PREDICT THE HOUSE PRICES FOR RESIDENTIAL HOMES IN AMES, IOWA

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DATA SCIENCE CAPSTONE PROJECT JUL 2023

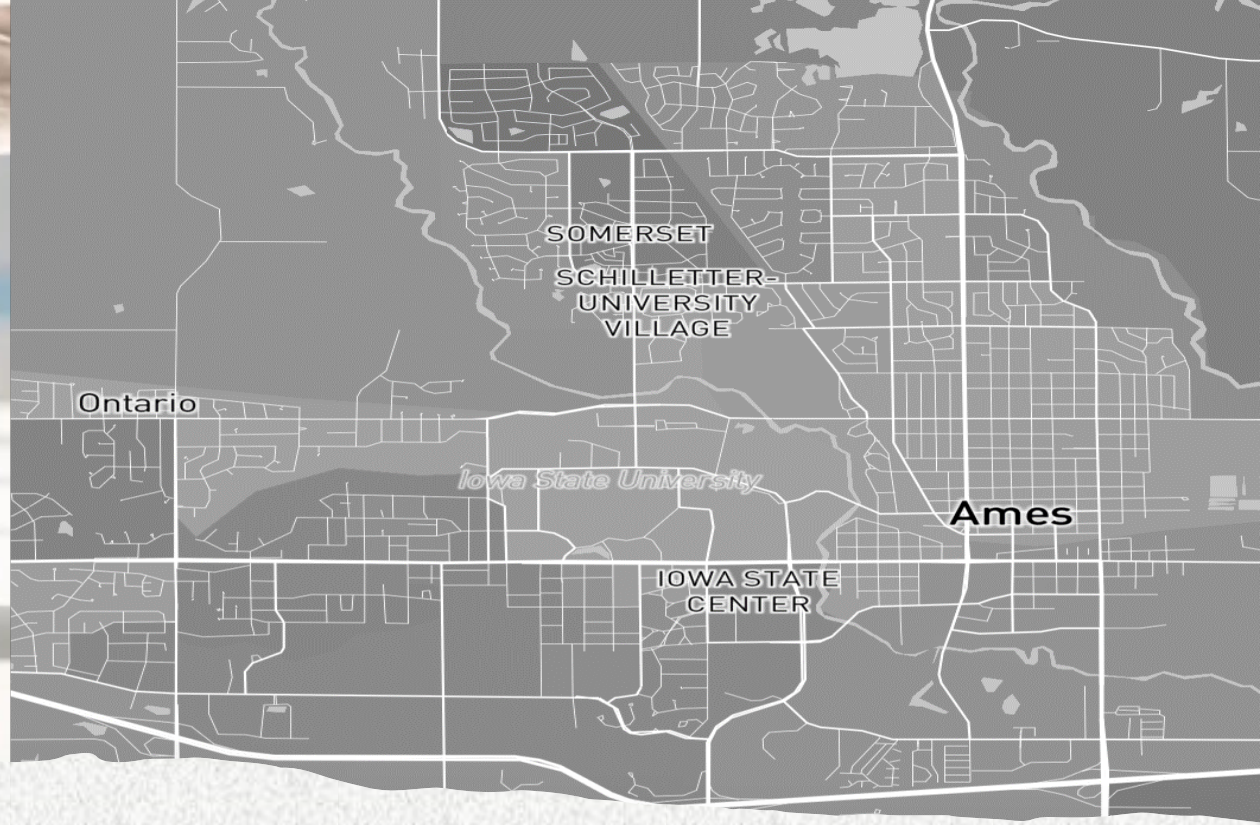
Springboard

THANKS TO SPRINGBOARD MENTOR

AJ Sanchez, Ph.D.

GOALS:

- Accurately Predict House Prices.
- Identify Key Features that Enhance House Value.



The intended stakeholders are Real Estate Agents, Brokers, Homeowners, Investors and prospective buyers.

