DAT565/DIT407 Assignment 2

Ola Bratt
ola.bratt@gmail.com

Patrick Attimont
patrickattimont@gmail.com

2024-01-xx

This paper is addressing the assignment 2 study queries within the *Introduction to Data Science & AI* course, DIT407 at the University of Gothenburg and DAT565 at Chalmers. The main source of information for this project is derived from the lectures and Skiena [**Skiena:2024**].

Problem 1: Scrapping house prices

Problem 1 have been solved using BeautifulSoup together with simple string operations such as

```
split, replace and strip,
```

also regaular expressions have been used to idefity certain information. The code can be found in the appendix.

Problem 2: Analyzing 2022 house sales

To caluculate the five-number summary of the closing prices of the houses prices we simply used

```
describe()
```

on the dataframe containing the closing prices. The result can be seen in table **??**.

When plotting the histogram of the closing prices, see figure **??** we used *square root method* to decide bin size. It seems appropriate since it revelas trends without hiding the details. The plot is skewed to the right, which is expected since there are few houses with high prices. The plot of closing price vs house area is shown in figure **??**. The plot of closing price vs house area with color is shown in figure **??**.

min	250000
25%	3200000
50%	4100000
75%	5035000
max	21000000

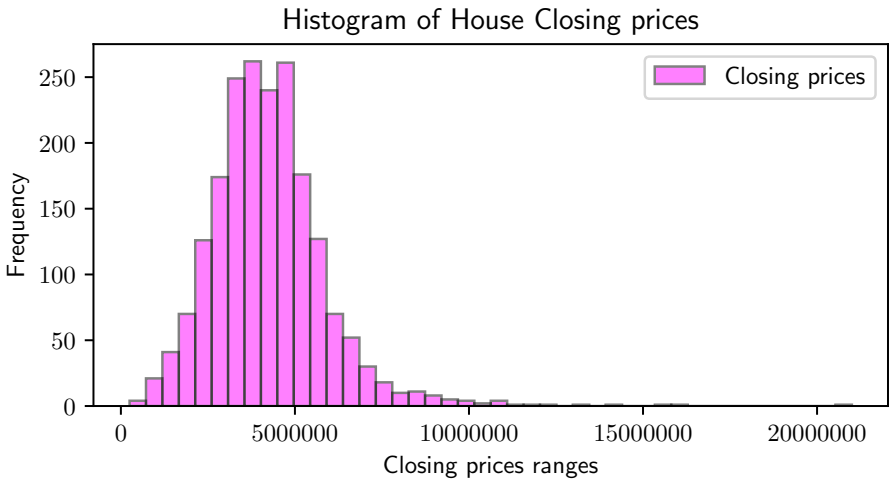
Table 1: Five-number summary of closing prices

Discussion

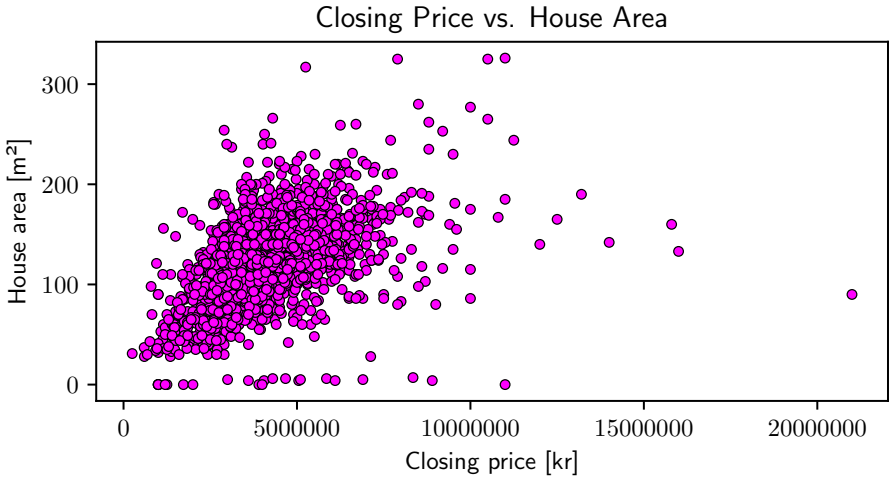
In Figure **??**, the distribution of house closing prices seems to follow a Gaussian shape: the data is well distributed around 4,000,000 kr. There is a small proportion of closing prices above 10,000,000 kr.

