



King County House Price Prediction

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DA 485 | Data Analytics Capstone Project

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Agenda

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Project Overview

Objective:

As a data scientist at FlyHomes, my role is to delve into the house sales data in the King County area. The task involves building predictive models for sale prices and pinpointing the factors that significantly influence house prices.

Business Question:

- **Location:** Which areas in King County command the highest average house prices?
- **Inner Factors:** What house features have the most substantial impact on the sale price?
- **External Factors:** How do external elements such as property tax rates, school ratings, and demographic data sway house prices in King County?

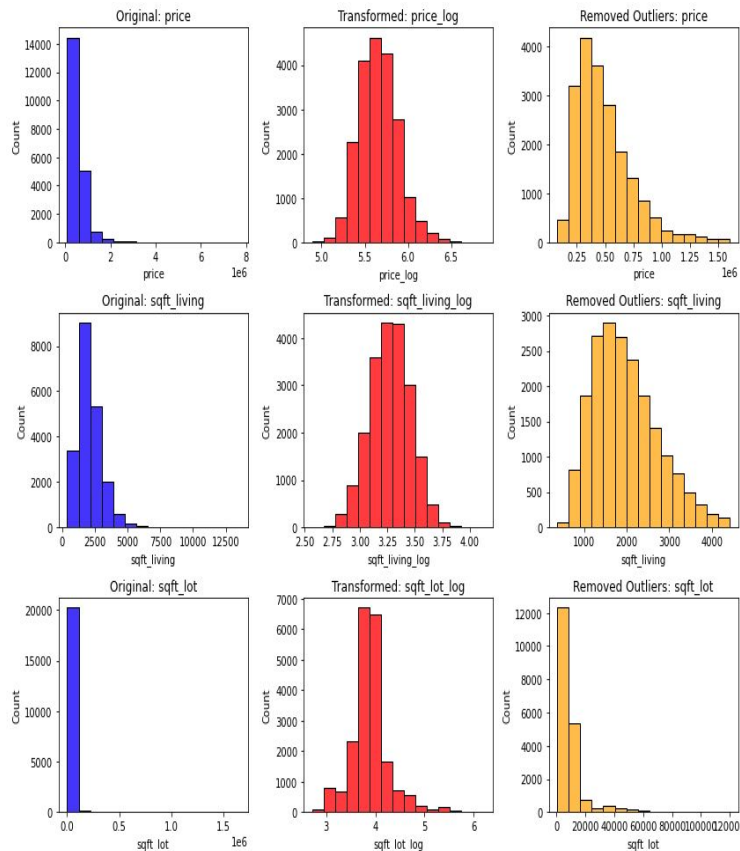
Goal:

This project aims to guide potential investors and homebuyers in making informed decisions in the King County real estate market.

Data Used for this Project

	Dataset Name	Data Source Link	Source
1	House Sales in King County	https://www.kaggle.com/datasets/harlfoxem/housesaleprediction	Kaggle
2	School Dataset	https://www.schooldigger.com/go/WA/cityrank.aspx?	Schooldigger
3	Crime Dataset	https://ucr.fbi.gov/crime-in-the-u.s	UCR
4	Property Tax Rate Dataset	https://kingcounty.gov/en/legacy/depts/finance-business-operations/treasury/property-tax.aspx	Kingcounty
5	Demographic Dataset	https://data.census.gov/ Tables S2301, DP03, S0801, S0101	Census

Data Processing





Languages & Libraries: Python (Pandas, NumPy, Seaborn, Matplotlib, Scikit-Learn, XGBoost)

Feature Selection:

