

# Mapping and Predicting Rental Prices in Munich



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Our project aimed to create an interactive story map to better understand and predict rental prices in Munich. By integrating visual storytelling, geospatial data, machine learning modeling, and a dynamic rental price calculator, we provide users with a tool to determine fair rental prices based on their preferences. This tool is designed to assist users in navigating the complex rental market within the city of Munich.

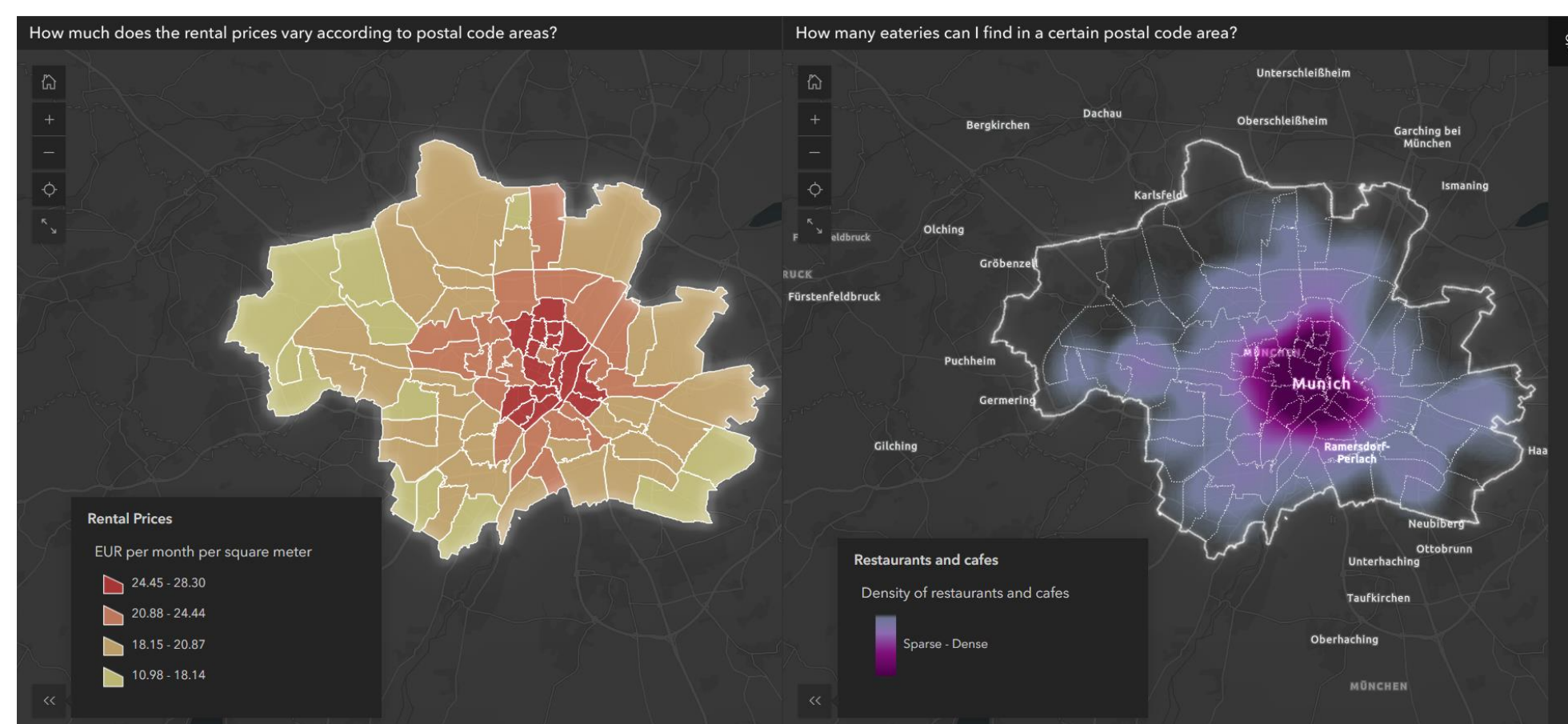


Fig. 1. Interactive map comparing rental prices (left) with the presence of eateries (cafes and restaurants) (right) in Munich.

## MOTIVATION

Finding a place to stay in Munich is one of the most challenging aspects of moving to this city, yet one of the most important. The cost of rent in Munich varies greatly depending on the location and access to different facilities or amenities. Hence, a basic understanding of the rental market is essential to estimate a fair price that aligns with one's needs. This was our motivation to create this project aimed to provide a story map for understanding and predicting rental prices in Munich.

## FROM DATA TO VISUALIZATION

Beyond the storytelling and interactive map visualization, data was gathered, analyzed, and presented using ArcGIS Pro, Python, and JavaScript.

