

HOME INSIGHT

Optimizing Real Estate  Decisions with Data Analysis

GROUP 7



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01 OVERVIEW

Briefly explains the project and its goal



Overview

The objective of this project is to leverage multiple linear regression modeling to analyze house sales data from King County, focusing on providing actionable insights for a real estate agency. By examining key factors influencing home values, the analysis aims to assist homeowners in making informed decisions about property renovations that can enhance their homes' estimated market worth.



02 BUSINESS & DATA UNDERSTANDING

Briefly explains the problem and the data given to assist in the study



Stakeholder & Business Understanding

The stakeholder for this project is a real estate agency specializing in residential property transactions. The business problem revolves around the need to offer strategic advice to homeowners on how specific renovations can impact their homes' market value. By understanding which home features contribute most significantly to property valuation, the agency can provide valuable guidance to clients seeking to maximize their investment returns through targeted improvements.



Data Understanding

The King County House Sales dataset contains essential attributes such as square footage, number of bedrooms and bathrooms, condition ratings, and location-related variables (e.g., zip code, latitude, longitude). These features play a critical role in determining property values, making them essential for building an effective regression model.



MODELLING

03

Creation of the model and what is done before



Data Preparation

The data preparation phase involved handling missing values by either imputing them or removing rows with incomplete data. Additionally, non-numeric features were converted into numeric formats using techniques like one-hot encoding for categorical variables e.g condition and grade.



Feature Selection

To identify relevant predictors for the regression model, a combination of domain knowledge and exploratory data analysis was used. Features showing strong correlations with home prices and deemed influential by the real estate domain were selected for modeling.



Modelling Overview

In this analysis, we employed linear regression and multiple linear regression techniques to model house prices using various features. The aim was to predict and understand how different factors influence housing prices.



Linear Regression Model

Initially, a simple linear regression model was built using the square footage of living space (`sqft_living`) as the predictor due to its strong correlation with house prices and linear relationship.

The resulting linear regression model had an R-squared value of 0.49, indicating that 49% of the variance in house prices could be explained by square footage alone. However, this model showed significant variability in predictions, as evidenced by a high Root Mean Squared Error (RMSE) of approximately 256,860.61.



Multiple Linear Regression Model

The subsequent multiple linear regression model incorporated a broader set of features to better capture the variance in house prices, resulting in an improved R-squared value of 0.676.

To enhance the predictive power and normality of the target variable, we performed a log transformation on house prices (price), leading to a more symmetric distribution. This log-transformed multiple linear regression model achieved a higher R-squared value of 0.772, explaining approximately 77.2% of the variance in log-transformed prices.



04 REGRESSION

About the regression models and their interpretation



Regression

The multiple linear regression analysis revealed significant relationships between various features and house prices. Factors such as the number of bedrooms, bathrooms, square footage (sqft_living), waterfront location, grade, and location coordinates (latitude and longitude) emerged as key predictors of housing prices. The model also highlighted the impact of specific features on price variation, offering insights into how different attributes contribute to property valuations.

05 RECOMMENDATIONS.

Recommendations on the model and to the stakeholders

☀ Recommendations on model

1. **Grouping by House Size or Adding More Data:**

- Partition the dataset based on house size (e.g., small, medium, large) to create specialized models for different types of homes.
- Increase dataset diversity by incorporating additional data on various property sizes or from nearby counties.

2. **Addressing Outliers:**

- Identify and investigate outliers within the dataset to understand their impact on model performance.
- Apply outlier removal techniques or robust regression methods to mitigate the influence of outliers on model accuracy.

☀ Recommendations to stakeholders

1. **Optimize Property Pricing:** Utilize the multiple linear regression model to refine property pricing strategies. Leverage features such as square footage, location (zipcode, latitude, longitude), and overall condition (grade, waterfront, view) to accurately assess property values. This will help in setting competitive yet profitable listing prices.
2. **Focus on Key Property Features:** Highlight and prioritize features that significantly influence property value, such as living space (sqft_living), number of bedrooms and bathrooms, quality of construction (grade), and proximity to amenities (waterfront, view). Emphasize these features in marketing materials to attract targeted buyer segments.
3. **Invest in Renovation and Upgrades:** Identify properties with potential for value enhancement based on regression coefficients (e.g., sqft_above, sqft_basement). Consider strategic renovations and upgrades to maximize return on investment (ROI) and appeal to discerning buyers.
4. **Enhance Location-Based Marketing:** Leverage location data (zipcode, latitude, longitude) to tailor marketing efforts to specific neighborhoods and regions. Highlight desirable aspects of each location to attract buyers seeking particular lifestyles or amenities.
5. **Continuous Monitoring and Adaptation:** Regularly update regression models with new data to track market trends and buyer preferences over time. This ongoing analysis will facilitate agile decision-making and adjustments to sales strategies in response to changing market dynamics.



NEXT STEPS

Given the project above what should be done

06

☀ Next steps for model improvement

1. **Feature Engineering:** Explore how different features interact and transform within the dataset to capture complex relationships effectively.
2. **Model Refinement:** Implement advanced regression techniques like Ridge or Lasso regression to handle multicollinearity and enhance the model's generalization.
3. **Outlier Detection and Management:** Continuously monitor for outliers and use robust regression methods to mitigate their impact on model accuracy.
4. **Diagnostic Checks:** Regularly evaluate model assumptions (e.g., normality, homoscedasticity) to ensure the reliability of regression results.
5. **Validation with Cross-Validation:** Validate model performance using cross-validation techniques to assess stability and reliability across diverse data subsets.
6. **Business Insights:** Translate model findings into actionable guidance for stakeholders, highlighting key factors influencing property values and investment decisions.

☀ Next steps for stakeholders

1. **Refine Marketing Strategies:** Utilize the identified key features and location-based insights to refine marketing strategies. Develop targeted campaigns that emphasize property attributes known to positively influence house prices, such as square footage, waterfront access, and desirable neighborhood characteristics.
2. **Enhance Property Listings:** Update property listings to highlight key features and showcase properties in high-demand areas. Use compelling descriptions and visuals that resonate with potential buyers seeking specific property attributes.
3. **Offer Upgrade and Renovation Services:** Collaborate with contractors or renovation specialists to offer upgrade and renovation services to property owners. Position renovations as value-enhancing investments that can increase property appeal and overall market value.
4. **Implement Data-Driven Pricing:** Apply data-driven pricing strategies based on regression insights. Use comparative market analysis (CMAs) to set competitive listing prices aligned with market trends and property value drivers.
5. **Evaluate Sales Performance:** Regularly evaluate sales performance and assess the effectiveness of implemented strategies. Use metrics such as conversion rates, average selling prices, and customer feedback to measure success and identify areas for improvement.

THANK YOU!

