Study on tree-based methods.

MATH 6380 project 2

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Outline

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Studying tree based methods...

Why did we choose tree-based methods?

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- We went through several methods.

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Why did we choose tree-based methods?

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- There are yet many improvement methods.
- Studied the method on 3 datasets.

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The dataset

This dataset and the preprocessing are the same as project 1.

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Goal for this dataset

Do straightforward analysis and compare with Lasso (PJ 1).

What we found

In terms of MSE, simple regression tree(0.11) slightly worse than Lasso(0.06); bagging, random forest and boosting even better(0.04, 0.02).

Visualize the results

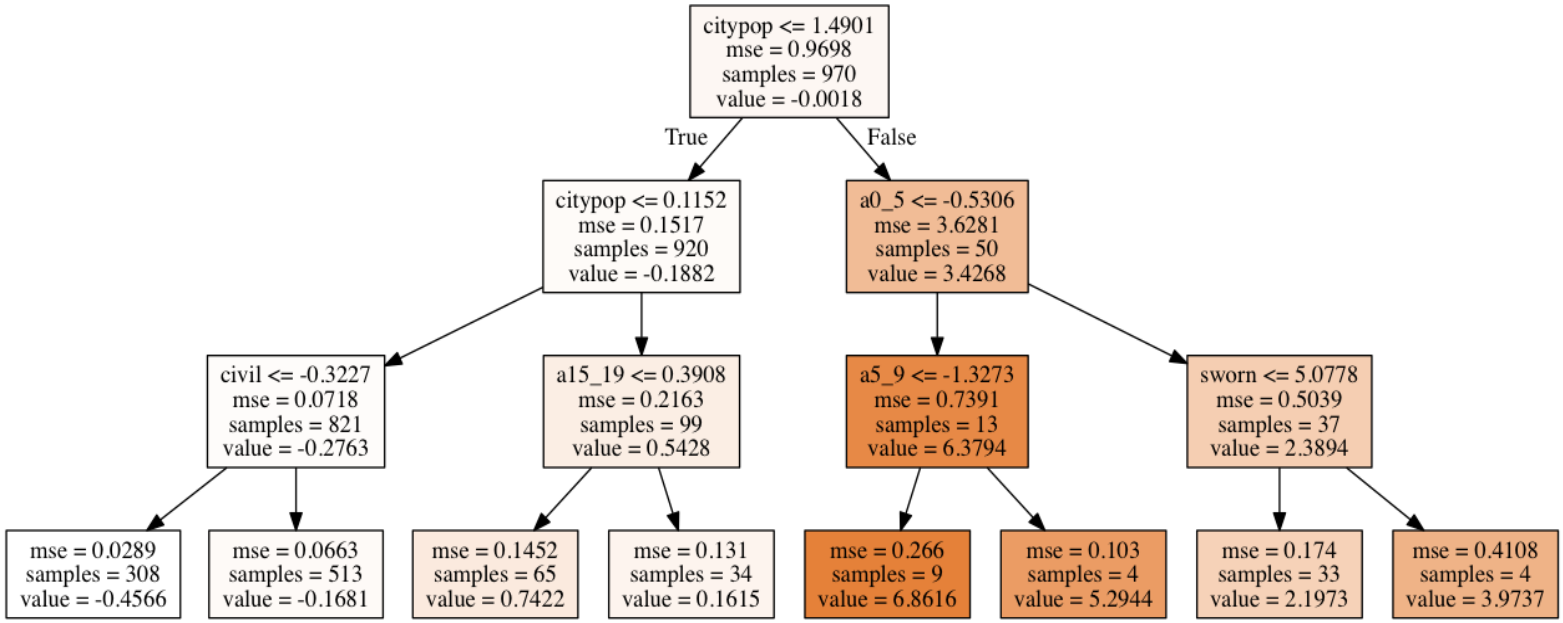

Figure: Regression tree on crime data

Boosting and random forests

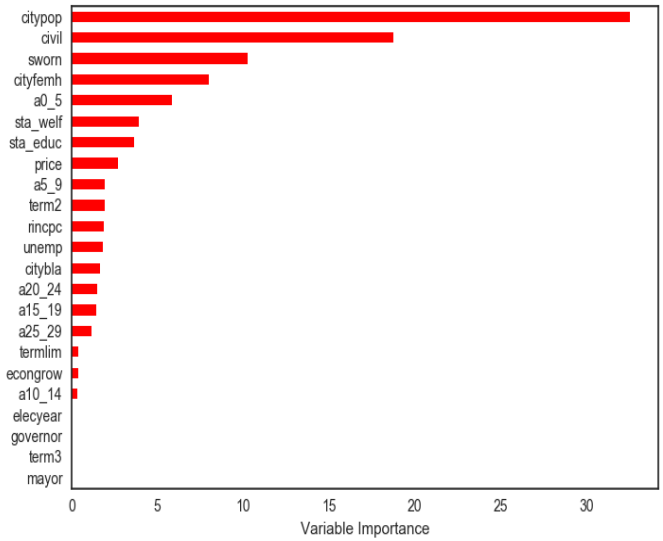

Figure: Importance from boosting

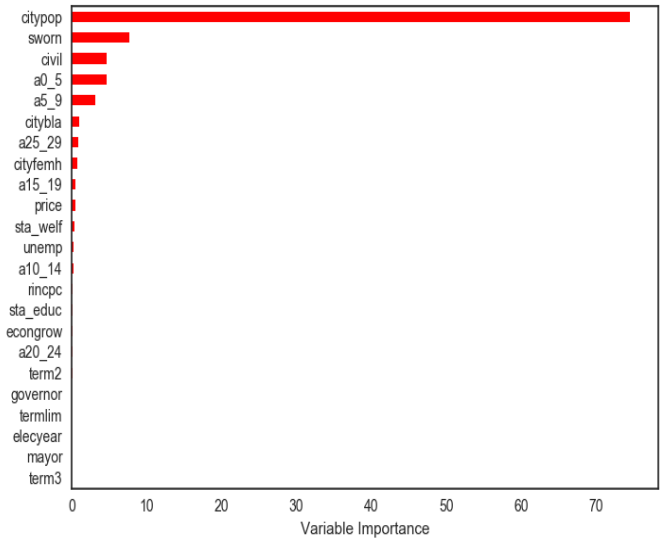

Figure: Importance from random forest

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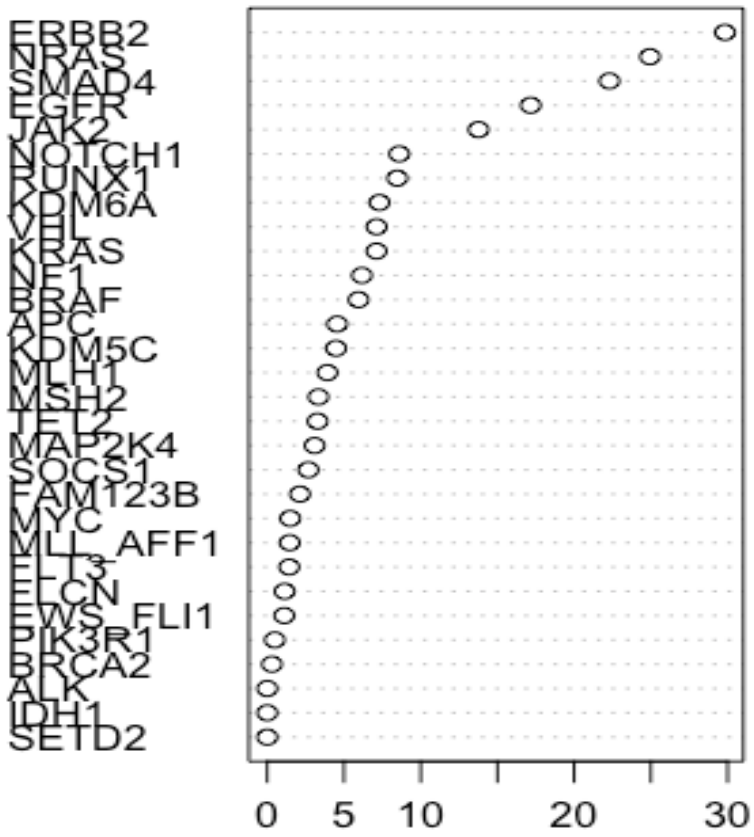
Variable Importance

- The **R randomForest** package optionally produces 2 additional pieces of information. One is called **Variable Importance**, a measure of the importance of the predictor variables.
- The random forest algorithm estimates the importance of a variable by looking at how much prediction error increases when (OOB) data for that variable is permuted while all others are left unchanged.
- In this project, we define variables/predictors with $\%IncMSE > 0$ as important variables, then select them as our predictors in our final model.

Importanct Variables in BinaryDrug

The necessary calculations are carried out tree by tree as the random forest is constructed. Our experience has been that even though the variable importance measures may vary from run to run, the ranking of the importances is quite stable.



A potential variable selection method?

- We have tried *LASSO* in this dataset. Bad.
- Somebody introduced $p - value$ selection. Kaggle $MSE = 3.08$. Good.
- Can we do better using variable importance?

some V.I related models

- V.I + *MLR*, Kaggle *MSE* = 3.26057

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some V.I related models

- V.I + *MLR*, Kaggle $MSE = 3.26057$
- V.I + *randomForest*, Kaggle $MSE = 3.23067$
- So sad.

Some Conclusions

We came up with some conclusions (inferences):

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1. dummy1

Some Conclusions

We came up with some conclusions (inferences):

1. dummy1
2. dummy2

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