Figure **??** shows, unsurprisingly, that increasing the house area increases the closing price on average. We can also see that closing prices fluctuate more for larger areas than for smaller ones.

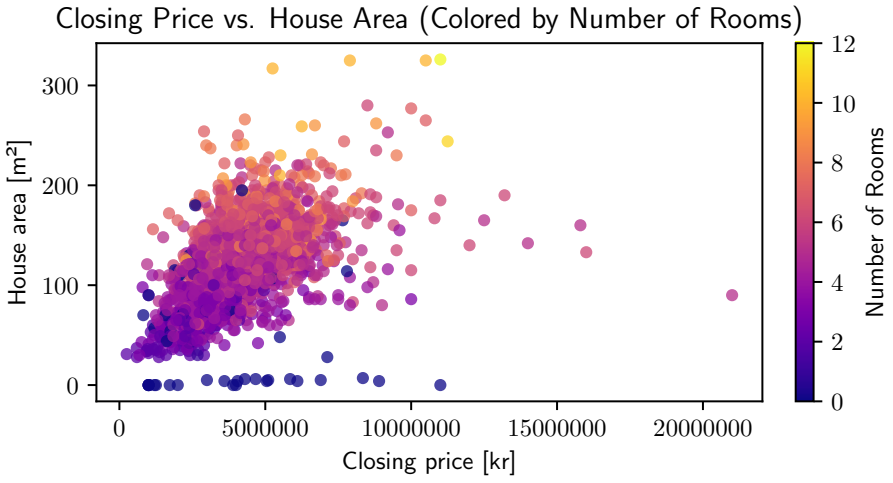
Finally, increasing the number of rooms tends to increase prices on average, which seems logical given that the floor area of a house is often linked to the number of rooms.



