

# CLASSIFICATION: EMPLOYEE CHURN

PROJECT 3 | METIS  
FALL 2019  
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# MOTIVATION

- ▶ Cost of replacing an employee is between 90% and 200% of their annual salary<sub>1</sub>
- ▶ U.S. employers paid \$600 billion in turnover costs in 2018<sub>2</sub>
- ▶ Companies can expect that annual cost to increase to \$680 billion by 2020<sub>2</sub>

1. SHRM

2. Tennessee-based Work Institute



# OBJECTIVE AND GOALS

Feature Selection

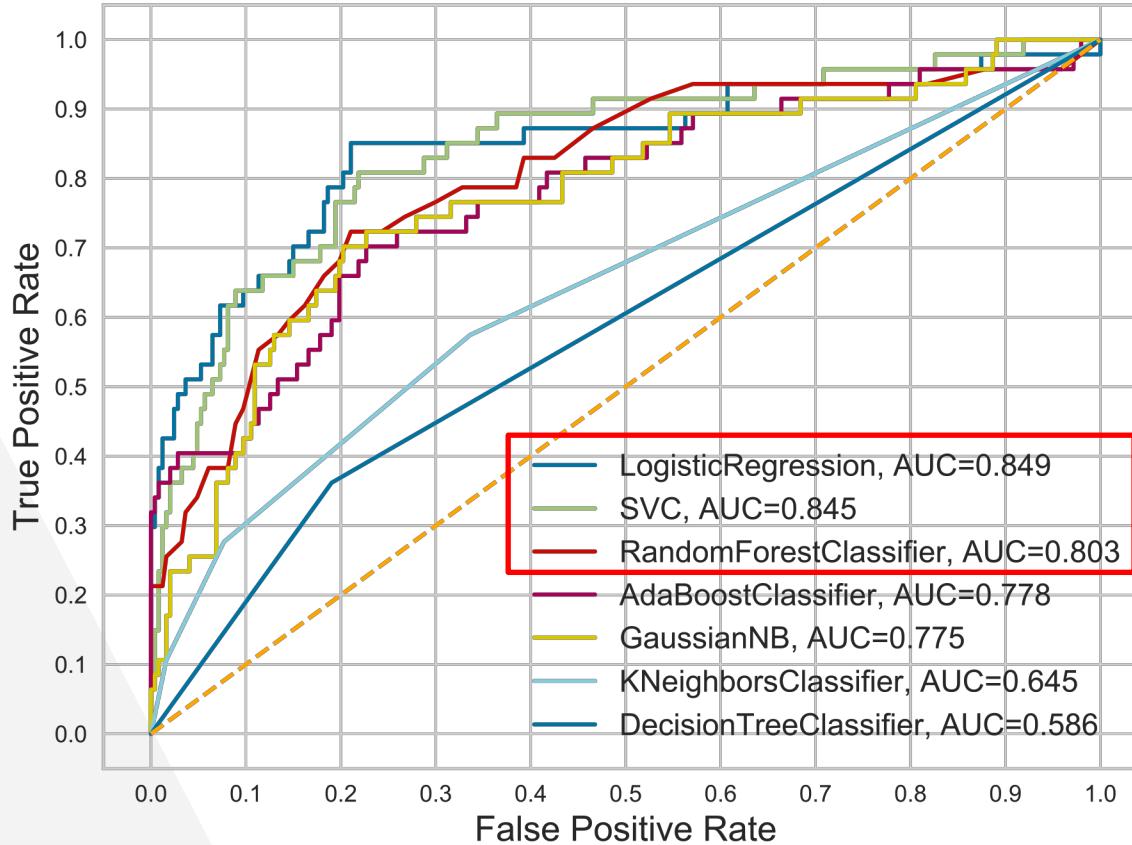
Classification  
Model Selection

Predict Employee  
Churn

## METHODOLOGY – DATA & TOOLS

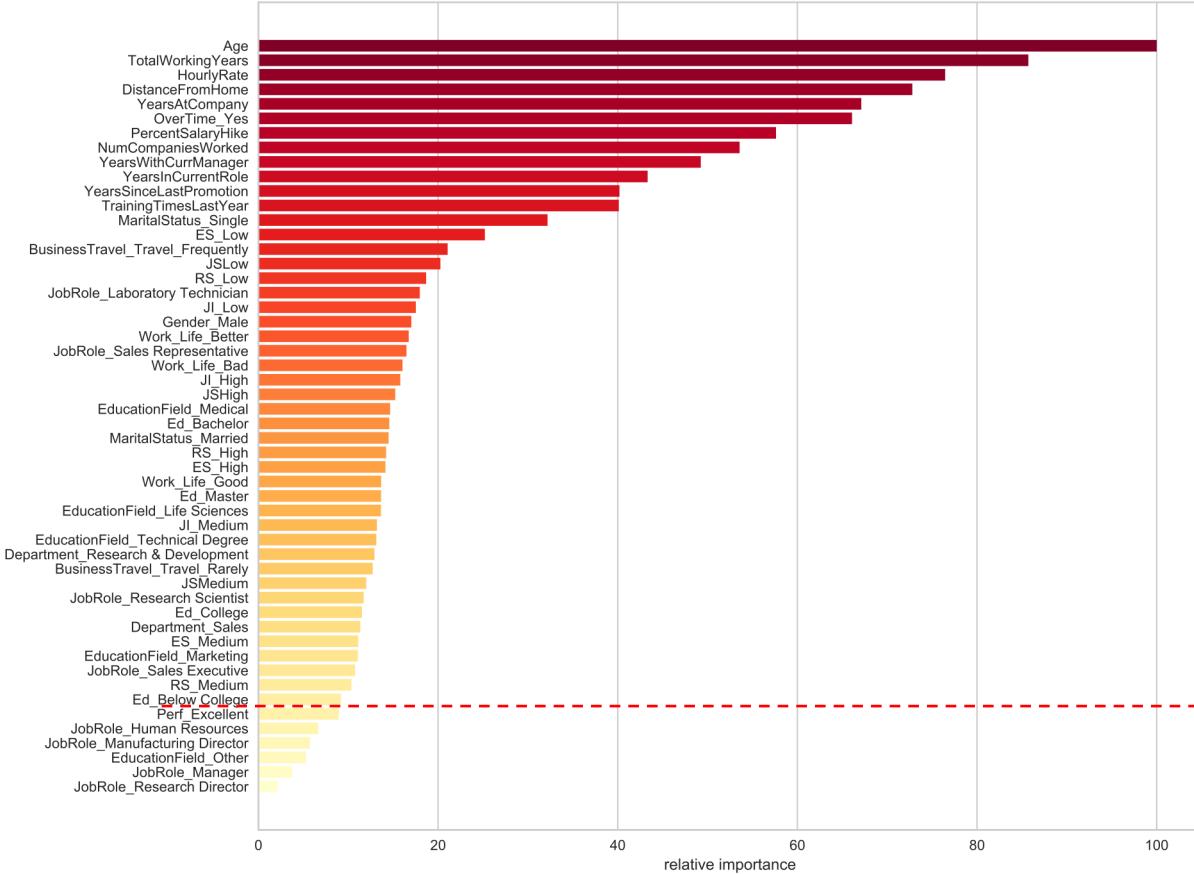
- ▶ Dataset – IBM HR Analytics Employee Attrition & Performance<sub>3</sub>
- ▶ Compare ROC/AUC scores across multiple classification models
- ▶ Focus on Recall (Sensitivity) =  $TP / (TP + FN)$
- ▶ Tableau/Flask

