beds',␣
 ↪columns='type', aggfunc=np.sum)
heatmap_df = heatmap_df.fillna(0)
heatmap(heatmap_df,annot=True)
```

[17]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f9760792110>
```



[18]:
```
heatmap_df = pd.DataFrame({'type': data['type'],
                           'baths': data['baths'],
                           'count': 1})
heatmap_df = pd.pivot_table(heatmap_df, values='count', index='baths',␣
 ↪columns='type', aggfunc=np.sum)
heatmap_df = heatmap_df.fillna(0)
heatmap(heatmap_df,annot=True)
```

[18]: <matplotlib.axes._subplots.AxesSubplot at 0x7f9760718c90>



Independent Variable	Predictive
City	Yes
Zip Code	Yes
State	Yes
Beds	Yes
Baths	Yes

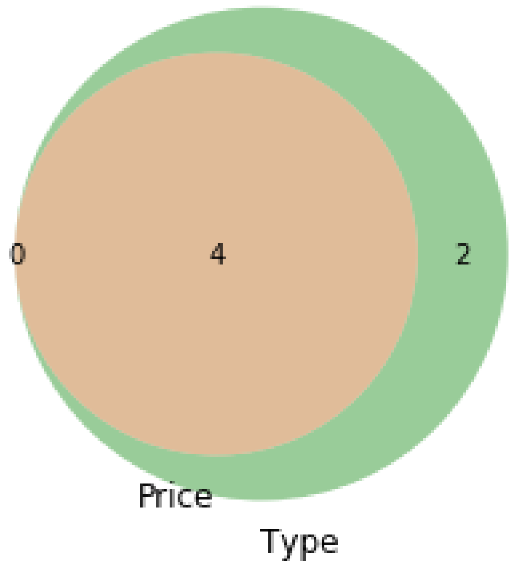
All of these are yes mainly just due to the fact that most of the entries in the data set are from residential properties, making most values of each independent variable category occur most frequenty with the residential type.

1.4 Part III: Compare Predictive Variables

[21]:
```
from matplotlib_venn import venn2, venn2_circles

list1 = ["Square Feet", "Zip Code", "Beds", "Baths"]
list2 = ["Square Feet", "City", "Zip Code", "State", "Beds", "Baths"]

venn2([set(list1), set(list2)], set_labels = ('Price', 'Type'))
plt.title('Independent Variables\' Predictiveness for Price and Type')
```

[21]: Text(0.5, 1.0, "Independent Variables' Predictiveness for Price and Type")

Independent Variables' Predictiveness for Price and Type



4 variables are predictive for both problems.

Independent Variable	Both or One	Why?
Square Feet	Both	Besides the lots with a square footage of zero, the scatter plot appears to have somewhat of an upward trend as square footage increases, with the spread of points widening as it goes. Looking at the interquartile ranges, the condos generally seem to have the smallest square footage, followed by residentials, followed by multi-family buildings, which makes sense.

Independent Variable	Both or One	Why?
City	One	The only reason it would be decently predictive of property type is because most property types are residential, so it's just very likely that guessing residential would be correct.
Zip Code	Both	For price, there seems to be a small upward trend. Again, for type, it's just very likely that guessing residential would be correct.

Independent Variable	Both or One	Why?
State	One	Every single entry in the data set is in the state of California, as would every new entry be, since this data set is about properties in and around Sacramento. As stated earlier, it's only predictive of type because most are residential, so it's very likely that guessing residential would be correct.
Beds	Both	For price, there seems to be somewhat of a rough upward trend as the number of beds increases. Again, for type, it's just very likely that guessing residential would be correct.

Independent Variable	Both or One	Why?
Baths	Both	For price, there seems to be an upward trend of price as the number of baths increases, but the IQR of properties with 3 and 4 baths are about the same. Again, for type, it's just very likely that guessing residential would be correct.