# DAT565/DIT407 Assignment 2

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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 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 generating the histogram depicting closing prices (see Figure **??**), 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. The resulting plot exhibits a right skew, which is expected given the scarcity of high-priced houses.

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

| | |
|---|---|
| min | 1.650.000 |
| 25% | 4.012.500 |
| 50% | 5.000.000 |
| 75% | 5.795.000 |
| max | 10.500.000 |

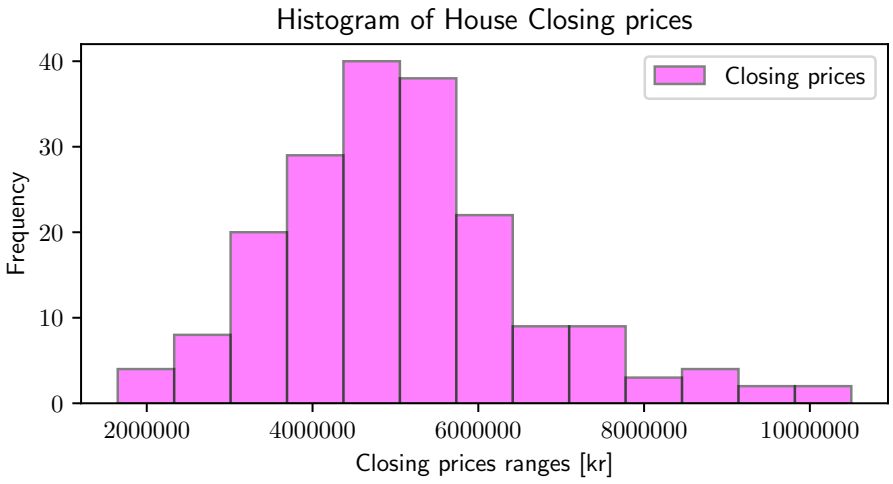
Table 1: Five-number summary of closing prices [kr].

## Discussion

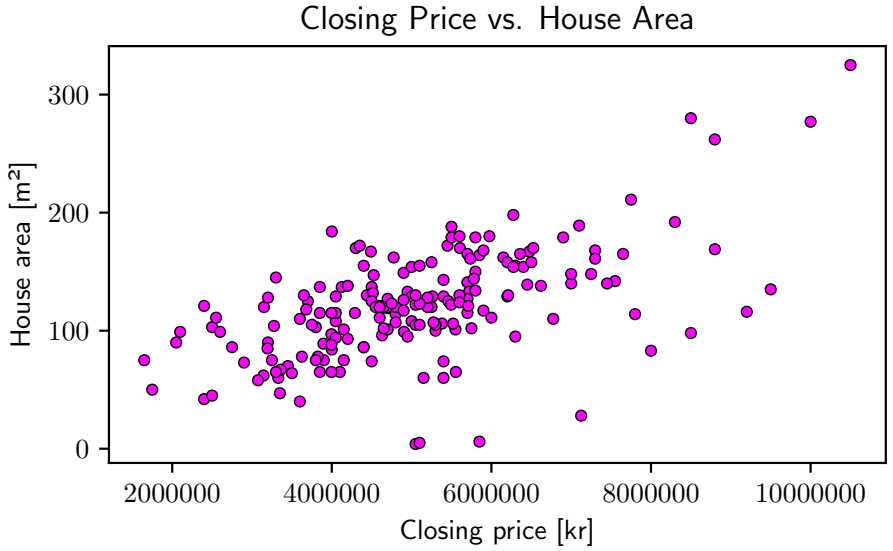
In Figure **??**, the distribution of house closing prices seems to follow a Gaussian shape: the data is well distributed around 5,000,000 kr. There is a small proportion of closing prices above 10,000,000 kr.

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.