## ROC Curve Analysis



BASELINE ROC/AUC CURVE

Feature Importances of 52 Features using RandomForestClassifier



# RANDOMFORESTCLASSIFIER

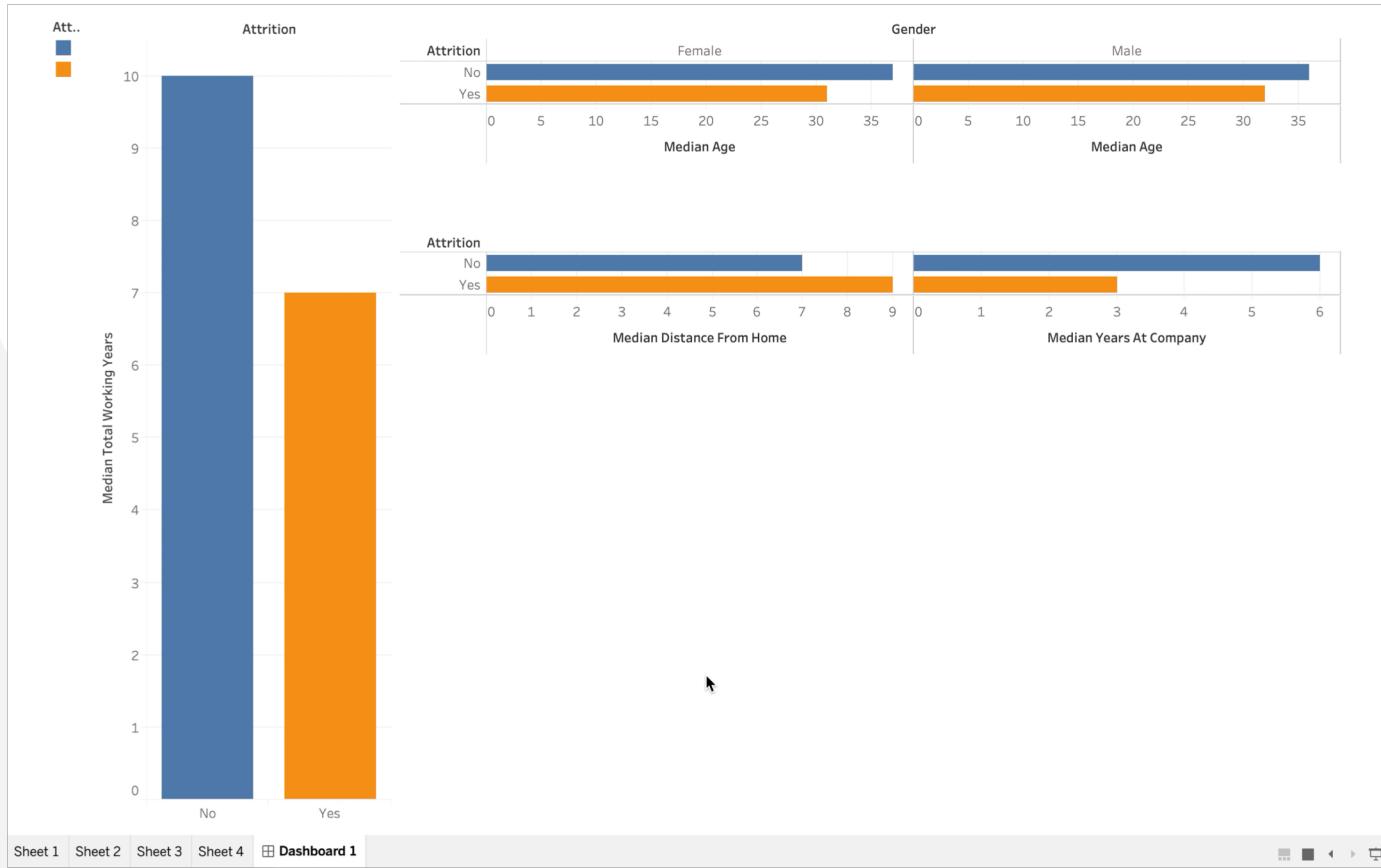


TABLEAU EDA

# METHODOLOGY - STEPS

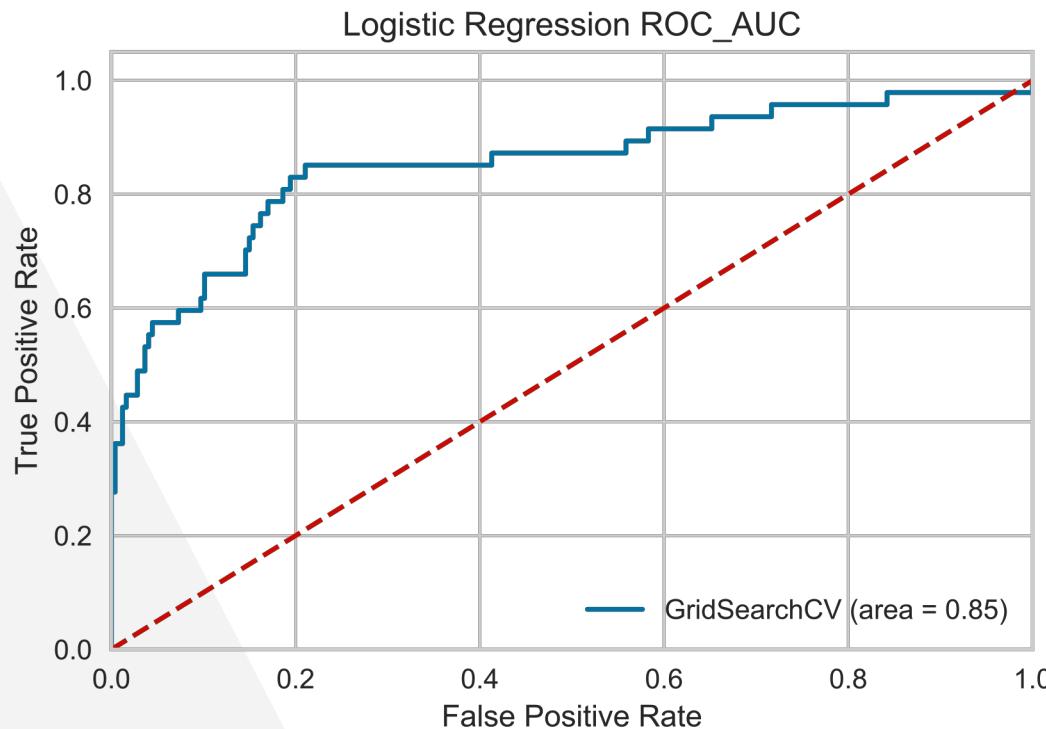
STANDARDIZED

SMOTE/ADASYN  
(80:20)

