# Stay Alert!
# The Ford Challenge

—2011 kaggle competition

Jumao Yuan and Ruoxi Chen

EXST 7152 Midterm Project
March 31, 2015

# Agenda

- Background
- Data Description
- Data Preprocessing
- Evaluation
- Models
- Results
- Summary

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https://images.google.com/

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**30** independent variables
**604329** observations

- ✓**Physiological (8)** **P1, P2, ……, P8**
- ✓**Environmental (11)** **E1, E2, ……, E11**
- ✓**Vehicular (11)** **V1, V2, ……, V11**

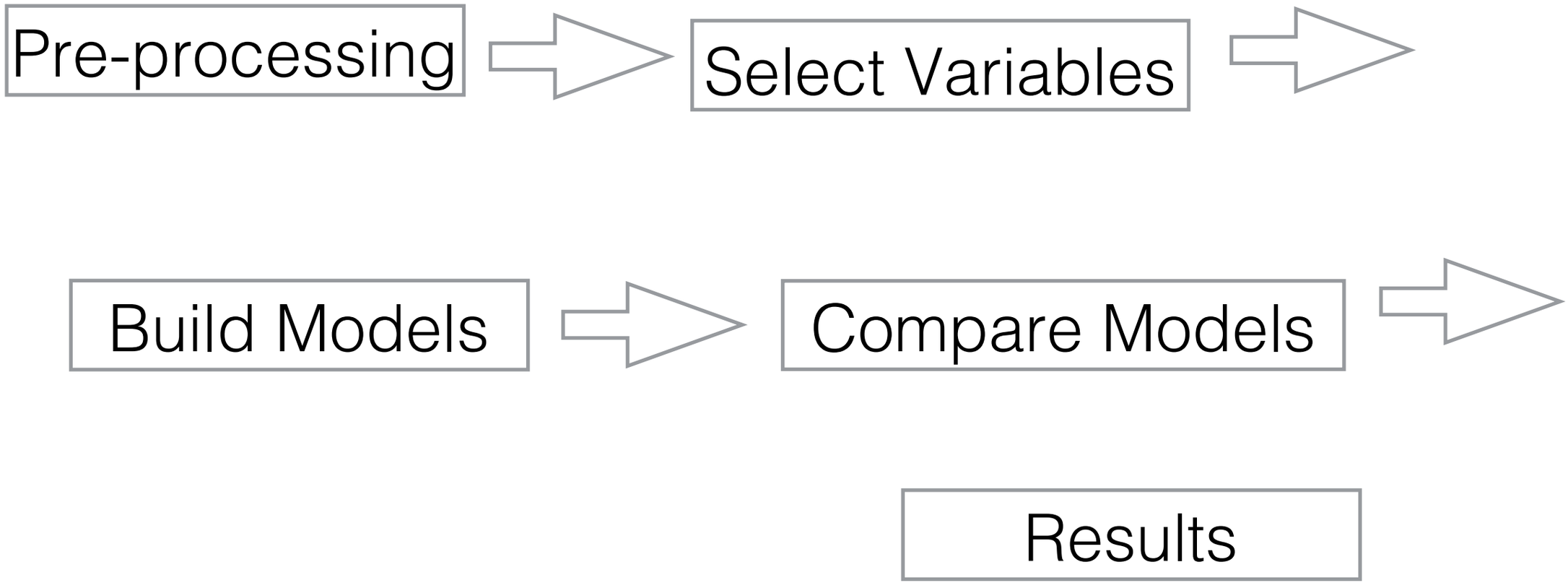
## Goal

Predict response variable “IsAlert”

- IsAlert = 1 if the driver is alert
- IsAlert = 0 if the driver is not alert

https://www.kaggle.com/c/stayalert/data.