First, data was collected from open-access sources like Open Street Maps for geospatial information and Kaggle for rental listing dataset (ImmoScout) [1]. Machine learning models such as Linear Regression, Random Forest, and Gradient Boosting [2][3] were trained and tested in Python to analyze the relationship between different variables and rental prices, and lastly make predictions.

ArcGIS Pro was used to style and integrate shapefiles into a story map. Finally, a rental price calculator was developed using JavaScript and embedded into the story map.

## THE STORY MAP

A story map was designed to display our findings from 3,843 rental listings along with spatial datasets, including eateries, city center, and parks.



Fig. 2. Starting page for the Story Map

## VARIABLES INFLUENCING RENTAL PRICES

We categorized our variables into two groups: facilities and amenities. Our findings indicate that facilities, such as proximity to the city center, the presence of eateries in the area, and nearby parks, influence rental prices. However, the most significant impact comes from amenities, such as living space offered, and service charges. Other influencing amenities were the availability of an elevator, balcony, and garden, and whether the building was new or old.

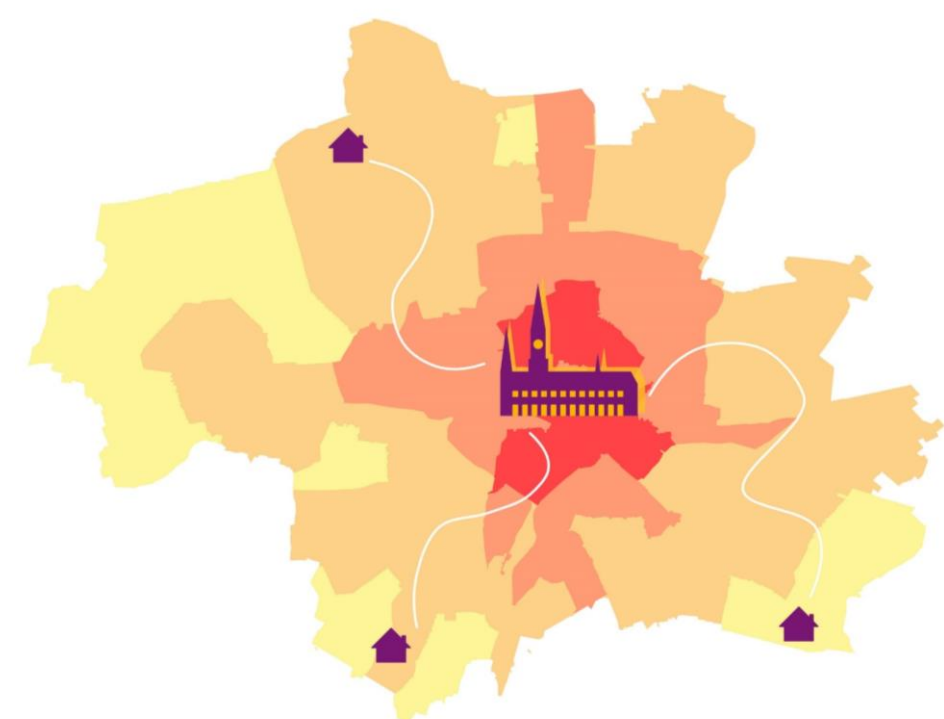


Fig. 3. Proximity to City Center significantly influences rental prices. The closer to the center, the higher the prices are.

As shown in Figures 1 and 3, throughout the story map, users can explore various interactive maps that display rental prices and compare them with different variables.

## THE CALCULATOR

We trained machine learning models using listing data, enriched by applying spatial data encoding. After evaluation, Gradient Boosting performed best with an RMSE of 268.7 EUR and an R2 score of 0.82, explaining 82,55% of the rental price variance.

We deployed the model within the Story Map by creating a calculator where users can select a range of options such as living space, property amenities, and location, to predict rental prices. The calculator also features an interactive map showing transport, nearby facilities, and parks.

## ACCOMPLISHMENTS AND LIMITATIONS

We are proud to have successfully integrated various variables to provide a clear understanding of the drivers affecting rental prices in Munich. Through our story map, users can explore how factors like proximity to the city center, amenities, and nearby facilities affect rental prices. We also developed a rental price calculator, for predicting prices based on these key features.

However, one limitation is the availability of up-to-date data, which is fundamental to keeping the calculator aligned with Munich's dynamic rental market.

## CONCLUSION

To sum up, our project provides key insights into rental prices market drivers in Munich by integrating spatial and listing data. We also developed a rental price calculator that allows users to predict prices based on various property features.

## IMPRINT

Mapping Project  
Winter Semester 2024/2025  
Technical University of Munich

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## KEYWORDS

Munich, Accommodation, Rental Prices, Machine Learning, Story Map

## LINK

<https://arcg.is/1qjgyu0>

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