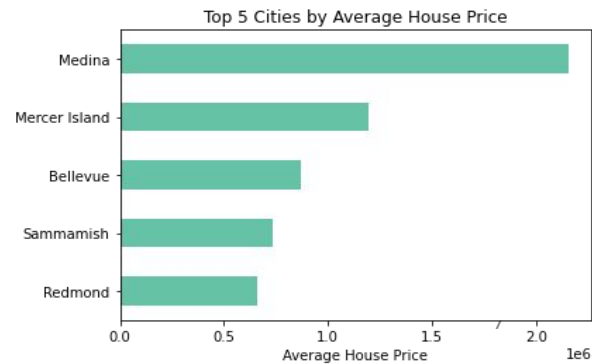
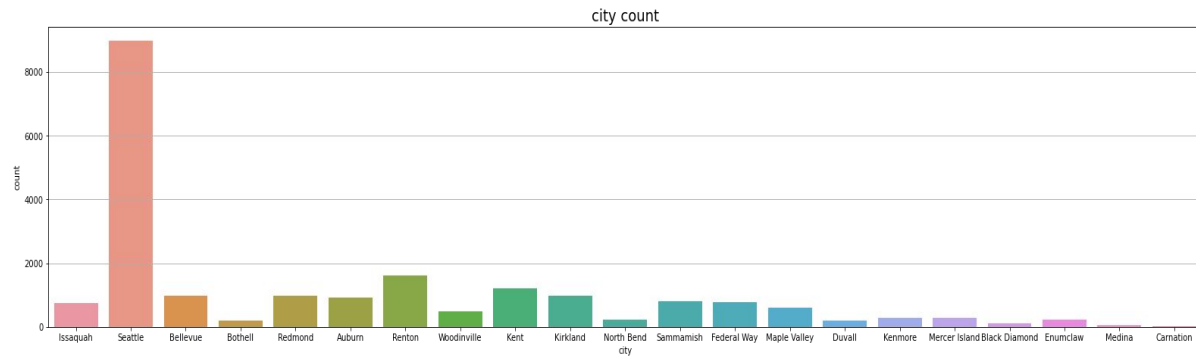
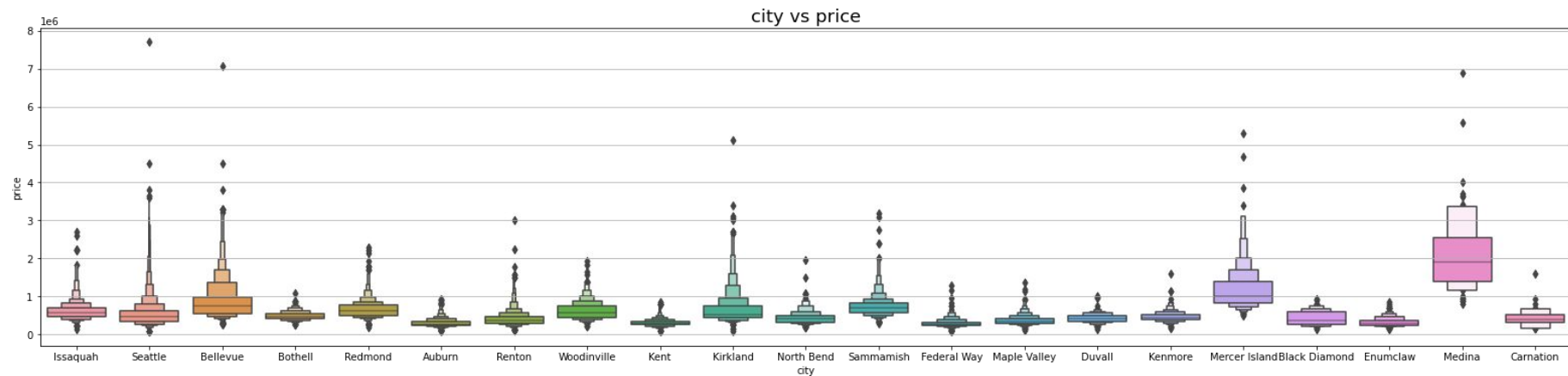
Targeted Variable	price_log
Inner Factors	condition, grade, floors, bedrooms, bathrooms, sqft_living_log, sqft_lot_log, house_age,
External Factors	school_rate, unemployment_rate, travel_time_to_work, total_population, typical_levy_rate, median_age, median_household_income, area_crime

Data Transformation: applied logarithmic transformation to the 'price', 'sqft_living' and 'sqft_lot'

