Project 2

Ames Housing Data and Kaggle Challenge

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INTRODUCTION

Ames is a city in Story County, Iowa, United States approximately 30 miles north of Des Moines in central Iowa. It is best known as the home of Iowa State University, with leading Agriculture, Design, Engineering, and Veterinary Medicine colleges.

In this project, datasets obtains from the Ames Assessor's Office (through Kaggle) are used to create a regression model that predicts the price of houses in Ames, IA.

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PROBLEM STATEMENT

To build a regression model with the

lowest error

to predict Sales Price of houses sold in Ames

DATASETS

Data set contains information from the Ames Assessor’s Office used in computing assessed values for individual residential properties sold in Ames, IA from 2006 to 2010.

Source: https://www.kaggle.com/c/dsi-us-6-project-2-regression-challenge/

Train.csv	2051 Observations	81 variables
Test.csv	879 Observations	80 variables

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DATASETS

Train.csv	23	21	20	17
	Ordinal	Nominal	Continuous	Discrete

For model selection & fitting

Test.csv	23	21	19	17
	Ordinal	Nominal	Continuous	Discrete

For prediction of house price to submit to Kaggle

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WORKFLOW

Data Cleaning

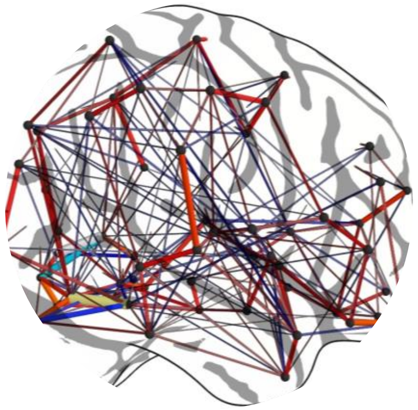
- Null handling
- Combine/remove
- Outlier removal
- EDA

One-Hot Encoding

- Encode category variable
- Ensure same shape for Train & Test

Feature Engineering

- Lasso Selection
- 30 variables



Modeling & Prediction

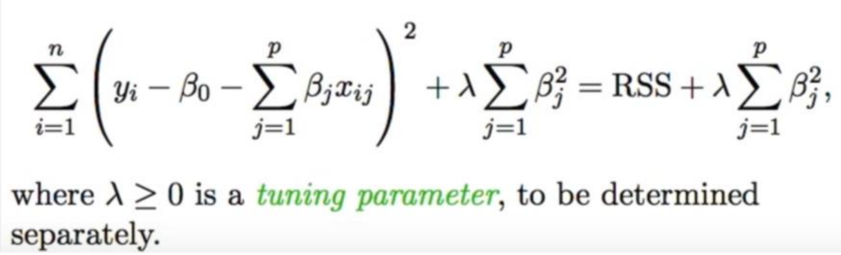
- 4 model: LR, Lasso, Ridge, Elastic
- Predict with LR

MODEL SELECTION

Linear Regression

$$\text{minimize: } RSS = \sum_{i=1}^{n}(y_i - \hat{y}_i)^2 = \sum_{i=1}^{n}\left(y_i - \left(\beta_0 + \sum_{j=1}^{p}\beta_j x_j\right)\right)^2$$

Ridge



$$\sum_{i=1}^{n}\left(y_i - \beta_0 - \sum_{j=1}^{p}\beta_j x_{ij}\right)^2 + \lambda\sum_{j=1}^{p}\beta_j^2 = \text{RSS} + \lambda\sum_{j=1}^{p}\beta_j^2,$$

where $\lambda \geq 0$ is a *tuning parameter*, to be determined separately.

Elastic Net

$$\text{minimize: } RSS + Ridge + Lasso = \sum_{i=1}^{n}\left(y_i - \left(\beta_0 + \sum_{j=1}^{p}\beta_j x_j\right)\right)^2 + \alpha\rho\sum_{j=1}^{p}|\beta_j| + \alpha(1-\rho)\sum_{j=1}^{p}\beta_j^2$$

Lasso

$$\sum_{i=1}^{n}\left(y_i - \beta_0 - \sum_{j=1}^{p}\beta_j x_{ij}\right)^2 + \lambda\sum_{j=1}^{p}|\beta_j| = \text{RSS} + \lambda\sum_{j=1}^{p}|\beta_j|.$$