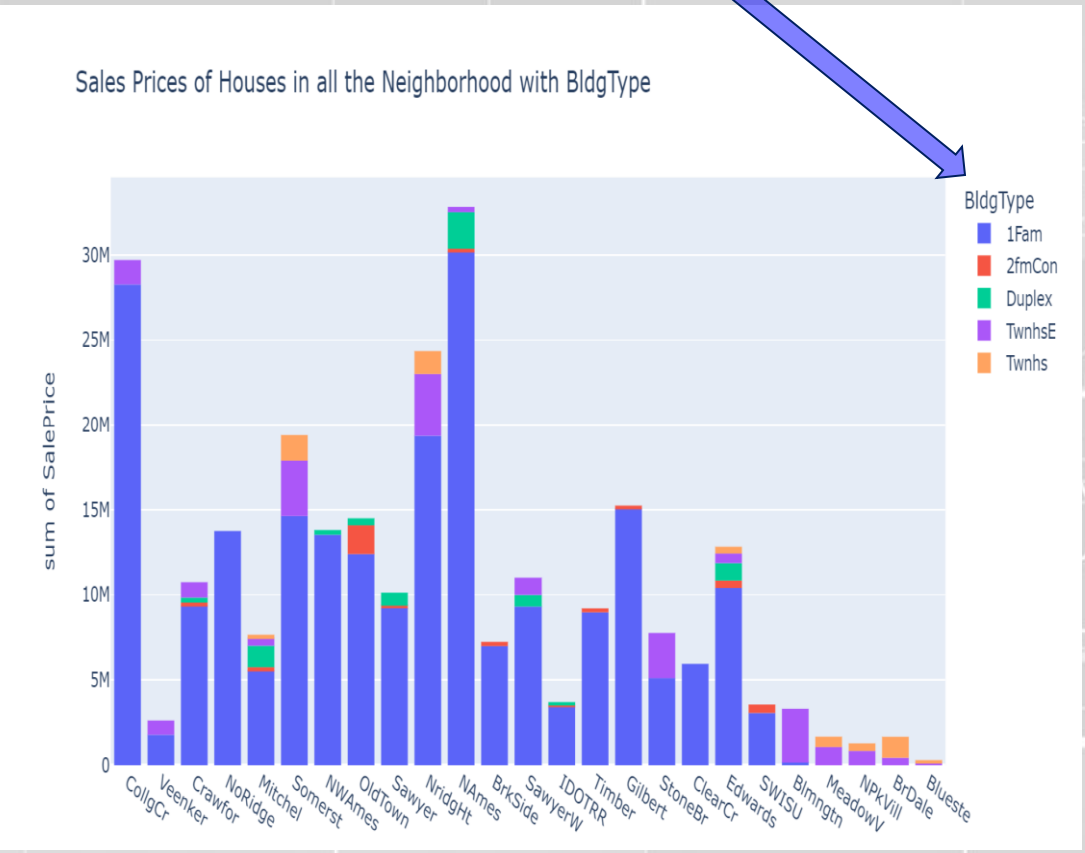
DATA EXPLORATION: 25 neighborhoods, 1460 houses and 80 features