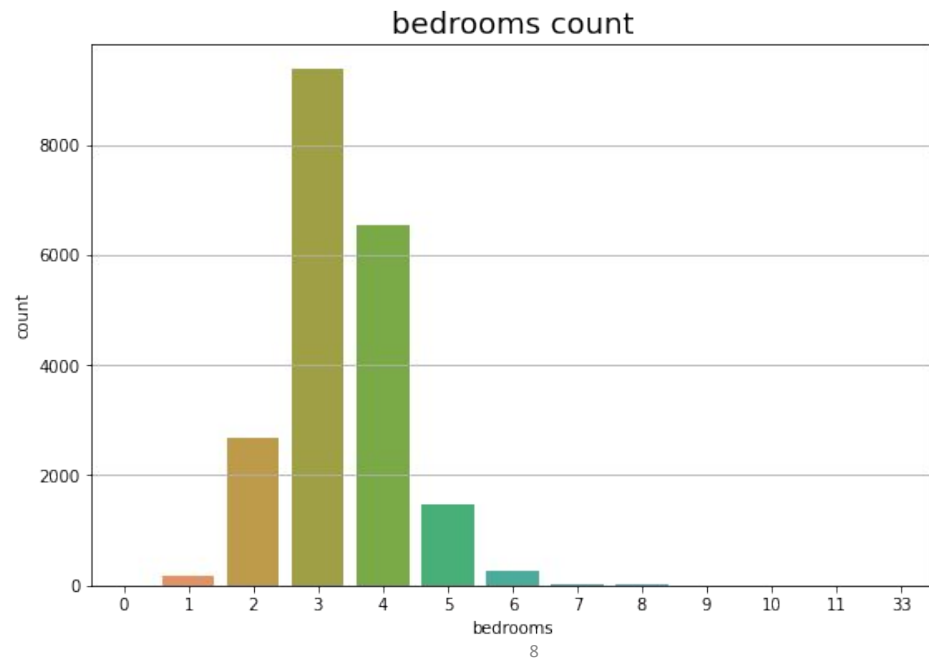
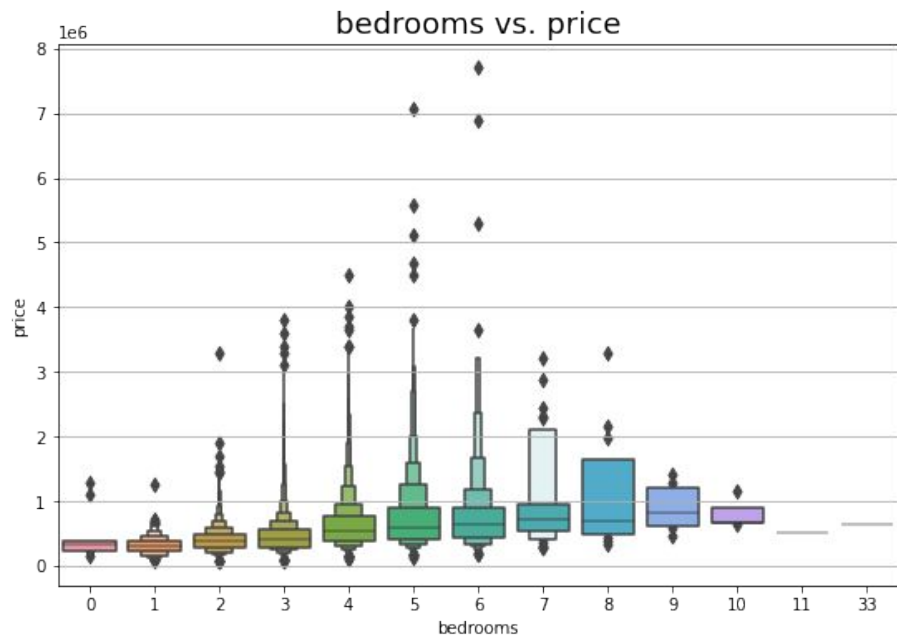
Methodologies

Method	 Pros	 Cons
EDA	<ul style="list-style-type: none">• Gain initial insights• Identify and rectify data errors• Select Features	<ul style="list-style-type: none">• Time-consuming with large datasets• Subjective insights
MLR	<ul style="list-style-type: none">• Clear and understandable model• Enables predictive modeling• Identifies impactful variables	<ul style="list-style-type: none">• Relies on strict assumptions• Issues with correlated predictors• Sensitive to outliers
XGBoost	<ul style="list-style-type: none">• High predictive accuracy• Handles missing data automatically• Highlights important features	<ul style="list-style-type: none">• Complex and hard to interpret• Requires substantial computational resources