ROC/AUC

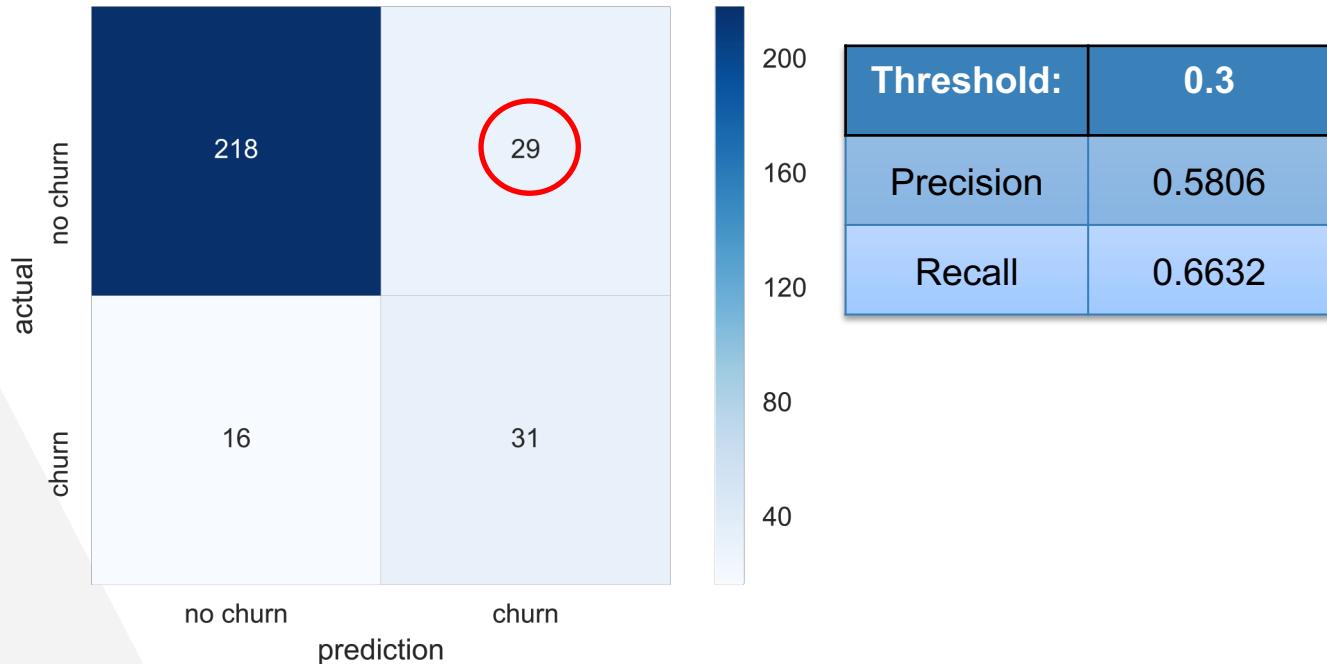
GRIDSEARCH CV

# RESULTS - MODEL

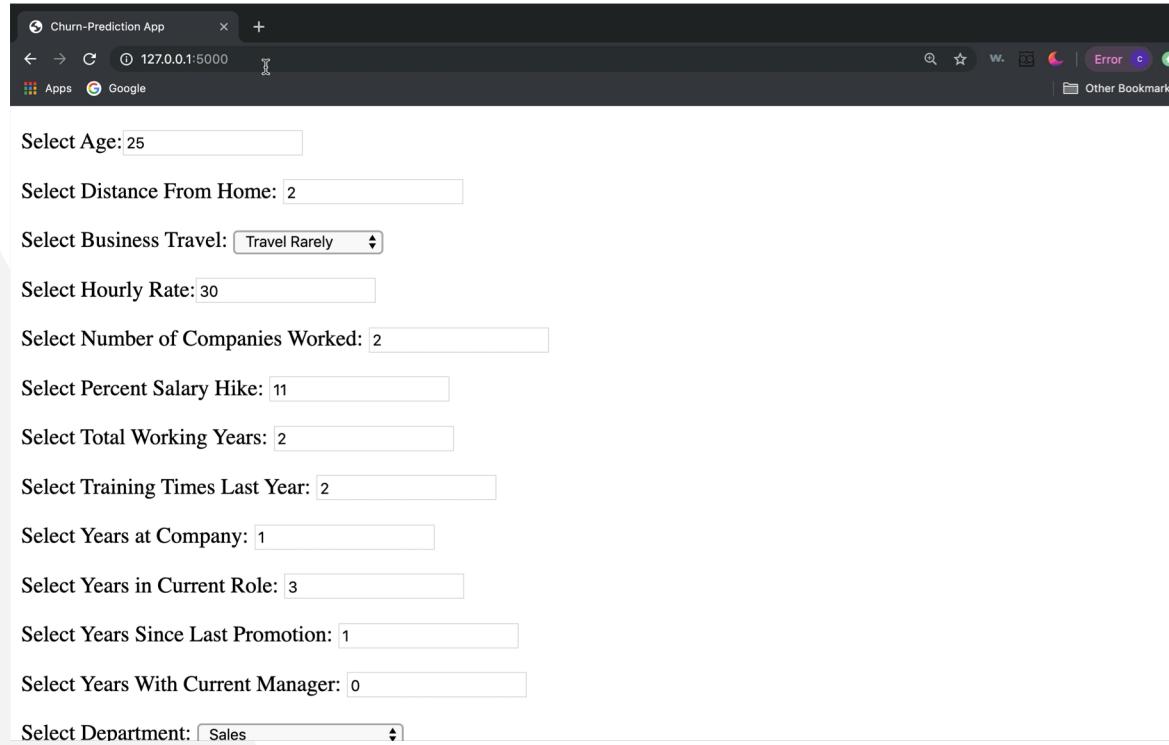


AUC	Recall
0.85	0.81

# RESULTS ON TEST SET



# RESULTS - FLASK APP



The screenshot shows a web browser window titled "Churn-Prediction App" with the URL "127.0.0.1:5000". The page displays a form with various input fields and dropdown menus. The fields are labeled with their respective variable names and values:

- Select Age: 25
- Select Distance From Home: 2
- Select Business Travel: Travel Rarely
- Select Hourly Rate: 30
