PREDICT THE HOUSE PRICES FOR RESIDENTIAL HOMES IN AMES, IOWA

SCHILLETTER-UNIVERSITY VILLAGE

OntarASIYA SHAKEEL

DATA SCIENCE CAPSTONE PROJECT JUL 2023

Ames



IOWA STATE

THANKS TO SPRINGBOARD MENTOR



AJ Sanchez, Ph.D.

GOALS:

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

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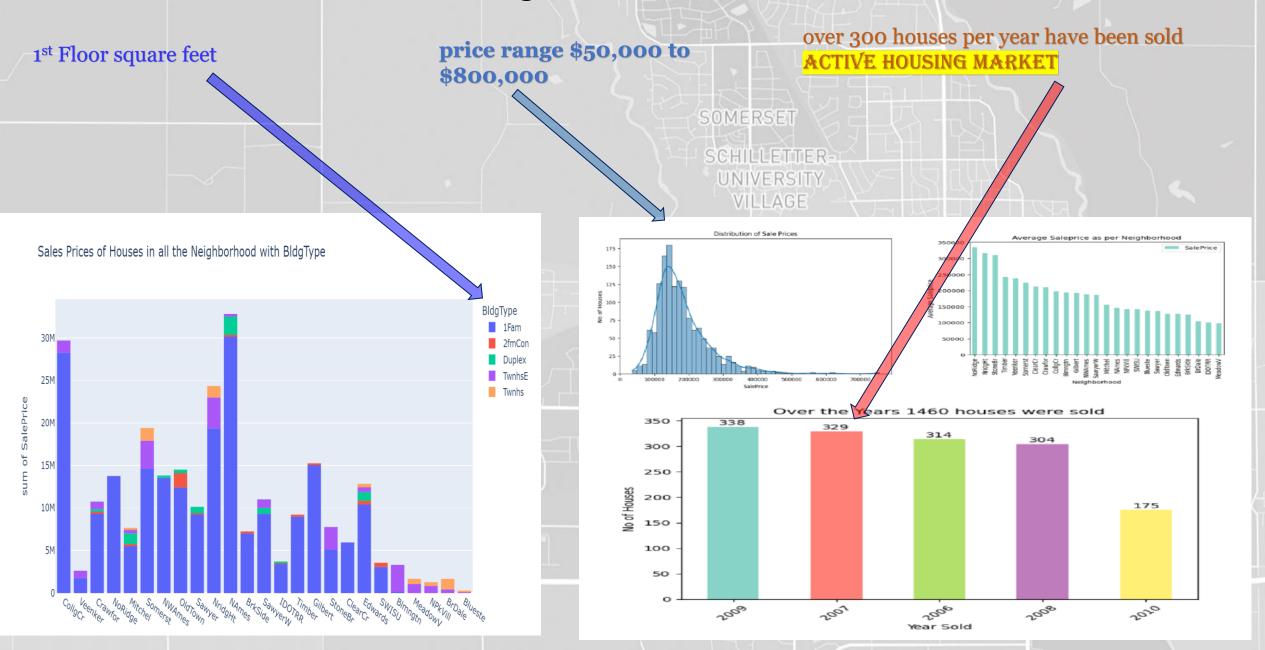


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The intended stakeholders are Real Estate Agents, Brokers, Homeowners, Investors and prospective buyers.

DATA EXPLORATION: 25 neighborhoods, 1460 houses and 80 features



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%

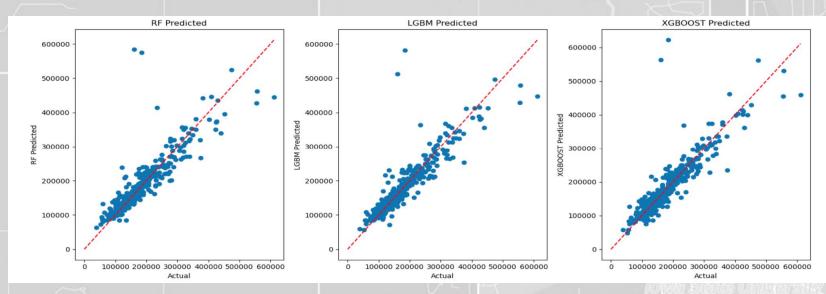
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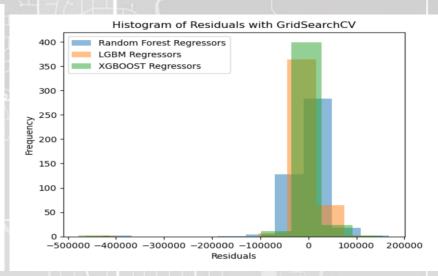
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- 1. We started with an initial model Linear Regression.
- 2. We tried different models like RandomForestRegressor, LGBMRegressor, and XGBRegressor to find the best one.
- 3. We fine-tuned the models using techniques called GridSearchCV and RandomizedSearchCV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