# Workflow


Pre-processing
Select Variables
Build Models
Compare Models
Results

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## Types of bad data:

1. missing values: NA, Unknown, NULL
2. Typos: 0 (numeric), negative values, probability>1

## Methods:

Data Deletion: easy to implement and fast

Data Imputation: complicated but more accurate

Here, **<0.1%** missing values, use data deletion

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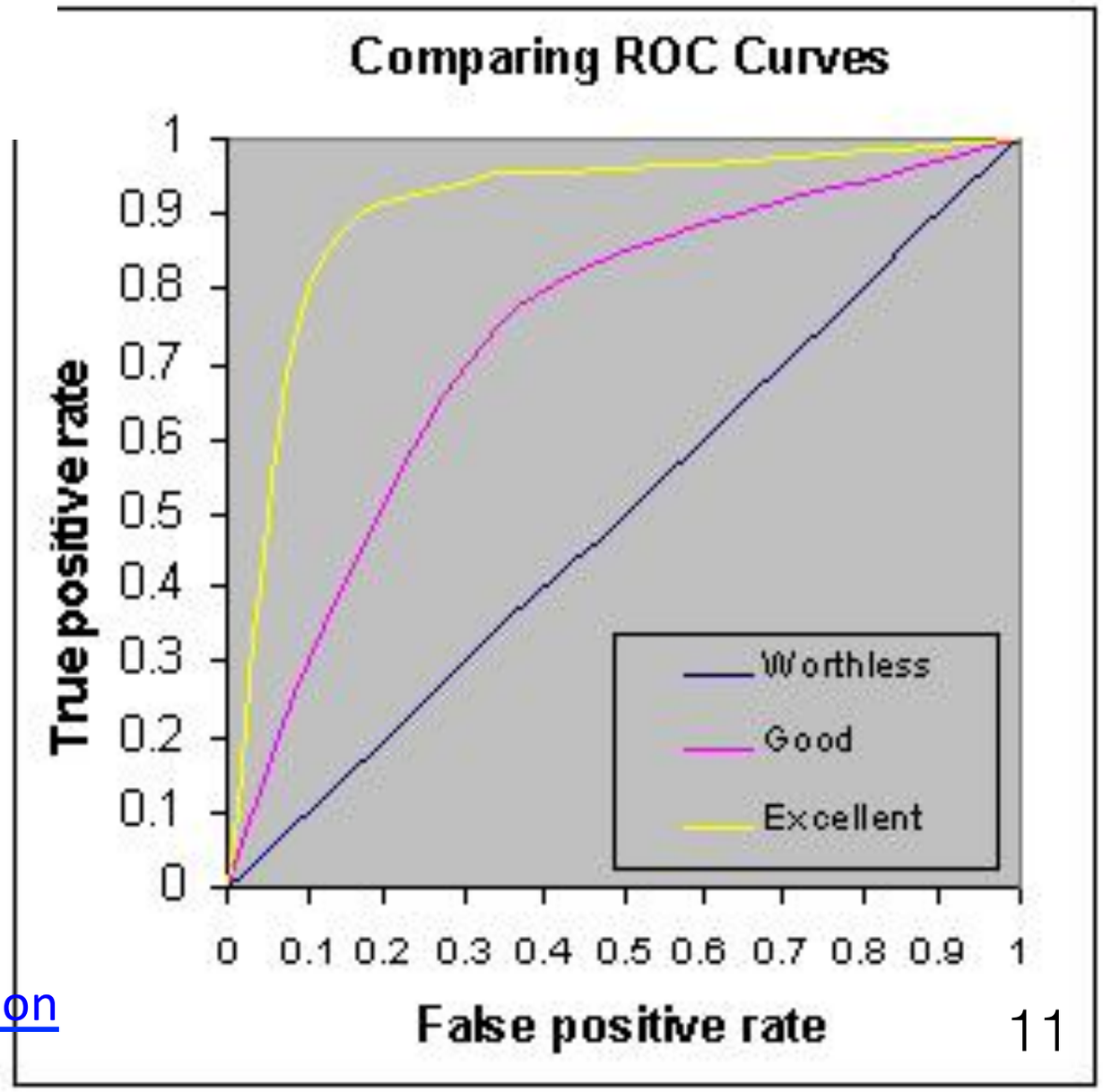
| | p'<br>(Predicted) | n'<br>(Predicted) |
|---|---|---|
| P<br>(Actual) | True Positive | False Negative |
| n<br>(Actual) | False Positive | True Negative |