- Select Number of Companies Worked: 2
- Select Percent Salary Hike: 11
- Select Total Working Years: 2
- Select Training Times Last Year: 2
- Select Years at Company: 1
- Select Years in Current Role: 3
- Select Years Since Last Promotion: 1
- Select Years With Current Manager: 0
- Select Department: Sales

## CONCLUSION

- ▶ Logistic Regression Classification Algorithm
- ▶ Several attributing factors that impact employee churn
- ▶ Focus on Recall - don't be afraid of higher false positives

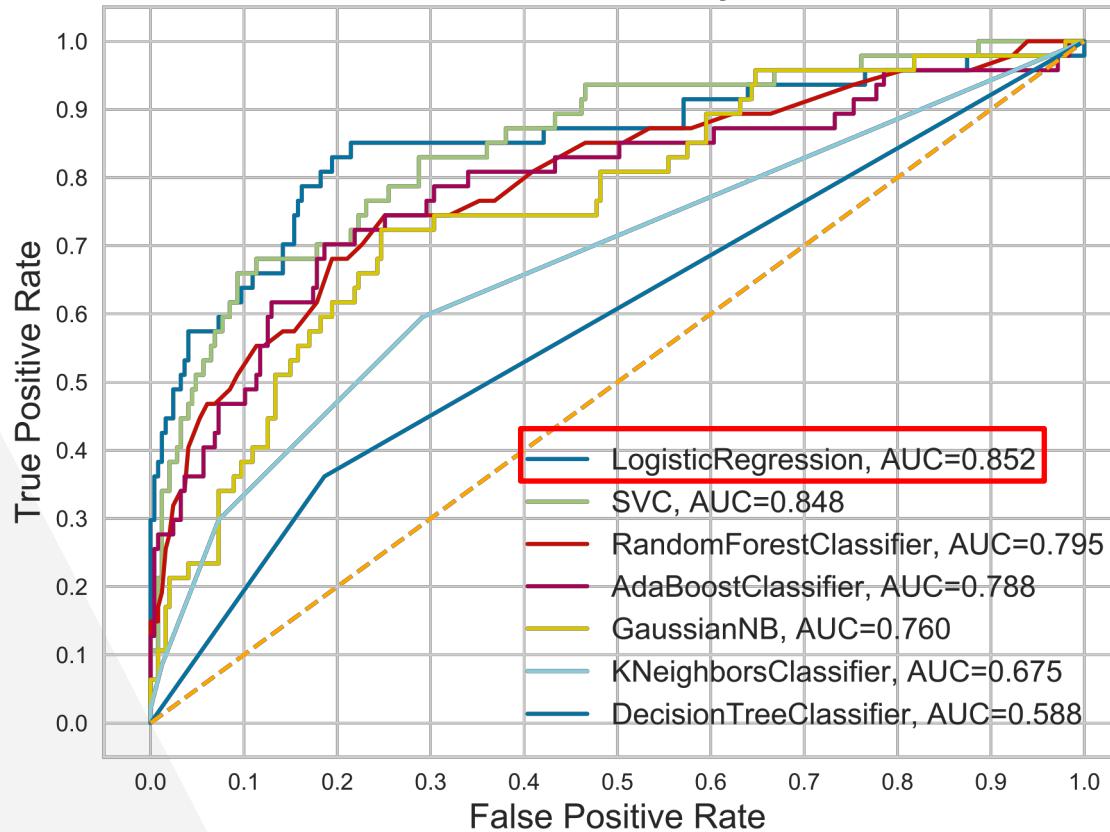


# THANKS!

Questions?