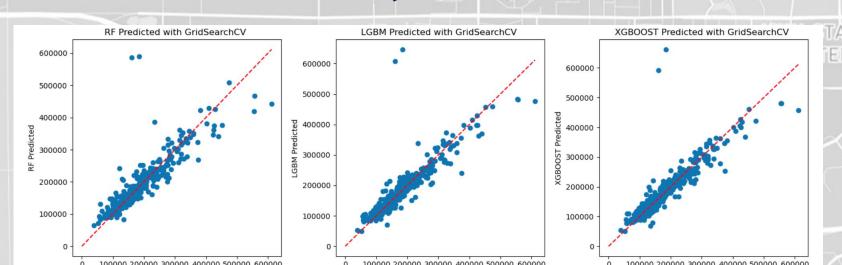
VISUALIZING THE IMPROVED PREDICTIONS

BEFORE

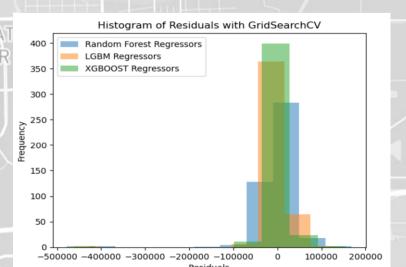




AND AFTER MODEL TUNING



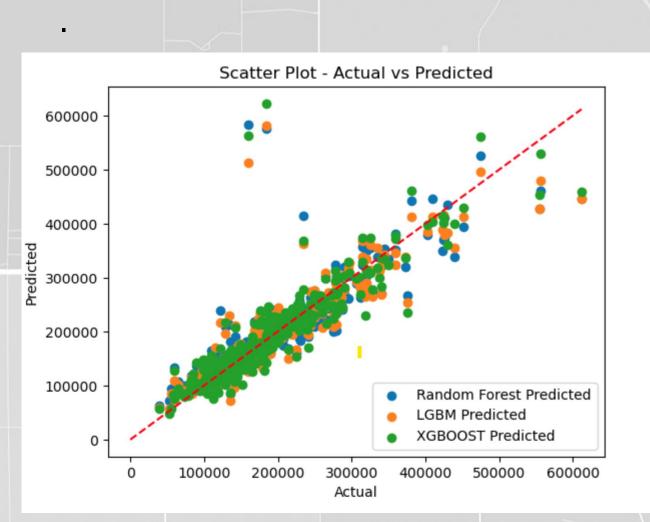




THE BEST MODEL

XGBRegressor with GridSearch tuning

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



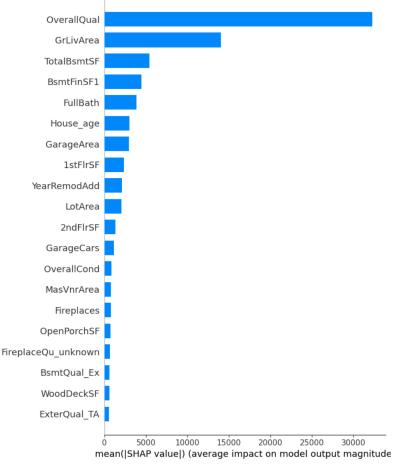
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KEY FEATURES THAT ENHANCE HOUSE VALUE.

SHAP (SHapley Additive exPlanations)



SOMERSET

Ontario AFFORDABLE WAYS TO **INCREASE HOUSE VALUE:**

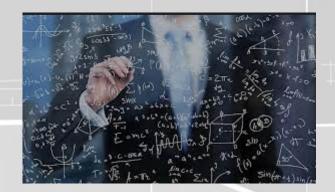
ADDING A GARAGE AREA.

INSTALLING A FIREPLACE.

		-Y X					
SCHILLETTER		140000	160000	180000	200000	220000	
UNIVERSITY	OverallQual						
VILLAGE	GrLivArea						
	TotalBsmtSF						
	2ndFlrSF						
YS TO	GarageArea						
	FullBath						
ALUE:	MSSubClass						
	YearRemodAdd						
Halls Unimerally	BsmtFinSF1						
	1stFlrSF						
E AREA.	Fireplaces).			
	MasVnrArea						
IOWAS	FireplaceQu_unknown						
CENT	GarageCars						
EPLACE.	BldgType_1Fam						
	LotArea						
	HalfBath						
	ExterQual_TA						
	KitchenAbvGr						
	GarageType_Detchd					220000	
		140000 160000 180000 200000 Model output value					

FUTURE WORK

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



Ontario





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SUMMRY

SOMERSET SCHILLETTER-

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- 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.

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