(a) Closing prices of houses



(b) Closing price vs house area



(c) Closing price vs house area with color

Figure 1: Plots of house prices

Appendix: Source Code

```
1  import numpy as np
2  import pandas as pd
3  import glob
4  import errno
5  import re
6  import locale
7  import datetime
8  import matplotlib as mpl
9  from matplotlib import pyplot
10 from bs4 import BeautifulSoup
11 locale.setlocale(locale.LC_TIME, "sv_SE") # For Swedish dates
12
13 date_obj = lambda dateText: datetime.datetime.strptime(dateText.
       ↪ replace('S ld ','').strip(), '%d %B %Y')
14
15 def cleanLocation(locationText):
16     locationText.span.decompose()
17     stripped = locationText.text.strip().replace("\n", "")
18     splitted = stripped.split(',')
19     locationList = list(map(lambda x: x.strip(), splitted))
20     return ", ".join(locationList)
21
22 def areaAndRoom(areaText):
23     areaText.span.decompose() if areaText.span else areaText
24     areaAndRoom = re.findall(r'\d+', areaText.text.strip())
25     areaAndRoomList = list(map(lambda x: x.strip(), areaAndRoom))
26     intList = [eval(i) for i in areaAndRoomList]
27     area = 0
28     room = 0
29     errors = 0
30     try:
31         area = intList[0]
32         room = intList[1]
33     except IndexError:
34         errors += 1
35     #print('Errors ' + errors.__str__())
36     return area, room
37
38 def cleanLandArea(landAreaText):
39     landAreaText = landAreaText.replace('\u00a0','')
40     return zeroIfNoNumber(landAreaText)
41
42 def cleanPrice(priceText):
43     priceText = priceText.replace('Slutpris','')
44     priceText = priceText.replace('kr','')
45     priceText = priceText.replace('\u00a0','')
46     return zeroIfNoNumber(priceText)
47
48 def zeroIfNoNumber(valueText):
49     value = re.findall(r'\d+', valueText)
50     if value.__len__() > 0:
51         value = int(value[0])
52     else:
53         value = 0
54     return value
55
56 def parseObject(obj):
57         dateText = obj.find('span',attrs={'class':'hcl-label hcl-
           ↪ label--state hcl-label--sold-at'}).text
58         addressText = obj.find('h2',attrs={'class':'sold-property-
```

```
            ↪ listing__heading qa-selling-price-title hcl-
            ↪ card__title'}).text
59          locationText = obj.find('span',attrs={'class':'property-
            ↪ icon property-icon--result'}).parent
60          areaText = obj.find('div',attrs={'class':'sold-property-
            ↪ listing__subheading sold-property-listing__area'})
61          extraAreaText = obj.find('span',attrs={'class':'listing-
            ↪ card__attribute--normal-weight'}).text if obj.find('
            ↪ span',attrs={'class':'listing-card__attribute--
            ↪ normal-weight'}) else ''
62          landAreaText = obj.find('div',attrs={'class':'sold-property
            ↪ -listing__land-area'}).text if obj.find('div',attrs
            ↪ ={'class':'sold-property-listing__land-area'}) else
            ↪ ''
63          priceText = obj.find('span',attrs={'class':'hcl-text hcl-
            ↪ text--medium'}).text
64          area, room = areaAndRoom(areaText)
65          extraArea = zeroIfNoNumber(extraAreaText)
66          return [date_obj(dateText), addressText.strip(),
            ↪ cleanLocation(locationText), area, extraArea, area +
            ↪  extraArea , room, cleanLandArea(landAreaText),
            ↪ cleanPrice(priceText)]
67
68
69  dir_path = '../kungalv_slutpriser/*.html'
70  files = glob.glob(dir_path)
71  entities = pd.DataFrame(columns=['Date', 'Address', 'Location', '
        ↪ Area', 'ExtraArea', 'TotalArea', 'Rooms', 'LandArea', 'Price
        ↪ '])
72  for name in files:
73      try:
74          with open(name) as f:
75              soup = BeautifulSoup(f, "html.parser")
76              objects = soup.findAll('li',attrs={'class':'sold-
                    ↪ results--normal-hit'})
77              for obj in objects:
78                  entity = parseObject(obj)
79                  entities.loc[len(entities.index)] = entity
80      except IOError as exc:
81          if exc.errno != errno.EISDIR:
82              raise
83
84
85  entities.to_csv('entities.csv', index=False, encoding='utf-8')
86
87
88  pyplot.rcParams['text.usetex'] = True
89  entities = pd.read_csv('entities.csv')
90  #print(entities.head())
91  print(entities['Price'].describe())
92
93  # Plot histogram of closing prices
94  num_bins = int(len(entities['Price']) ** 0.5) # Determine the
        ↪ number of bins using the square root choice method
95  fig1, ax1 = pyplot.subplots(figsize=(5, 2.7), layout='constrained')
96  ax1.hist(entities['Price'], bins=num_bins, color='magenta',
        ↪ edgecolor='black', linewidth=1, alpha=0.5, label='Closing
        ↪ prices')
97  ax1.set_xlabel('Closing prices ranges')  # Add an x-label to the
        ↪ axes.
98  ax1.set_ylabel('Frequency')  # Add a y-label to the axes.
99  ax1.set_title("Histogram of House Closing prices")  # Add a title
```

```
    ↪ to the axes.
ax1.legend(loc='upper right')
ax1.ticklabel_format(useOffset=1, style='plain', axis='x')
fig1.savefig('histogram_closing_price.pdf', bbox_inches='tight')


# Plot Closing Price vs. House Area
fig2, ax2 = pyplot.subplots(figsize=(5, 2.7), layout='constrained')
ax2.scatter(entities['Price'], entities['Area'], s=15, color='
    ↪ magenta', edgecolor='black', linewidth=0.5)
ax2.set_xlabel('Closing price [kr]')  # Add an x-label to the axes.
ax2.set_ylabel('House area [m ]')  # Add a y-label to the axes.
ax2.set_title("Closing Price vs. House Area")  # Add a title to the
    ↪  axes.
ax2.ticklabel_format(useOffset=1, style='plain', axis='x')
fig2.savefig('closing_price_house_ares.pdf', bbox_inches='tight')


# Plot Closing Price vs. House Area (Colored by Number of Rooms)
fig3, ax3 = pyplot.subplots(figsize=(5, 2.7), layout='constrained')
ax3.scatter(entities['Price'], entities['Area'],  c=entities['Rooms
    ↪ '], cmap='plasma', s=15, alpha=0.75)
ax3.set_xlabel('Closing price [kr]')  # Add an x-label to the axes.
ax3.set_ylabel('House area [m ]')  # Add a y-label to the axes.
ax3.set_title("Closing Price vs. House Area (Colored by Number of
    ↪ Rooms)")  # Add a title to the axes.
sm = pyplot.cm.ScalarMappable(cmap='plasma')
sm.set_array(entities['Rooms'])
fig3.colorbar(sm,  label='Number of Rooms', ax=pyplot.gca())
ax3.ticklabel_format(useOffset=1, style='plain', axis='x')
fig3.savefig('closing_price_house_ares_color.pdf', bbox_inches='
    ↪ tight')
```