

DAT565/DIT407 Assignment 2

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2024-01-30

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 [1].

Problem 1: Scrapping house prices

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

`split, replace and strip,`

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

Problem 2: Analyzing 2022 house sales

To calculate 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 1.

When generating the histogram depicting closing prices (see Figure 1a), we employed the "square root method" to determine the bin size. This method was chosen for its ability to unveil trends while maintaining a balance, as larger bins would obscure relevant features, such as the dip around 4.000.000 kr. The resulting plot exhibits a right skew, which is expected given the scarcity of high-priced houses.

Figure 1b displays the relationship between closing prices and house areas, while Figure 1c illustrates the same relationship, with the number of rooms colorized.

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

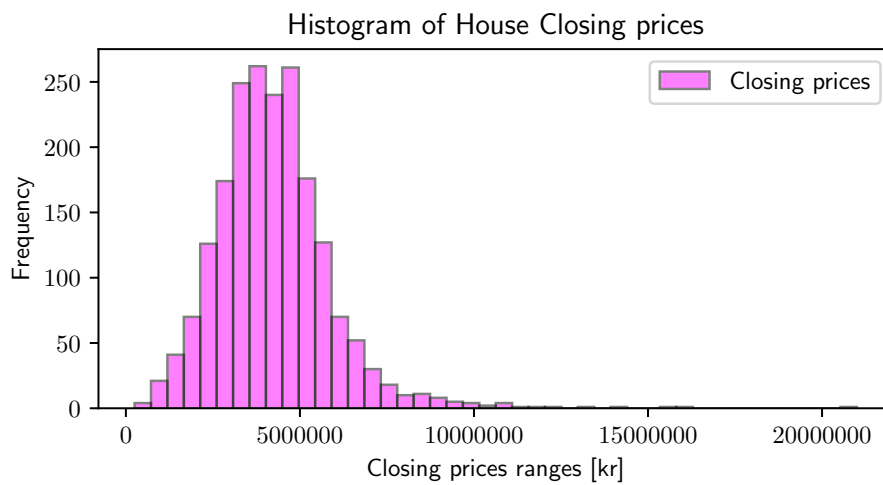
Table 1: Five-number summary of closing prices

Discussion

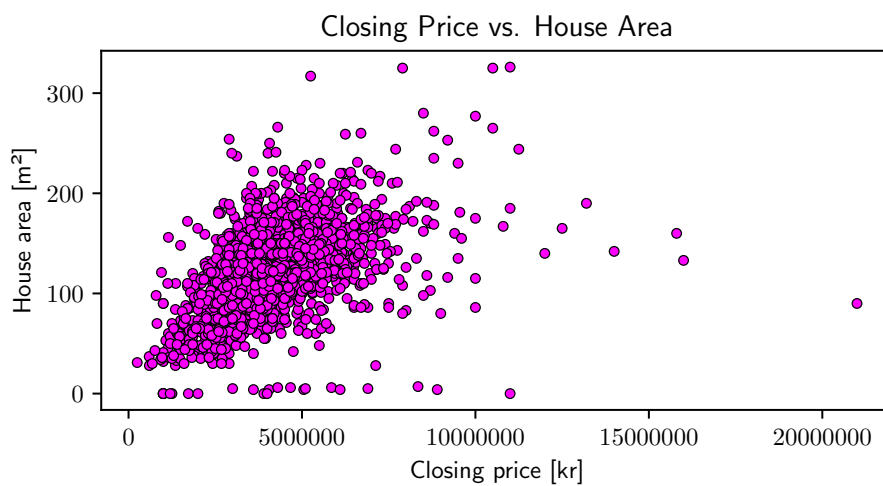
In Figure 1a, the distribution of house closing prices seems to follow a Gaussian shape: the data is well distributed around 4,000,000 kr. There is a small proportion of closing prices above 10,000,000 kr.

Figure 1b 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.