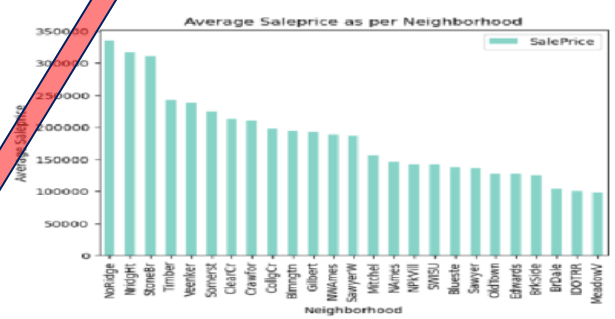
1st Floor square feet

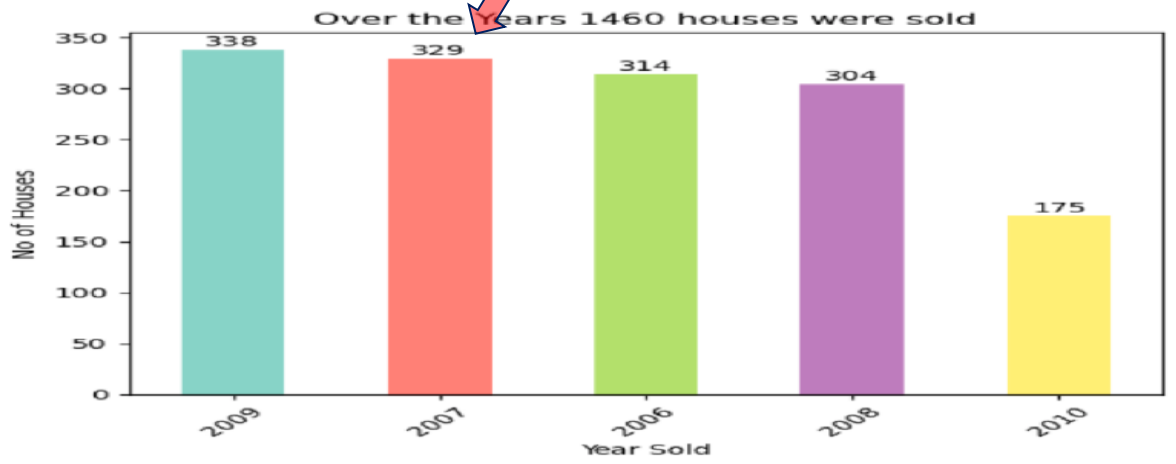
price range $50,000 to $800,000

over 300 houses per year have been sold

ACTIVE HOUSING MARKET







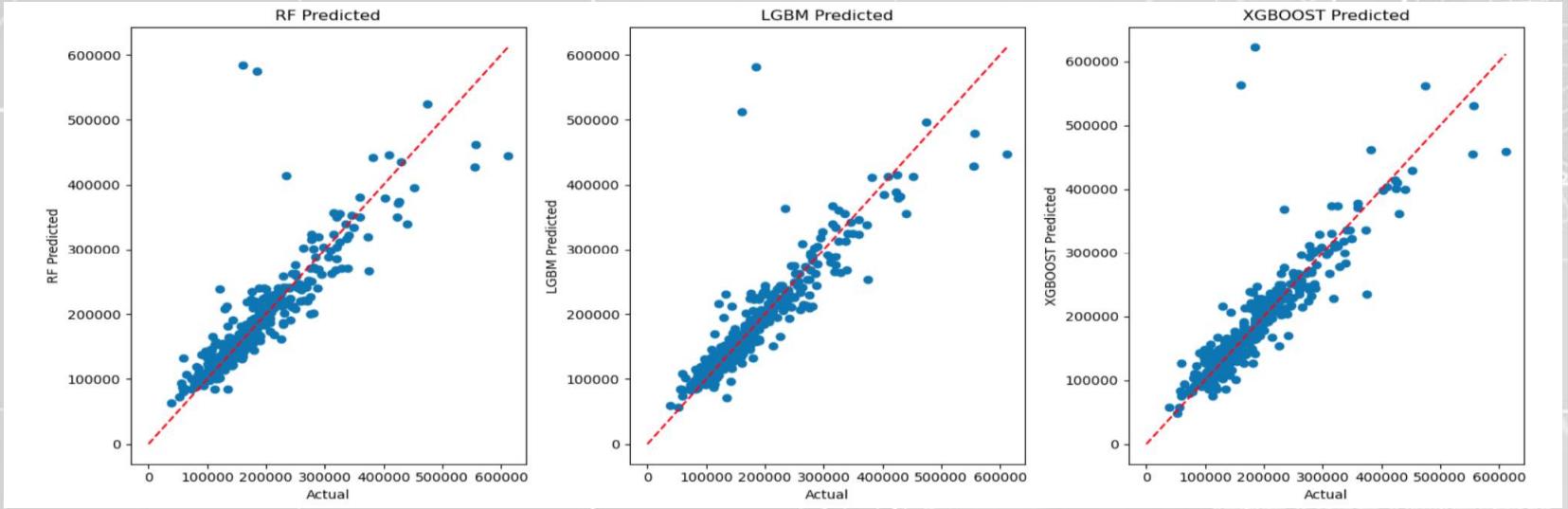
MACHINE LEARNING PIPELINE

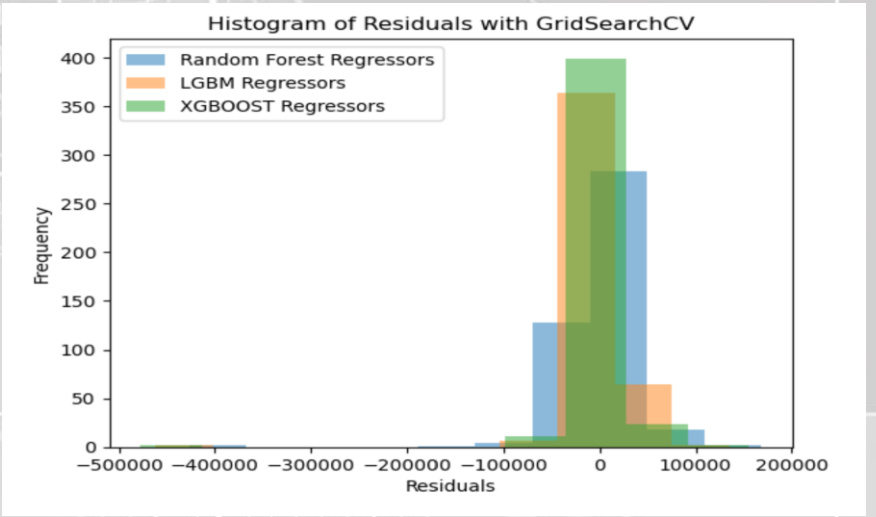
Model	MAE	MAPE
LGBMRegressor	$17,976	11%
XGBRegressor	$18,707	12%
RandomForestRegressor	$19,679	12%
GridSearchCV (RandomForestRegressor)	$19,455	12%
GridSearchCV (LGBMRegressor)	$16,758	11%
GridSearchCV (XGBRegressor)	**$16,718**	11%
RandomSearch (RandomForestRegressor)	$19,814	12%
RandomSearch (LGBMRegressor)	$18,152	11%
RandomSearch (XGBRegressor)	$17,261	11%

1. **We started with an initial model Linear Regression.**
2. **We tried different models like RandomForestRegressor, LGBMRegressor, and XGBRegressor to find the best one.**
3. **We fine-tuned the models using techniques called GridSearchCV and RandomizedSearchCV to improve their performance.**