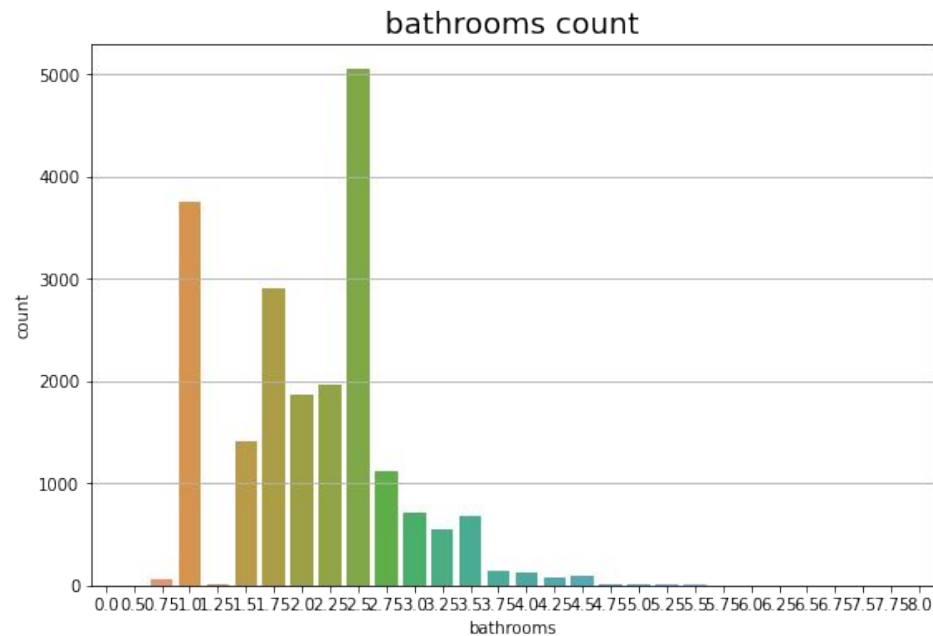
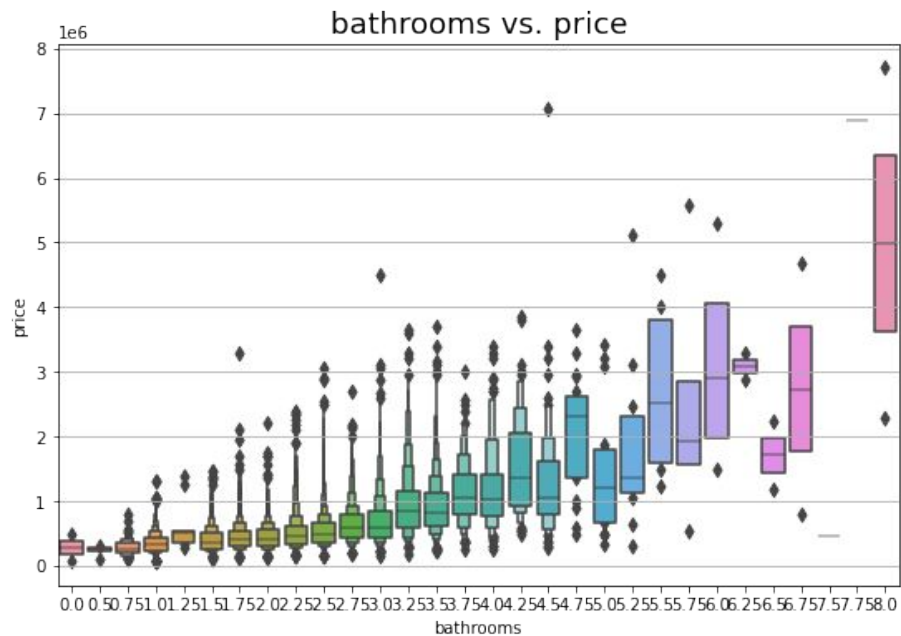
Exploration



