Final Presentation - The Gould-en Rule

Stats 101C Lecture 3

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Section 1

Introduction

Introduction

- With the rise in popularity of YouTube, many people are now making a living off creating YouTube videos
- The more views gained by the video, the more likely it is for that channel to profit
- We are interested in predicting the growth rate in video views between the **second** and **sixth** hour that a YouTube video is published

Section 2

Pre-Processing

Outliers

- Examined a univariate plot to look for stray points and removed them systematically
  - Based off personal judgment and inference on the effect of the stray points
- We also remove highly correlated variables as indicated by a heat map
  - To avoid overfitting based on having too many predictors

Predictor Selection

- We use LASSO to select significant predictors
  - Used to refine predictors from a large subset
  - LASSO pushes non-significant predictors to zero and keeps the most significant ones
- First fit a LASSO model for a sequence of candidate λ values
- Then select our optimal value of λ as the one that is one standard deviation above the λ value that resulted in the lowest test MSE
- Then extract the predicted coefficients in this LASSO model as our predictors for the candidate model

Section 3

Model Fitting

Overview

- Most of our models were fit using bagging or random forest
    - Only adjusted certain parameters at a time (number of trees, depth, and λ)

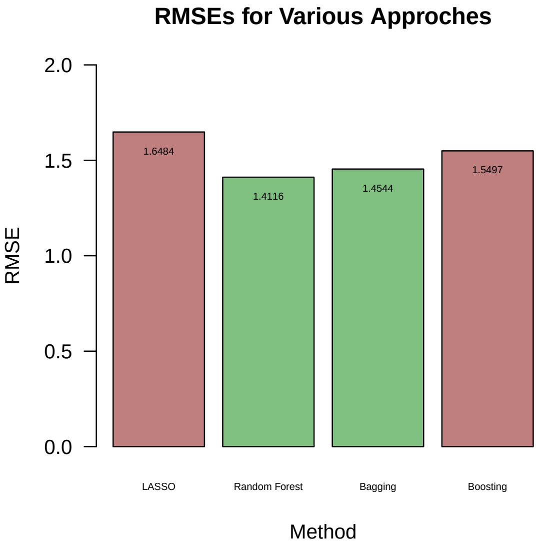
Candidate Model: Random Forest

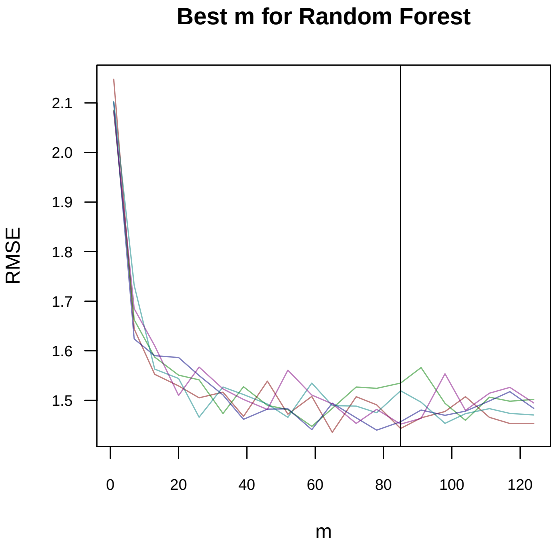
- After running LASSO to refine predictors, we use this smaller subset to find m for random forest
  - m is the number of variables the model randomly considers in each node of each decision tree
  - Find optimal m using 5-fold cross-validation and select m corresponding to the lowest *median* RMSE of the 5 folds
  - Median is more preferable than mean due to the mean's sensitivity to extreme points
- Once optimal m is selected, fit another random forest model to 80% of the preprocessed training data
  - Fit this extra model to ensure the model was performing consistently

Candidate Model: Bagging

- Considered a bagging approach as well as random forest ($m = p$)

RMSEs


RMSEs for Various Approches
2.0
1.5
1.0
0.5
0.0
RMSE
1.6484
1.4116
1.4544
1.5497
LASSO
Random Forest
Bagging
Boosting
Method


Best m for Random Forest
2.1
2.0
1.9
1.8
1.7
1.6
1.5
RMSE
0
20
40
60
80
100
120
m

Section 4

Results

Results

Kaggle scores:

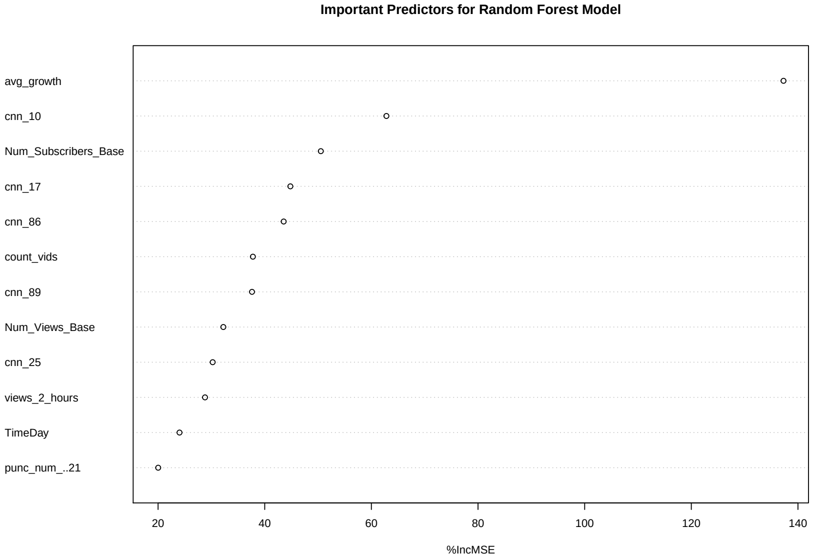
A. 1.39753
B. 1.40285

Model (B) only differs from (A) in the sense that $m = p$ as opposed to m equaling the value with the lowest median RMSE. Here p is the number of predictors.

Section 5

Variable Importance

Variable Importance



Section 6

Conclusion

Conclusion

- We believed our model performed well due to the fact that it works as an ensemble method
  - Combines multiple individual models to get more accurate responses
- By using cross-validation for our selection of m, we limit the potential effect of a random seed showing us an inaccurately good or bad RMSE
- `TimeDay` custom variable is important - creating our own variables helped