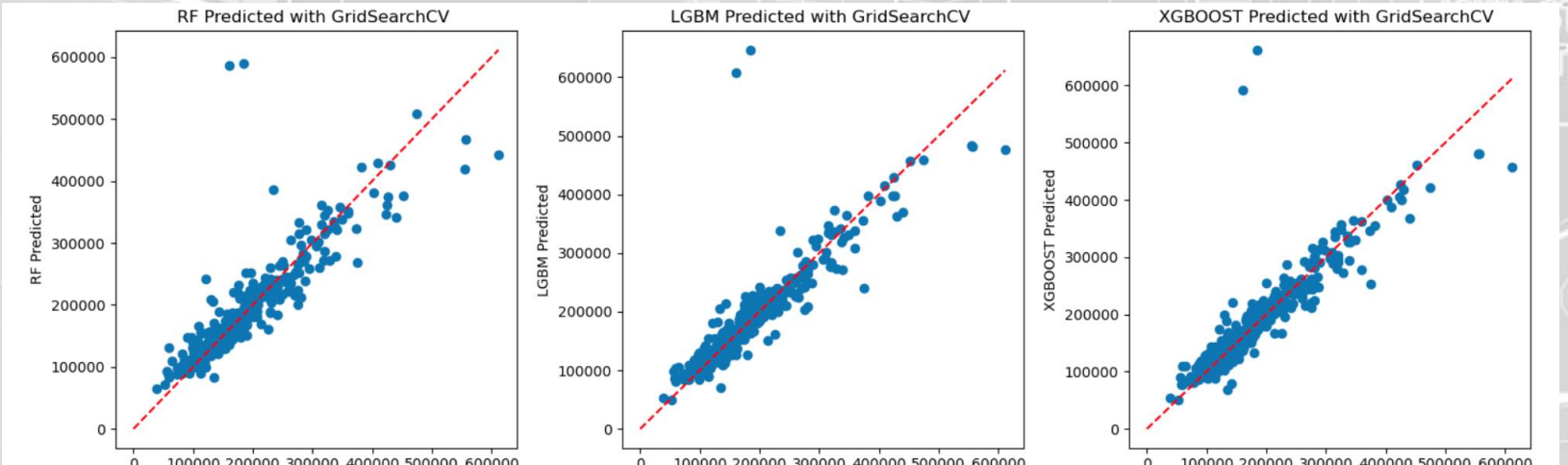
VISUALIZING THE IMPROVED PREDICTIONS

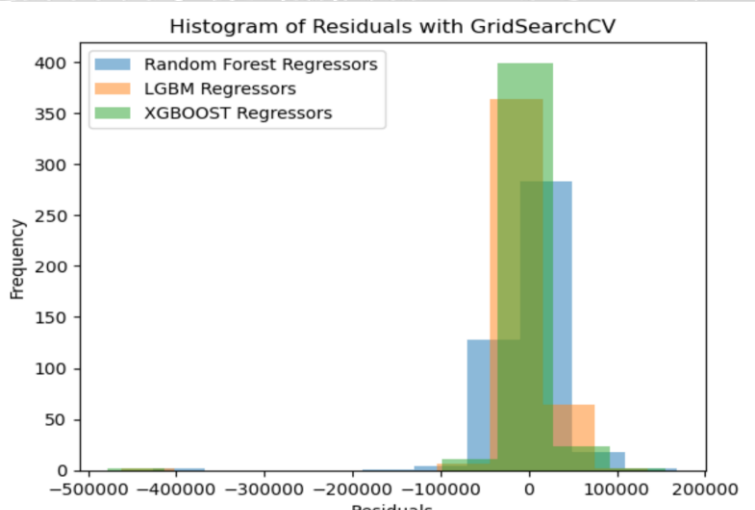
BEFORE





AND AFTER MODEL TUNING





THE BEST MODEL

XGBRegressor with GridSearch tuning

With deviation of $16,718 between predicted and actual house prices.