# AUC Score

# ROC Curve




https://www.kaggle.com/c/stayalert/details/Evaluation

http://gim.unmc.edu/dxtests/roc3.htm

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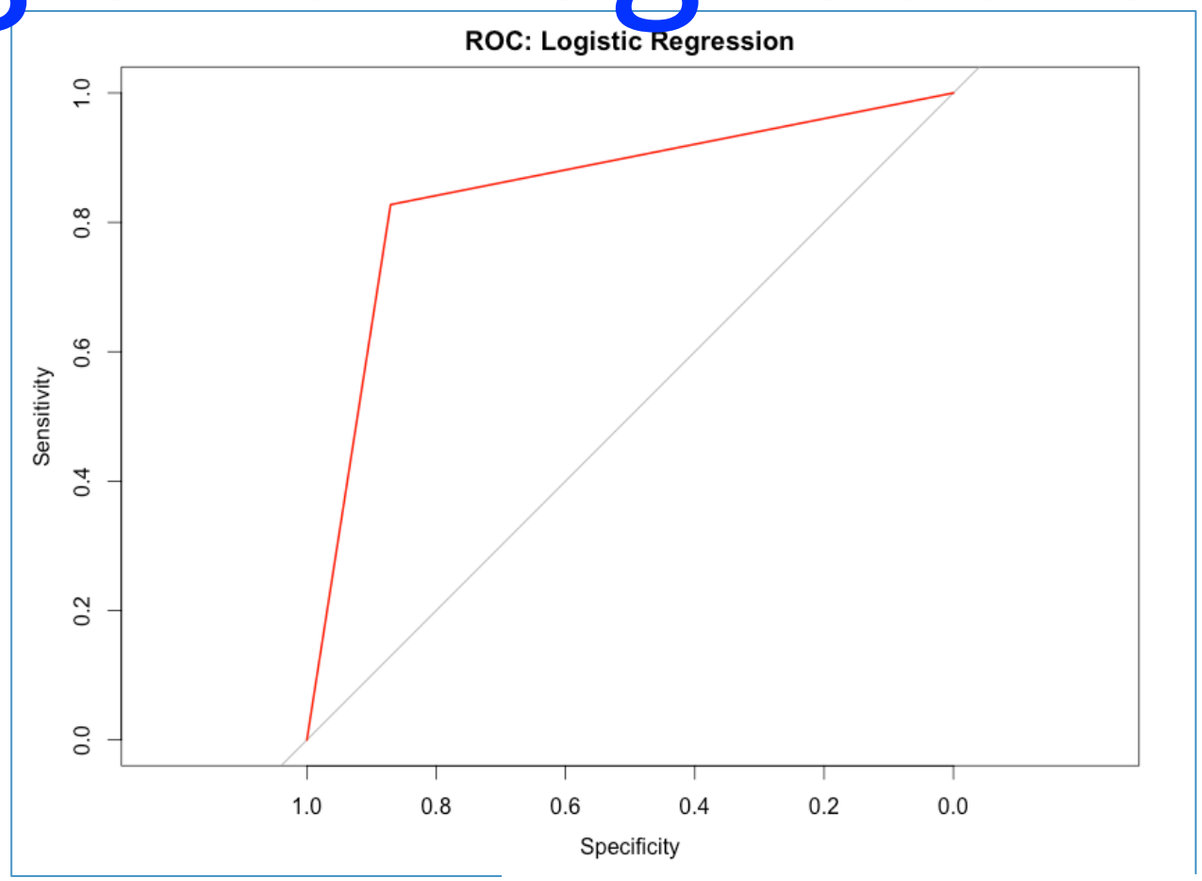