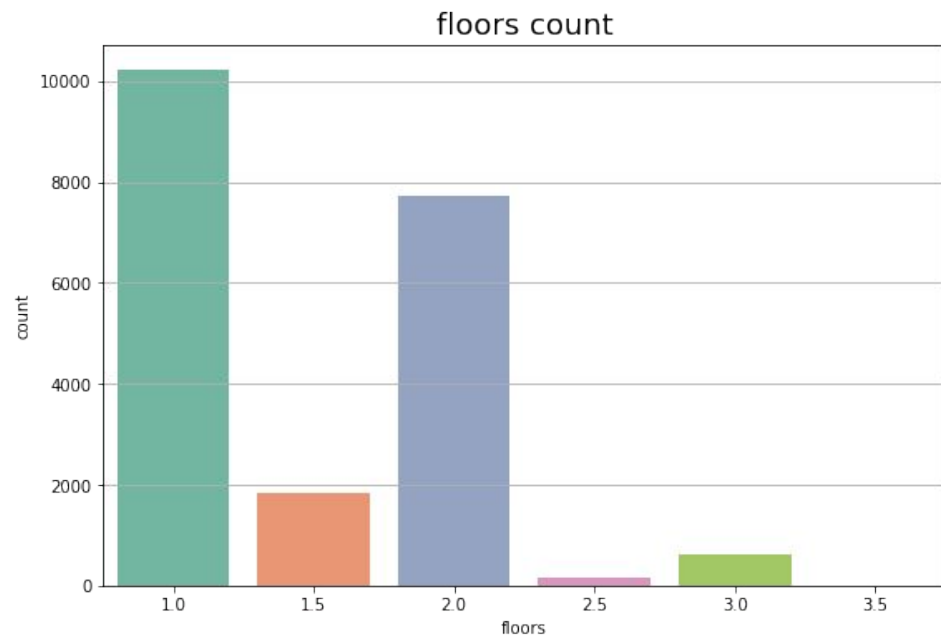
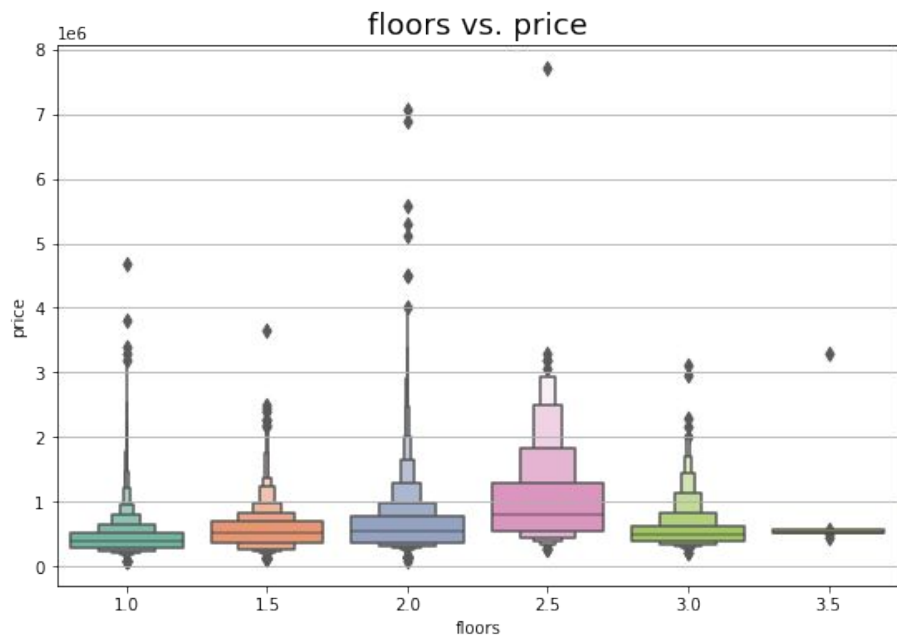
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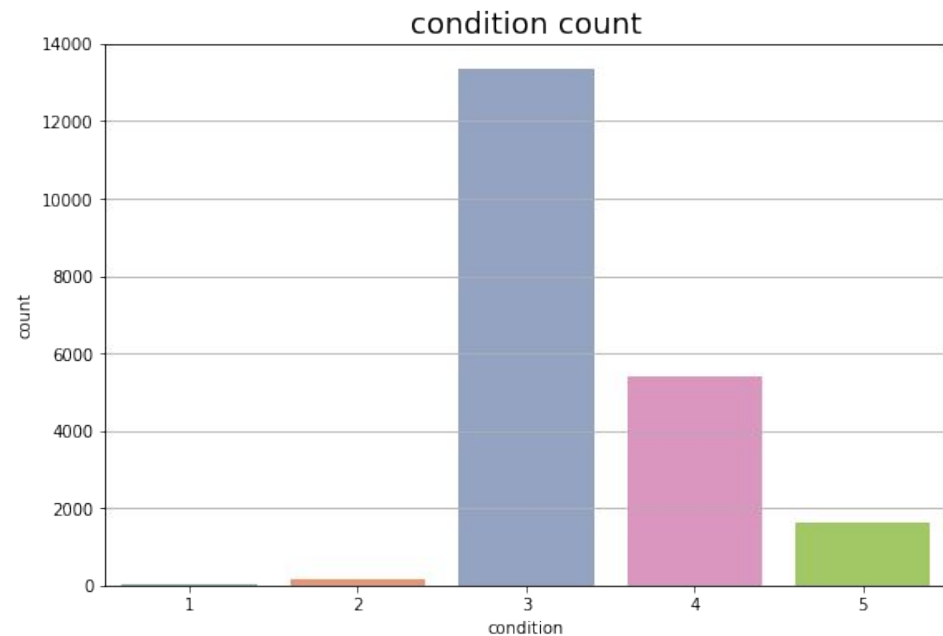
