

# Apartment Rental Prediction System

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## Introduction

### Dataset overview

As stated on the webpage of the ‘Apartment rental offers in Germany’ dataset, it contains 198,379 rental offers scraped from the Germany’s biggest real estate online platform  $\beta$  ImmobilienScout24.

The data set consists of a single CSV file: *immo\_data.csv* which only contains offers for rental properties. The data features important rental property attributes, such as the living area size, the rent (both base rent as well as total rent), the location, type of energy, and etc. The **date** column present in the data set defines the time of scraping, which was done on three distinct dates: *2018-09-22*, *2019-05-10* and *2019-10-08*.

The complete list of data set columns is extensive<sup>1</sup> and thus in this study we will use the following subset:

## [1]	"hasKitchen"	"heatingType"	"balcony"
## [4]	"lift"	"garden"	"cellar"
## [7]	"noParkSpaces"	"livingSpace"	"typeOfFlat"
## [10]	"noRooms"	"floor"	"numberOfFloors"
## [13]	"condition"	"newlyConst"	"interiorQual"
## [16]	"yearConstructed"	"energyEfficiencyClass"	"region1"
## [19]	"region2"	"region3"	"baseRent"
## [22]	"electricityBasePrice"	"heatingCosts"	"serviceCharge"
## [25]	"totalRent"	"date"	

This sub-selection reduces the number of considered data set columns<sup>2</sup> from 48 to 26 and is motivated by the personal preferences of the report’s author and has no scientifically proven motivation. On the contrary, this column selection shall be seen as a part of problem statement. In other words, the task is to build an accurate<sup>3</sup> rental price prediction model based on the predictors from this set of columns.

The additional data preparation steps will be described in the “*Data wrangling*” section of this document.

### Project goal

### Execution plan

## Data wrangling

```
nrow(aarg_data$selected_data)
```

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<sup>1</sup>Please consider reading *Appendix A* for the complete list of the data set columns.

<sup>2</sup>Please consider reading *Appendix B* for the column descriptions.

<sup>3</sup>Please consider reading the *Project goal* section for an exact goal formulation.

```
## [1] 198332

## # A tibble: 26 x 3
##   `Column name`      `N/A count` `N/A percent`
##   <chr>              <int>      <dbl>
## 1 electricityBasePrice 151158      76.2
## 2 energyEfficiencyClass 143315      72.3
## 3 heatingCosts         135154      68.2
## 4 noParkSpaces         130405      65.8
## 5 interiorQual         83001       41.8
## 6 numberOfFloors       71792      36.2
## 7 condition            50317      25.4
## 8 yearConstructed     42293      21.3
## 9 floor               37612      19.0
## 10 heatingType         32605      16.4
## 11 totalRent           29762      15.0
## 12 typeOfFlat          27571      13.9
## 13 serviceCharge        5110       2.58
## 14 hasKitchen           1         0
## 15 lift                 1         0
## 16 garden               1         0
## 17 cellar               1         0
## 18 livingSpace          1         0
## 19 noRooms              1         0
## 20 baseRent             1         0
## 21 balcony              0         0
## 22 newlyConst           0         0
## 23 regio1               0         0
## 24 regio2               0         0
## 25 regio3               0         0
## 26 date                 0         0
```

```
nrow(arog_data$cleaned_data)
```

```
## [1] 168543

## # A tibble: 24 x 3
##   `Column name`      `N/A count` `N/A percent`
##   <chr>              <int>      <dbl>
## 1 hasKitchen         0         0
## 2 heatingType        0         0
## 3 balcony            0         0
## 4 lift               0         0
## 5 garden             0         0
## 6 cellar             0         0
## 7 noParkSpaces       0         0
## 8 livingSpace        0         0
## 9 typeOfFlat         0         0
## 10 noRooms            0         0
## 11 floor              0         0
## 12 numberOfFloors     0         0
## 13 condition          0         0
## 14 newlyConst         0         0
## 15 interiorQual       0         0
## 16 energyEfficiencyClass 0         0
## 17 regio1             0         0
```

## 18 regio2	0	0
## 19 regio3	0	0
## 20 baseRent	0	0
## 21 heatingCosts	0	0
## 22 serviceCharge	0	0
## 23 totalRent	0	0
## 24 date	0	0

168562  $\approx$  168543

## Data analysis

## Modeling approach

## Results

## Conclusions

## Appendix A: The complete list of data set columns

Hereby we present the list of columns from the original data set:

## [1] "regio1"	"serviceCharge"
## [3] "heatingType"	"telekomTvOffer"
## [5] "telekomHybridUploadSpeed"	"newlyConst"
## [7] "balcony"	"electricityBasePrice"
## [9] "picturecount"	"pricetrend"
## [11] "telekomUploadSpeed"	"totalRent"
## [13] "yearConstructed"	"electricityKwhPrice"
## [15] "scoutId"	"noParkSpaces"
## [17] "firingTypes"	"hasKitchen"
## [19] "geo_bln"	"cellar"
## [21] "yearConstructedRange"	"baseRent"
## [23] "houseNumber"	"livingSpace"
## [25] "geo_krs"	"condition"
## [27] "interiorQual"	"petsAllowed"
## [29] "streetPlain"	"lift"
## [31] "baseRentRange"	"typeOfFlat"
## [33] "geo_plz"	"noRooms"
## [35] "thermalChar"	"floor"
## [37] "numberOfFloors"	"noRoomsRange"
## [39] "garden"	"livingSpaceRange"
## [41] "regio2"	"regio3"
## [43] "description"	"facilities"
## [45] "heatingCosts"	"energyEfficiencyClass"
## [47] "lastRefurbish"	"date"

## Appendix B: Data set column descriptions

Here is the list of the initially considered data set columns with the descriptions thereof:

1. **hasKitchen** – has a kitchen
2. **balcony** – does the object have a balcony
3. **cellar** – has a cellar
4. **lift** – is elevator available
5. **floor** – which floor is the flat on
6. **garden** – has a garden
7. **noParkSpaces** – number of parking spaces
8. **livingSpace** – living space in sqm
9. **condition** – condition of the flat
10. **interiorQual** – interior quality
11. **regio1** – Bundesland
12. **regio2** - District or Kreis, same as geo krs
13. **regio3** – City/town
14. **noRooms** – number of rooms
15. **numberOfFloors** – number of floors in the building
16. **typeOfFlat** – type of flat
17. **yearConstructed** – construction year
18. **newlyConst** – is the building newly constructed
19. **heatingType** – Type of heating
20. **energyEfficiencyClass** – energy efficiency class
21. **heatingCosts** – monthly heating costs in €
22. **serviceCharge** – auxiliary costs such as electricity or Internet in €
23. **electricityBasePrice** – monthly base price for electricity in €
24. **baseRent** – base rent without electricity and heating
25. **totalRent** – total rent (usually a sum of base rent, service charge and heating cost)
26. **date** – time of scraping