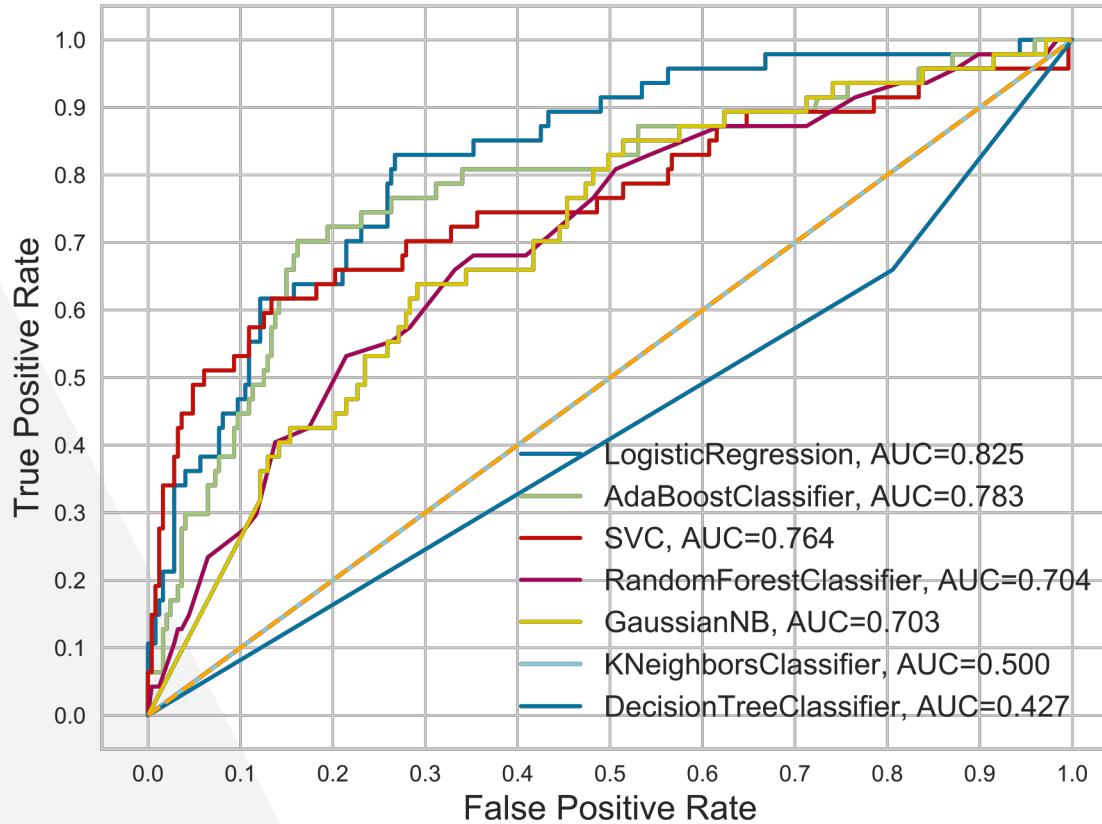
# APPENDIX

## ROC Curve Analysis



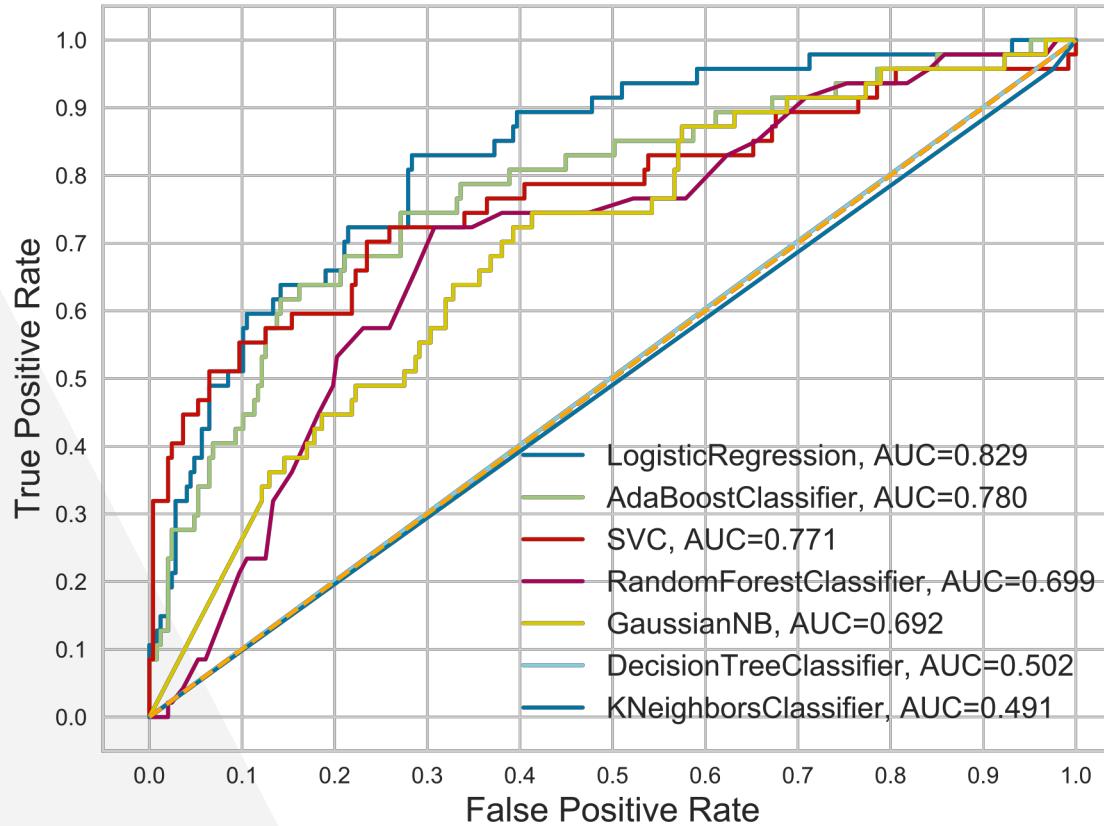
STANDARDIZED & REDUCED FEATURES ROC/AUC

## SMOTE ROC Curve Analysis



STANDARDIZED & SMOTE

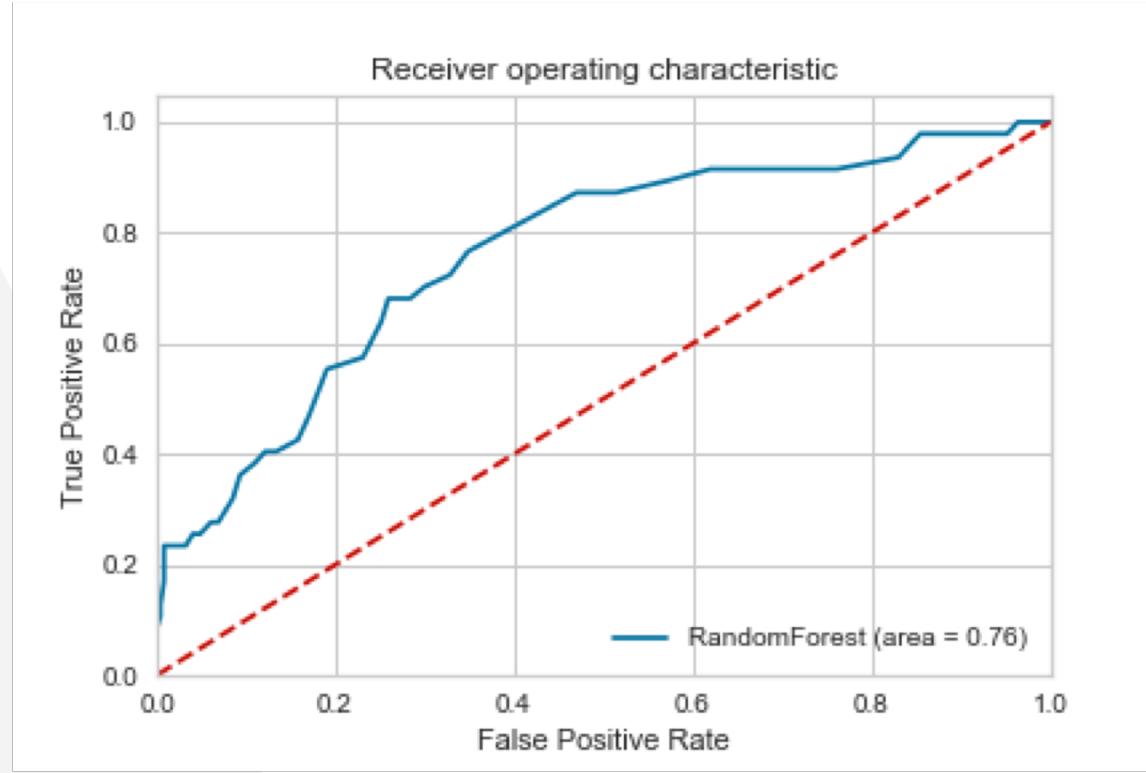
## ADASYN ROC Curve Analysis



STANDARDIZED & ADASYN

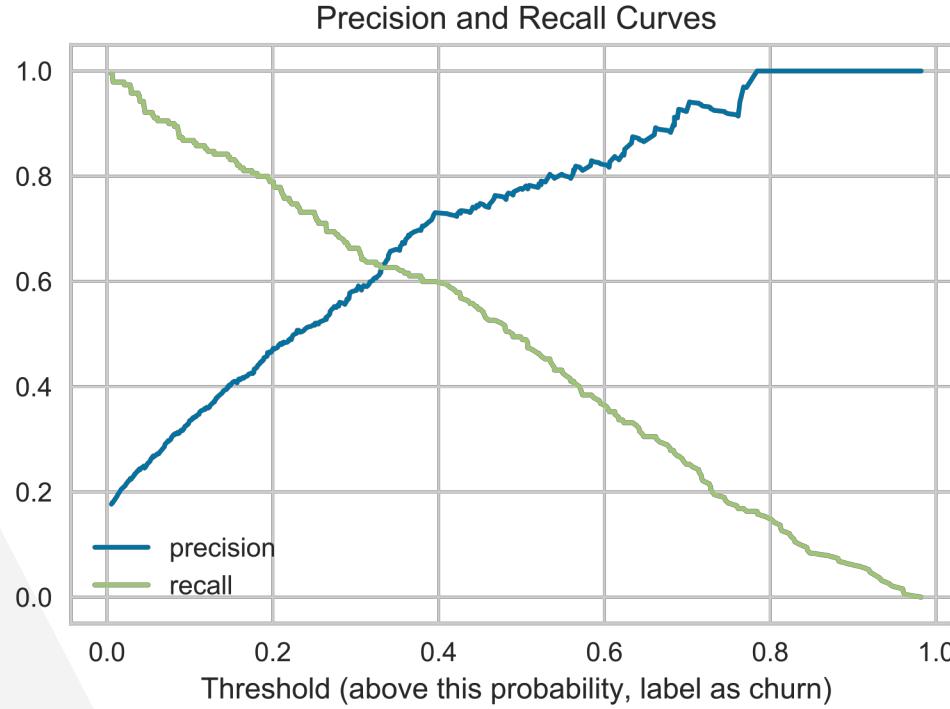
## Confusion Matrix for selected model

	precision	recall	f1-score	support
False	0.98	0.90	0.94	268
True	0.45	0.81	0.58	26
accuracy			0.89	294
macro avg	0.71	0.86	0.76	294
weighted avg	0.93	0.89	0.91	294



Standardizing, Balancing,  
GridSearch CV  
RandomForest, but did  
worse than logistic  
regression

## PRECISION RECALL CURVE



Set Threshold for 30%  
Maximize recall



The gap between the goals of the organization  