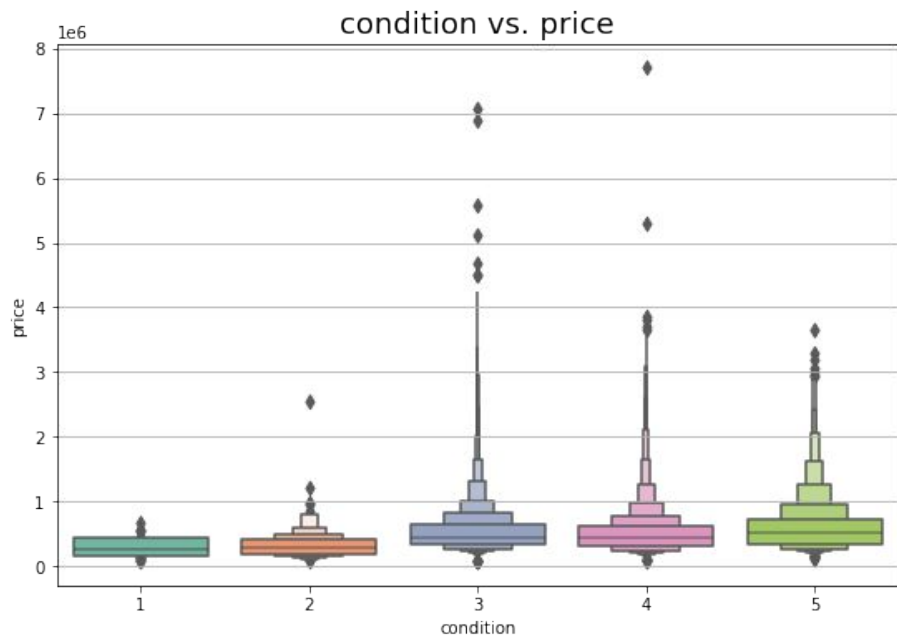
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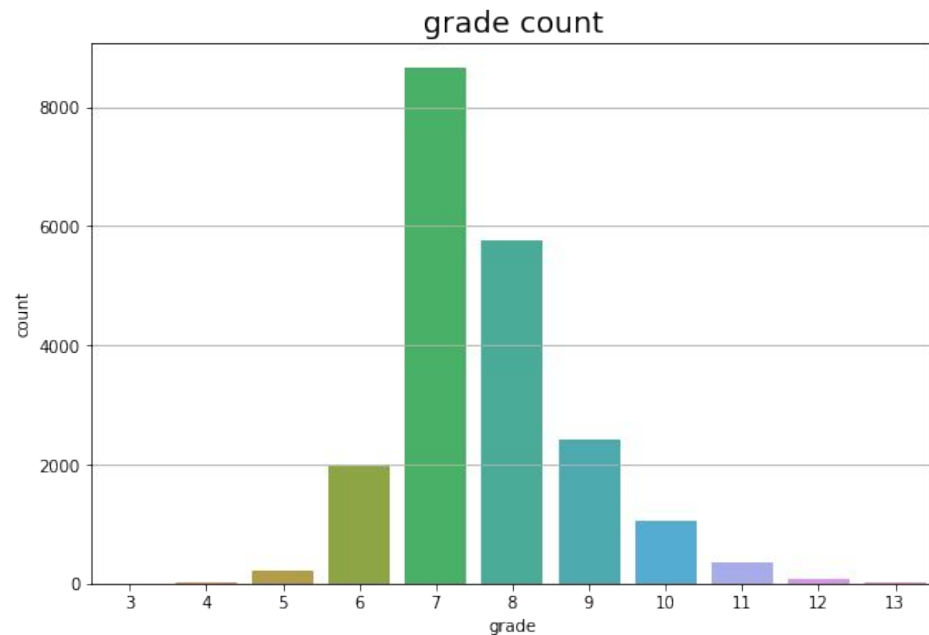
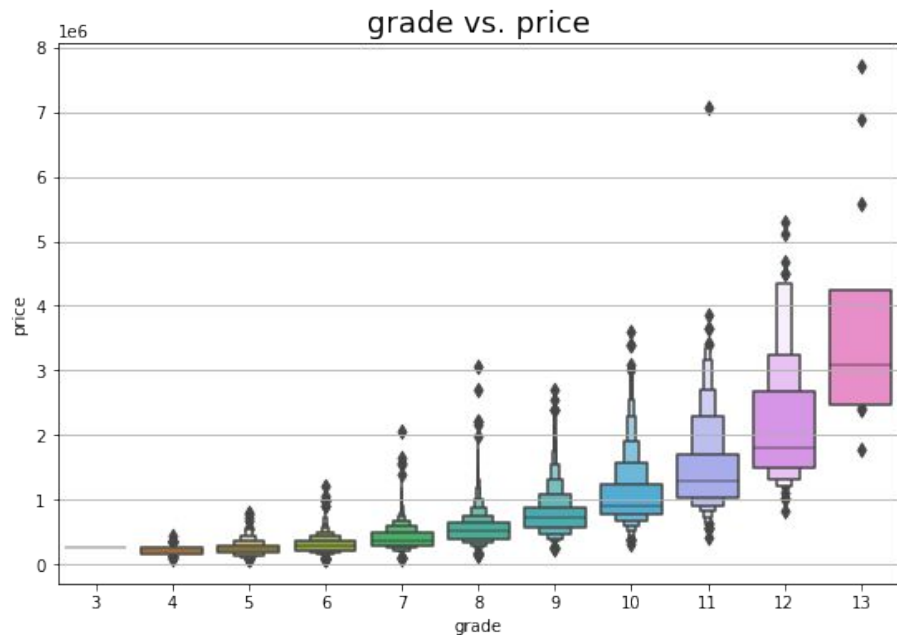
Exploration