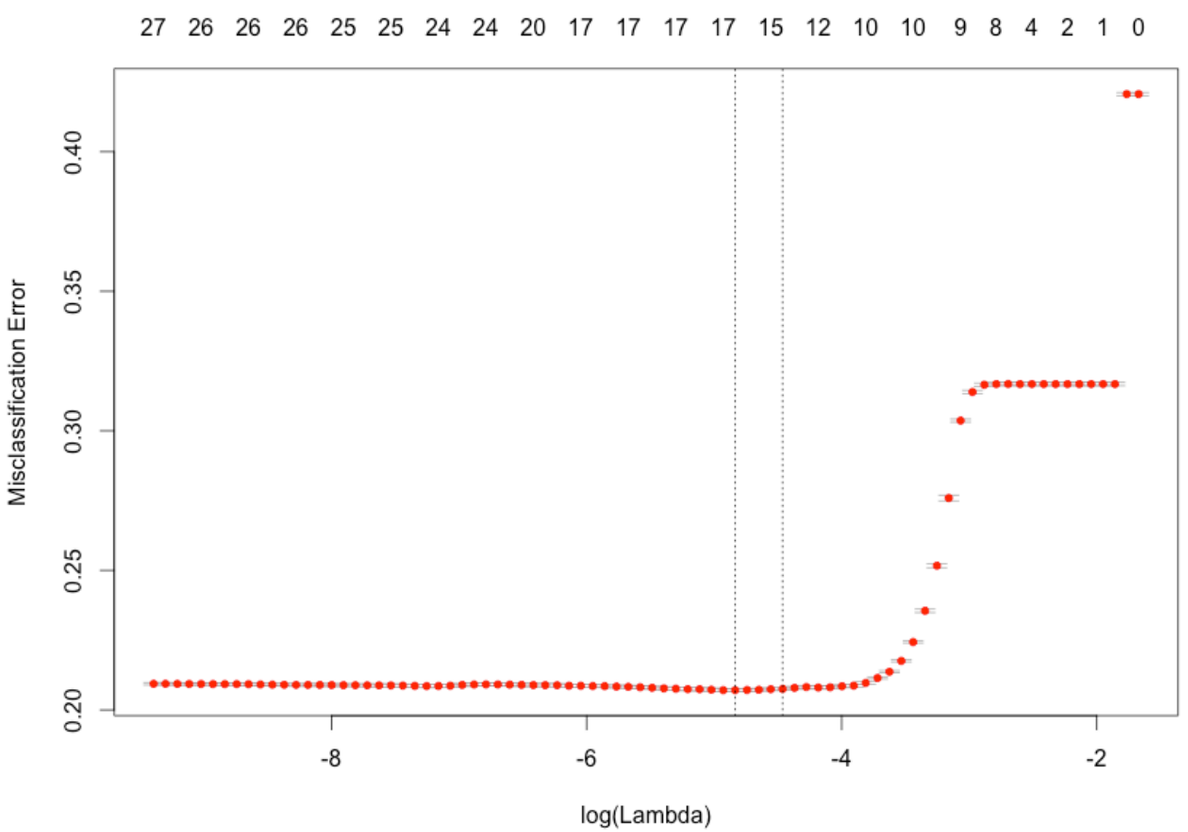
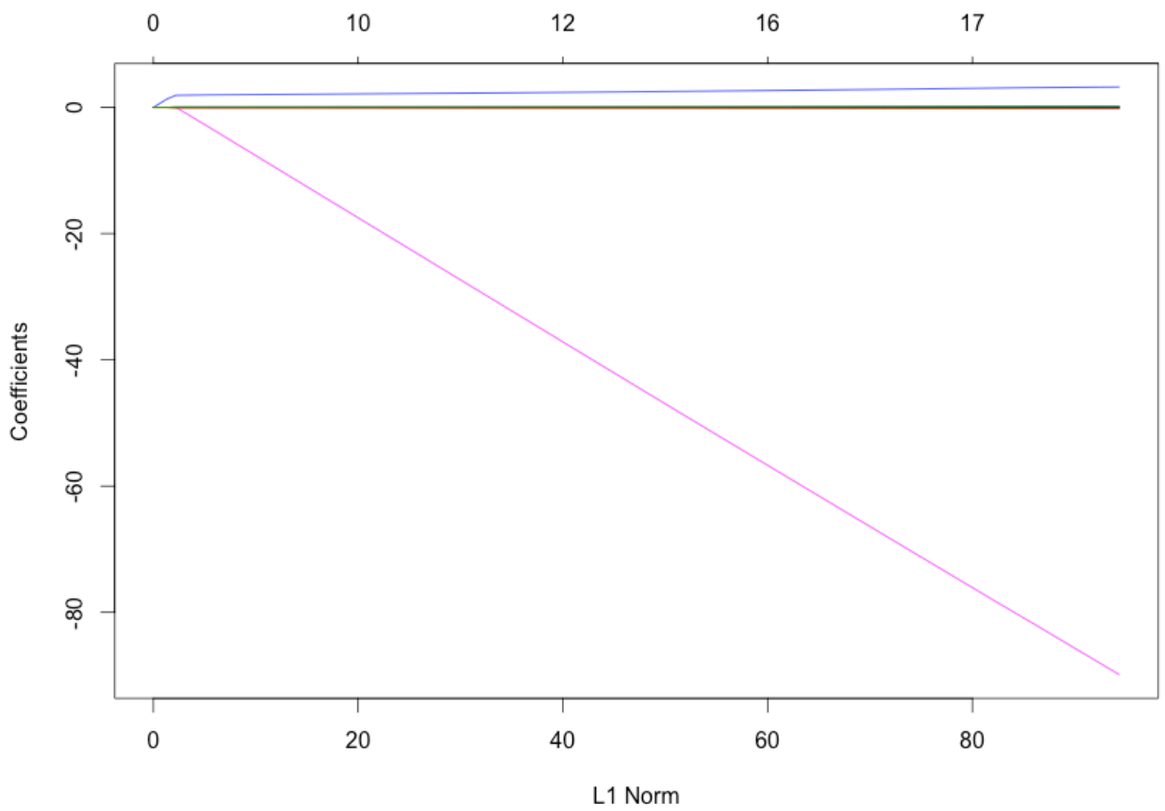
# Logistic Regression