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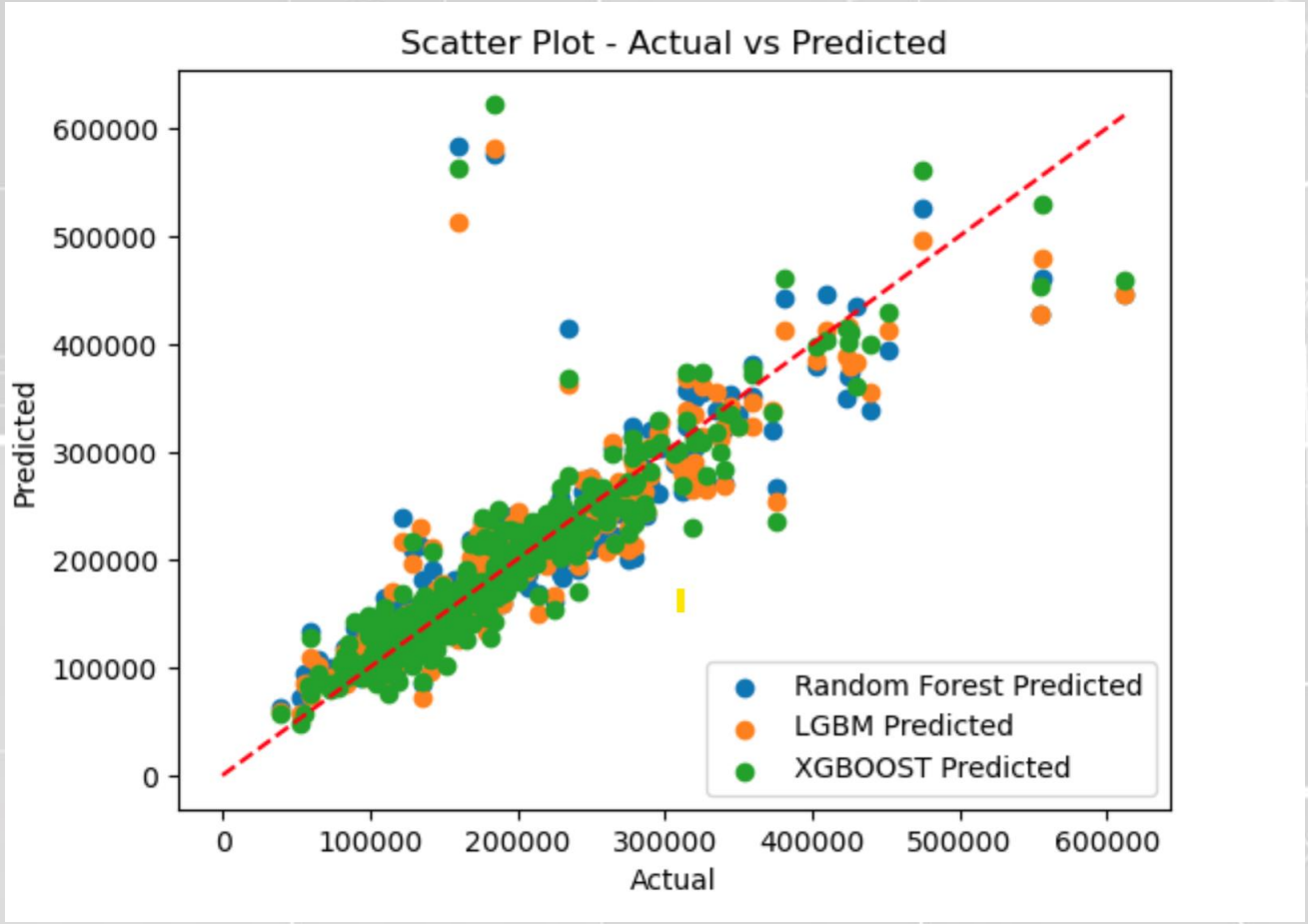
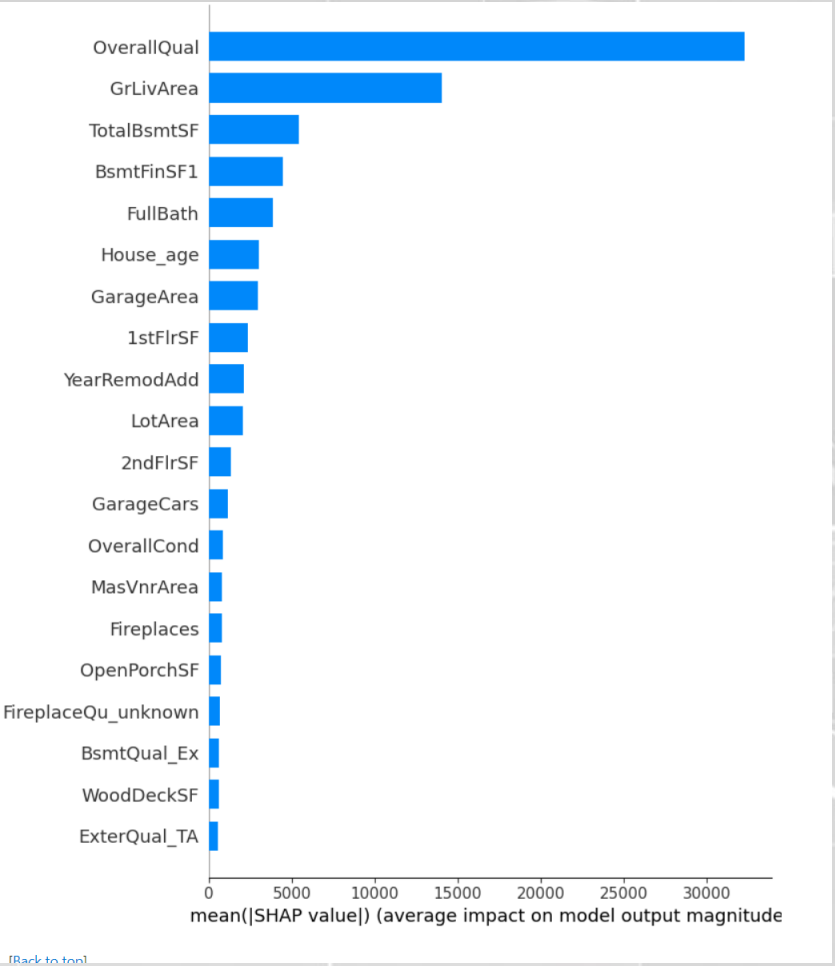


KEY FEATURES THAT ENHANCE HOUSE VALUE.