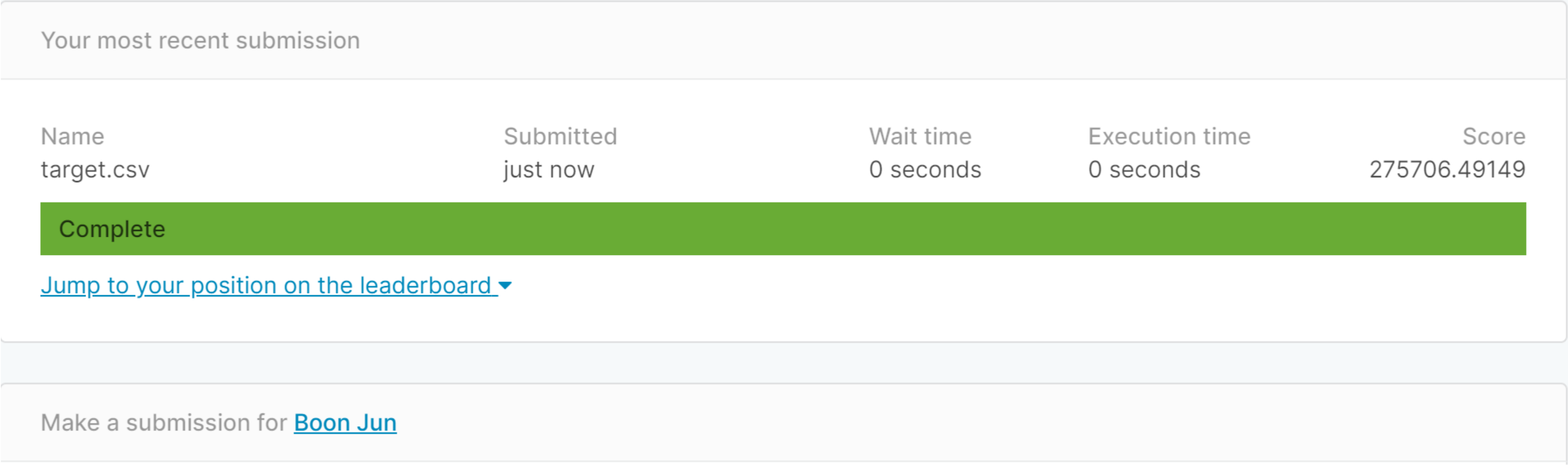
MODEL SELECTION

1. Train/Test Split: 0.25 test size
2. Validation of model by comparing scores of 4 models

Model	R2 Score
Linear Regression	**0.8852429133130981**
Ridge	0.8851807633561328
Lasso	0.8852429122211832
Elastic Net	0.8727541829079618

3. Select Linear Regression and fit X, y (Before split data)
4. Predict with test data set

PREDICTION WITH LR



Your most recent submission

```
Name          Submitted    Wait time    Execution time    Score
target.csv    just now     0 seconds    0 seconds         275706.49149
```

Complete

Jump to your position on the leaderboard ▾

Make a submission for Boon Jun

R2 Score	0.8871977269985987

SUMMARY

Model	R2 Score
Linear Regression	**0.8852429133130981**
Lasso	0.8852429122211832

Small differences in R2 score with lasso = model is not over-fitted

Covers 88.5% of the dataset

SUMMARY

Top 5 positive coefficient

Features	Coefficient
Neighborhood_GrnHill	**16899.599814**
Neighborhood_StoneBr	57611.905242
Exterior 1st_CemntBd	54873.019475
Neighborhood_NridgHt	32298.972379
Neighborhood_NoRidge	25516.544566

Top 5 negative coefficient

Features	Coefficient
MS SubClass_90	-21019.93873
Exterior 2nd_AsbShng	-23354.882
MS SubClass_160	-25164.03323
MS SubClass_120	-28192.61868
Exterior 2nd_CmentBd	**-44892.38964**

- Being in the neighborhood GrnHill will increase the Sale Price by USD 16,899
- Having house exterior covered with cement board (Exterior 2nd_CmentBd) will decrease the prices by USD 44,892
- Total Square Feet & Age of House will not affect house sale price as much
- GrnHill, StoneBR, NridgeHt, NoRidge neighborhood houses affect sale prices the most among others in Ames
- Planned Unit Development (PUD) houses will decrease the sale price

THANK YOU

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