Library(glmnet)

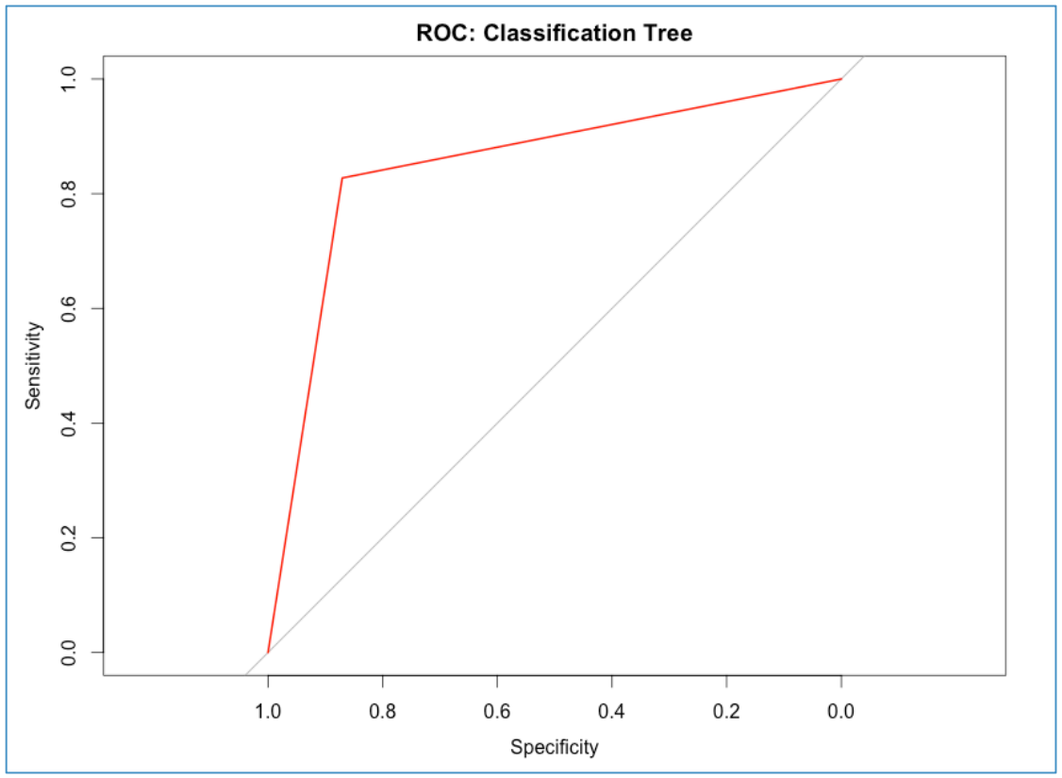


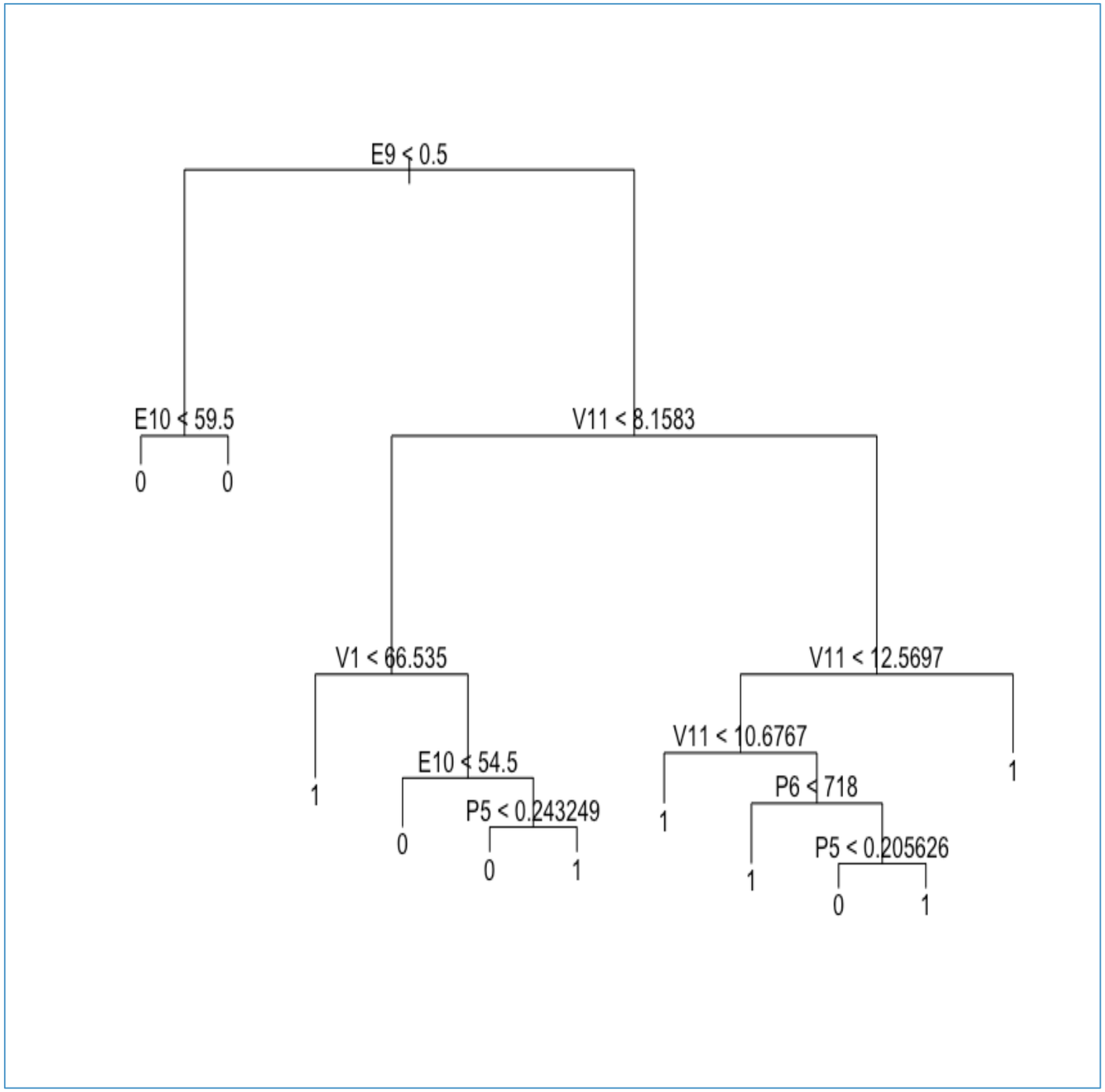