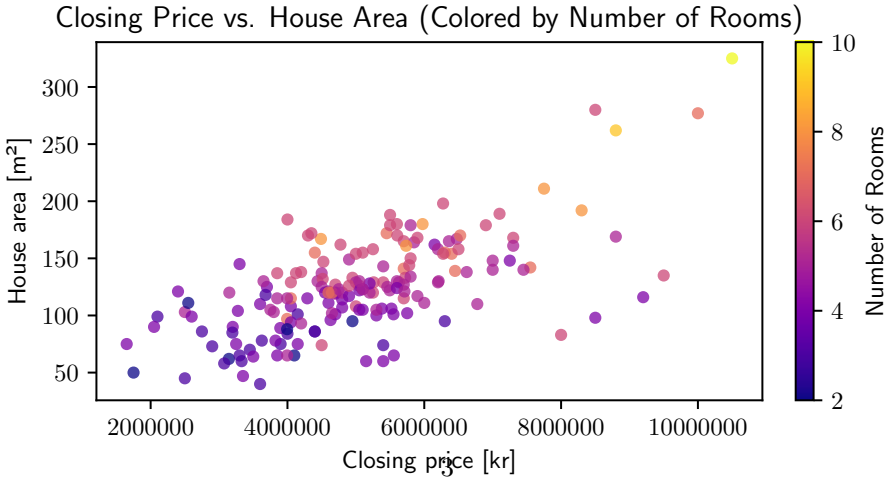
Finally, increasing the number of rooms tends to increase prices on average, which seems logical given that the floor area of a house is often linked to the number of rooms.




(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

# 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

```
import numpy as np
import pandas as pd
import glob
import errno
import re
import locale
import datetime
import matplotlib as mpl
from matplotlib import pyplot
from bs4 import BeautifulSoup
locale.setlocale(locale.LC_TIME, "sv_SE") # For Swedish dates

date_obj = lambda dateText: datetime.datetime.strptime(dateText.
    ↪ replace('S  ld ','').strip(), '%d %B %Y')

def cleanLocation(locationText):
    locationText.span.decompose()
    stripped = locationText.text.strip().replace("\n", "")
    splitted = stripped.split(',')
    locationList = list(map(lambda x: x.strip(), splitted))
    return ", ".join(locationList)

def areaAndRoom(areaText):
    areaText.span.decompose() if areaText.span else areaText
    areaAndRoom = re.findall(r'\d+', areaText.text.strip())
    areaAndRoomList = list(map(lambda x: x.strip(), areaAndRoom))
    intList = [eval(i) for i in areaAndRoomList]
    area = 0
    room = 0
    errors = 0
    try:
        area = intList[0]
        room = intList[1]
    except IndexError:
        errors += 1
    #print('Errors ' + errors.__str__())
    return area, room

def cleanLandArea(landAreaText):
    landAreaText = landAreaText.replace('\u00a0','')
    return zeroIfNoNumber(landAreaText)

def cleanPrice(priceText):
    priceText = priceText.replace('Slutpris','')
    priceText = priceText.replace('kr','')
    priceText = priceText.replace('\u00a0','')
    return zeroIfNoNumber(priceText)

def zeroIfNoNumber(valueText):
    value = re.findall(r'\d+', valueText)
    if value.__len__() > 0:
        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  entities['Date'] = pd.to_datetime(entities['Date'])
91  entities = entities[entities['Date'].dt.year == 2022]
92  #print(entities.head())
93  print(entities['Price'].describe())
94
95  # Plot histogram of closing prices
```

```
num_bins = int(len(entities['Price']) ** 0.5) # Determine the number of bins using the square root choice method
fig1, ax1 = pyplot.subplots(figsize=(5, 2.7), layout='constrained')
ax1.hist(entities['Price'], bins=num_bins, color='magenta', edgecolor='black', linewidth=1, alpha=0.5, label='Closing prices')
ax1.set_xlabel('Closing prices ranges')  # Add an x-label to the axes.
ax1.set_ylabel('Frequency')  # Add a y-label to the axes.
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')
```