Exploration



Exploration



Model Comparison

	Inner Factors		External Factors		Overall Factors	
	MRL	XGBoost	MRL	XGBoost	MRL	XGBoost
Top 5 Significant variables	living_log, gade, lot_log, bathrs, bedrs	lot_log, living_log, h_age, bathrs, grade	unemp_rate, levy_rate, Sch_rate, travel_time, med_age	med_age, med_hh_income, tot_pop, travel_time, unemp_rate	tevy_rate, unemp_rate, living_log, schol_rate, grade,	lot_log, living_log, h_age, bathrs, grade
MAE	0.097	0.100	0.110	0.115	0.063	0.056
MSE	0.014	0.016	0.019	0.023	0.006	0.006
RMSE	0.312	0.128	0.332	0.153	0.250	0.079
R-Squared	0.688	0.678	0.528	0.541	0.865	0.877



Findings

Prime Locations for Investment

- Medina, Mercer Island, Bellevue, Sammamish, and Redmond

House Features

- **Optimal Features:** Homes with 2.5 floors tend to fetch the highest prices.
- **Grade:** A higher grade generally correlates with a higher price; the condition score is less influential.

Model

- **Inner Factors:** The sqft_living_log, sqft_lot_log, grade, and the number of bathrooms significantly impact house prices.
- **External Factors:** The unemployment rate, travel time to work, and median age are significant factors.
- **Overall:** The sqft_living_log and grade being pivotal factors.

Challenges

Multicollinearity: Present in both inner and external factors, yet better managed by the XGBoost model compared to MLR

Recommendation



Utilize the insights derived from the analysis to create data-driven marketing strategies. For example, highlighting the optimal house features (like the number of floors and grade score) in marketing.



Offer advisory services to clients, helping them make informed decisions based on the significant factors influencing house prices in King County.



Collaborate with local authorities to gather more recent data to current market trends and dynamics.



Recommend leveraging the XGBoost model for predictive analyses given its slightly superior performance compared to the MLR model, especially in handling multicollinearity issues effectively.

Further Work

More sales data:

The dataset covers the period from May 2014 to May 2015. To reach a more accurate conclusion, it is essential to obtain data that is both more recent and spans a longer period.

Temporal Analysis:

Conduct a temporal analysis to understand how house prices have evolved over time and identify any seasonal trends or patterns.

Interactive Dashboard:

Develop an interactive dashboard that allows users to explore the data and insights visually and to generate custom reports based on their preferences.





Audience Q&A

Thank you

Sources

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