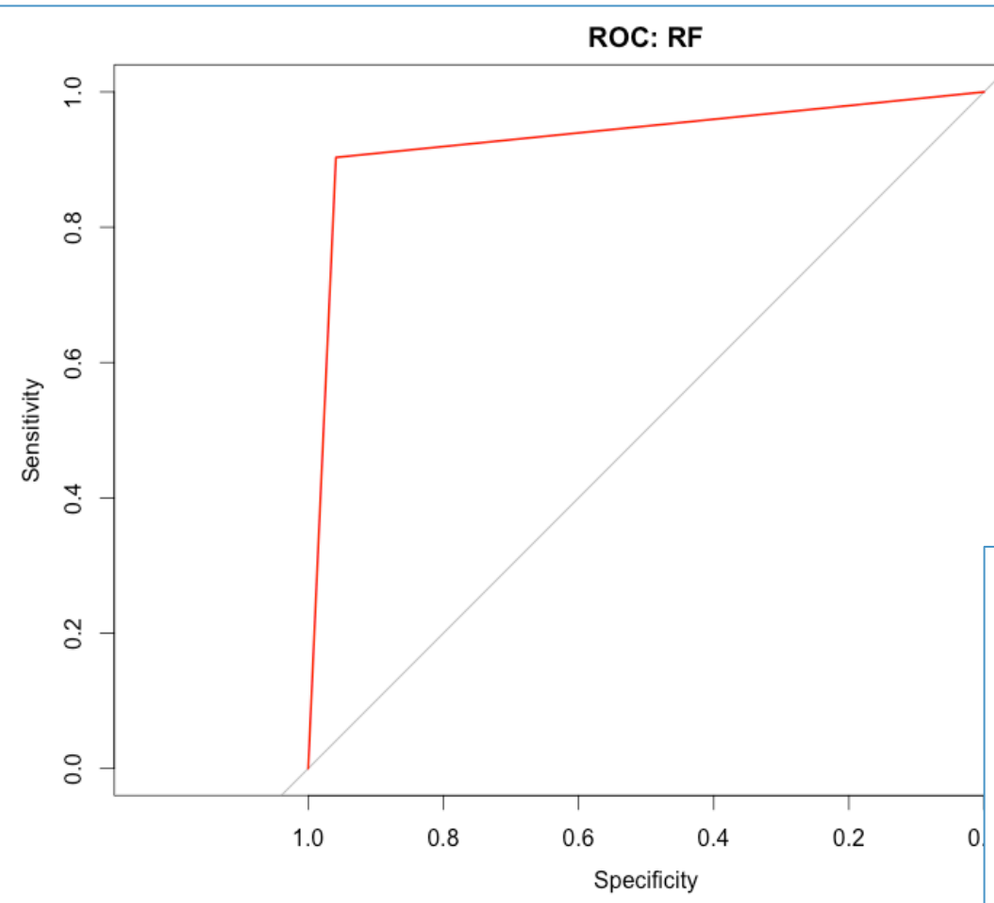
# Classification Tree

Library(tree)