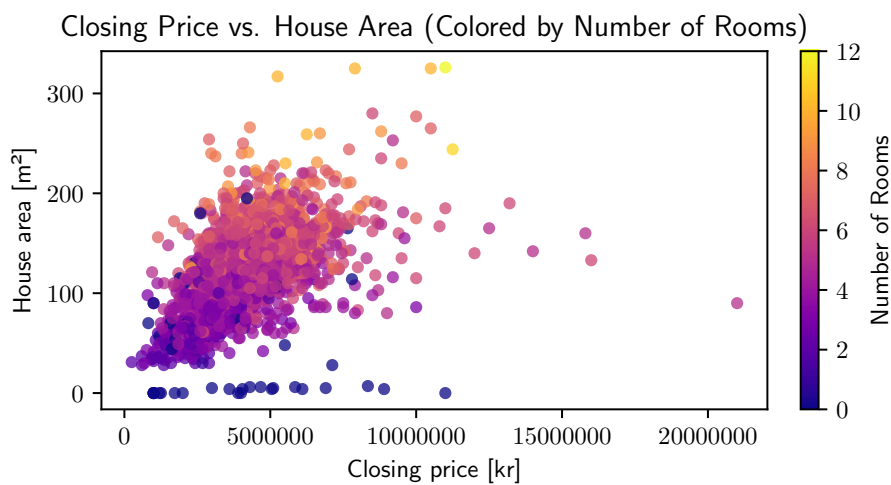
Finally, increasing the number of rooms tends to increase prices on average, which seems logical given that the floor area of a house is often linked to the number of rooms.



(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

References

- [1] Steven S Skiena. *The Data Science Design Manual*. Retrieved 2024-01-20. 2024. URL: <https://ebookcentral.proquest.com/lib/gu/detail.action?docID=6312797>.

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()
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.
100 ax1.legend(loc='upper-right')
101 ax1.ticklabel_format(useOffset=1, style='plain', axis='x')
102 fig1.savefig('histogram_closing_price.pdf', bbox_inches='tight')
103
104
105 # Plot Closing Price vs. House Area
106 fig2, ax2 = pyplot.subplots(figsize=(5, 2.7), layout='constrained')
107 ax2.scatter(entities['Price'], entities['Area'], s=15, color='
    ↪ magenta', edgecolor='black', linewidth=0.5)
108 ax2.set_xlabel('Closing-price-[kr]') # Add an x-label to the axes.
109 ax2.set_ylabel('House-area-[m ]') # Add a y-label to the axes.
110 ax2.set_title("Closing-Price-vs.-House-Area") # Add a title to the
    ↪ axes.
111 ax2.ticklabel_format(useOffset=1, style='plain', axis='x')
112 fig2.savefig('closing_price_house_ares.pdf', bbox_inches='tight')
113
114
115 # Plot Closing Price vs. House Area (Colored by Number of Rooms)
116 fig3, ax3 = pyplot.subplots(figsize=(5, 2.7), layout='constrained')
117 ax3.scatter(entities['Price'], entities['Area'], c=entities['Rooms
    ↪ '], cmap='plasma', s=15, alpha=0.75)
118 ax3.set_xlabel('Closing-price-[kr]') # Add an x-label to the axes.
119 ax3.set_ylabel('House-area-[m ]') # Add a y-label to the axes.
120 ax3.set_title("Closing-Price-vs.-House-Area-(Colored-by-Number-of-
    ↪ Rooms)") # Add a title to the axes.
121 sm = pyplot.cm.ScalarMappable(cmap='plasma')
122 sm.set_array(entities['Rooms'])
123 fig3.colorbar(sm, label='Number-of-Rooms', ax=pyplot.gca())
124 ax3.ticklabel_format(useOffset=1, style='plain', axis='x')
125 fig3.savefig('closing_price_house_ares_color.pdf', bbox_inches='
    ↪ tight')

```