SHAP (SHapley Additive exPlanations)



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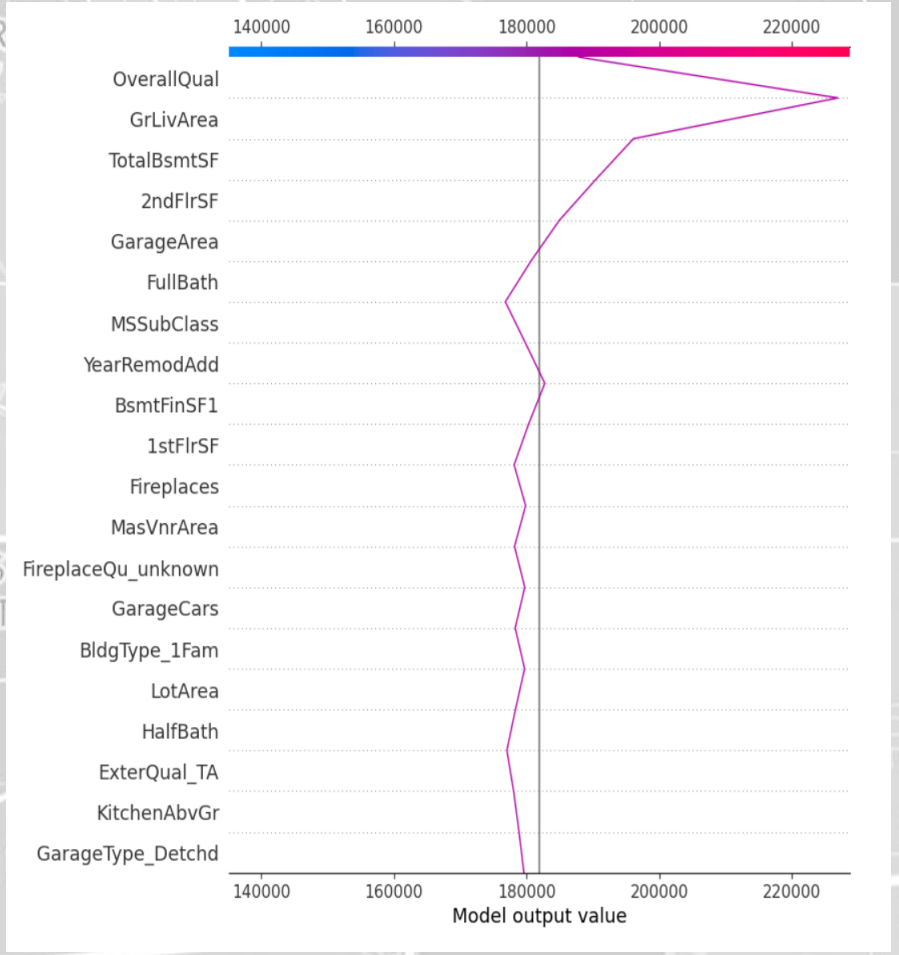
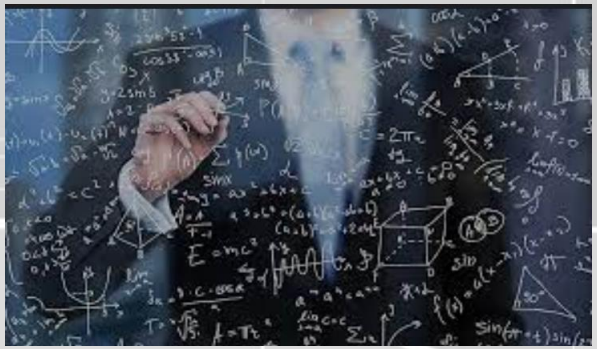
AFFORDABLE WAYS TO INCREASE HOUSE VALUE:

- ADDING A GARAGE AREA.
- INSTALLING A FIREPLACE.



FUTURE WORK

- More Data about Economic indicators, crime rates, school ratings
- Advance feature engineering techniques
- Annual updates



SUMMRY

- **Analyzed three models (RandomForestRegressor, LGBMRegressor, XGBRegressor) to predict house prices.**
- **XGBRegressor with GridSearch tuning performed the best (MAE: $16,718, MAPE: 11%).**
- **Valuable insights for real estate analysis and decision-making; SHAP force plot visualizes feature impact on prices.**