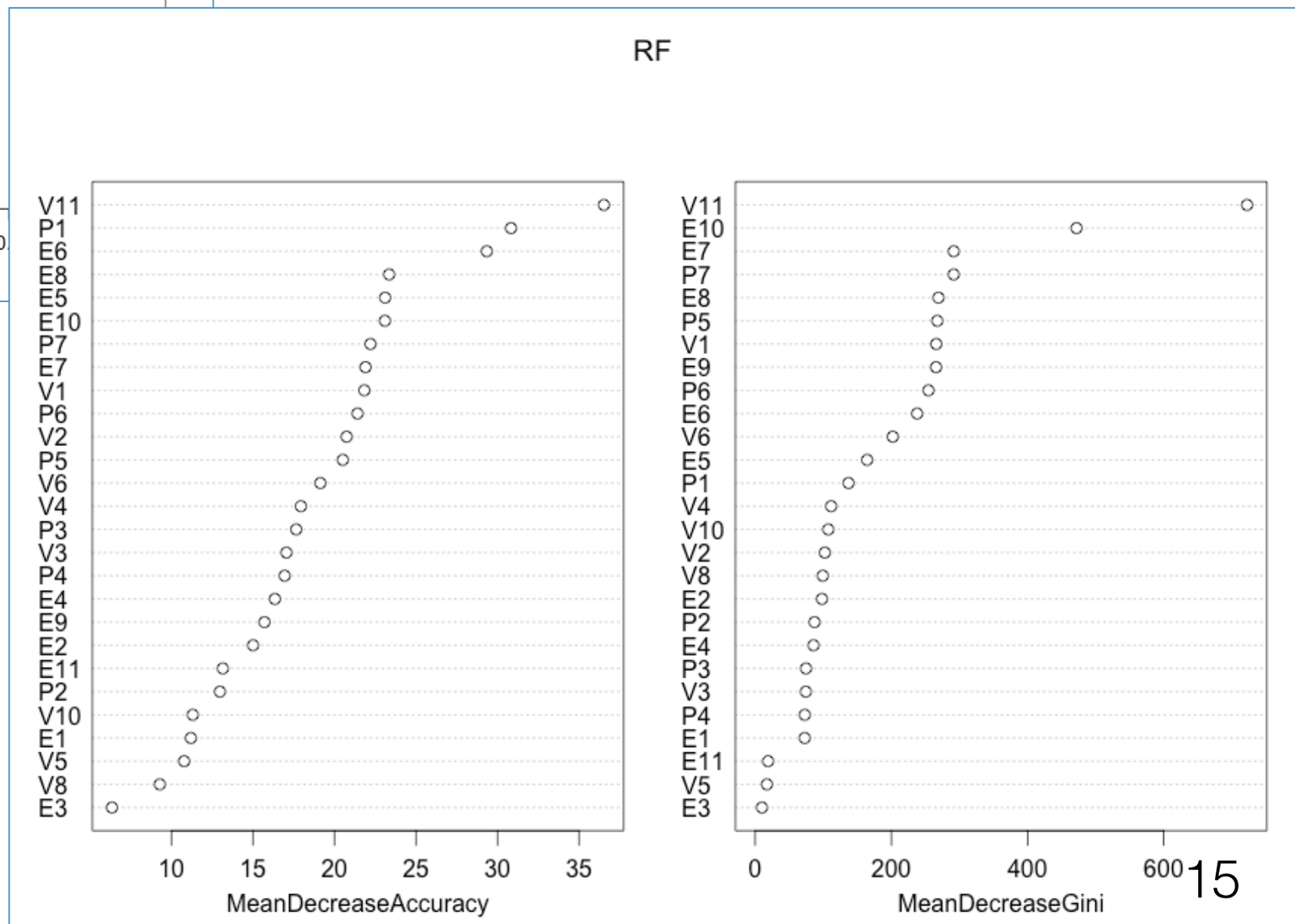



# Random Forest




Library(randomForest)

RF <- randomForest
(training[,-c(1,9,27,29)],
factor(training$IsAlert),
sampsize=10000,
do.trace=TRUE,
importance=TRUE,
ntree=**100**,
forest=TRUE)



# Other models

- ✓Naïve Bayes
- ✓SVM
- ✓GLM
- ✓Neural Network (NN)
- ✓CART – regression tree

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| Method | AUC Score | Variables Selected | Computation Time (s) |
|---|---|---|---|
| Logistic | 0.78 | 23 vars | 10.722 |
| Random Forest | 0.93 | V11 E10 E7 | 393.314 |
| Decistion Tree | 0.83 | V11 E10 P5 P6 V1 | 10.722 |
| Naive Bayes | 0.76 | – | – |
| NN(two-layer) | 0.77 | – | – |
| SVM | 0.73 | – | – |

Reference: “First place in the ‘Stay Alert!’ competiion”, inference, March 2011.

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- ✓Random Forest works good
- ✓Only V11, E10, etc. variables are important
- ✓Rcode

  -- https://github.com/jyuan4/Kaggle_Ford_Challenge

- ✓R is slow for large data computation

  -- Python, Perl, R on HPC?

# Thanks ☺