and the skills of the workforce.



1



## COMPLACENCY

Self-satisfaction especially when accompanied by unawareness of actual dangers or deficiencies. —MERRIAM-WEBSTER DICTIONARY

Culprits of  
Complacency





## TURNOVER

2

The ratio of the number of workers that had to be replaced in a given time period to the average number of workers  
—DICTIONARY.COM



30.5%



AVERAGE U.S.  
TURNOVER RATE

NUMBER OF POSITION  
TURNOVERS EACH YEAR



42.7  
MILLION



1/5th



OF WORKERS VOLUNTARILY  
LEAVE THEIR JOB EACH YEAR

PORTION OF EMPLOYEES  
FIRED OR OTHERWISE LET  
GO INVOLUNTARILY



1/6th

THE COSTS OF TURNOVER

## THE COSTS OF TURNOVER



### DIRECT COSTS

- Separation costs
- Temporary staffing
- Replacement costs
- Training costs

### INDIRECT COSTS

- Lost productivity
- Coping with vacancy
- Learning curve of new employee
- Reduced morale
- Lost clients
- Lost knowledge



Companies typically pay between **25% and 250% of an employee's annual salary** to replace that employee.

### TIPS



#### USE PRE-EMPLOYMENT SCREENING



#### ESTABLISH PROPER BENEFITS AND COMPENSATION



#### REVIEW COMPENSATION & BENEFITS ANNUALLY



#### PAY ATTENTION TO EMPLOYEES' NEEDS

250% of an employee's annual salary to replace that employee.

## TIPS

 USE PRE-EMPLOYMENT SCREENING

 ESTABLISH PROPER BENEFITS AND COMPENSATION

 REVIEW COMPENSATION & BENEFITS ANNUALLY

 PAY ATTENTION TO EMPLOYEES' NEEDS

 BOLSTER EMPLOYEE ENGAGEMENT

 CREATE A POSITIVE WORK ENVIRONMENT

 OUTLINE CHALLENGING, CLEAR CAREER PATHS