

Case Study of Churn Prediction

Objective

- Predict rider churn (vs retention) rate for a ride sharing company
- Propose solution to improve customer retention rate



Data Engineering

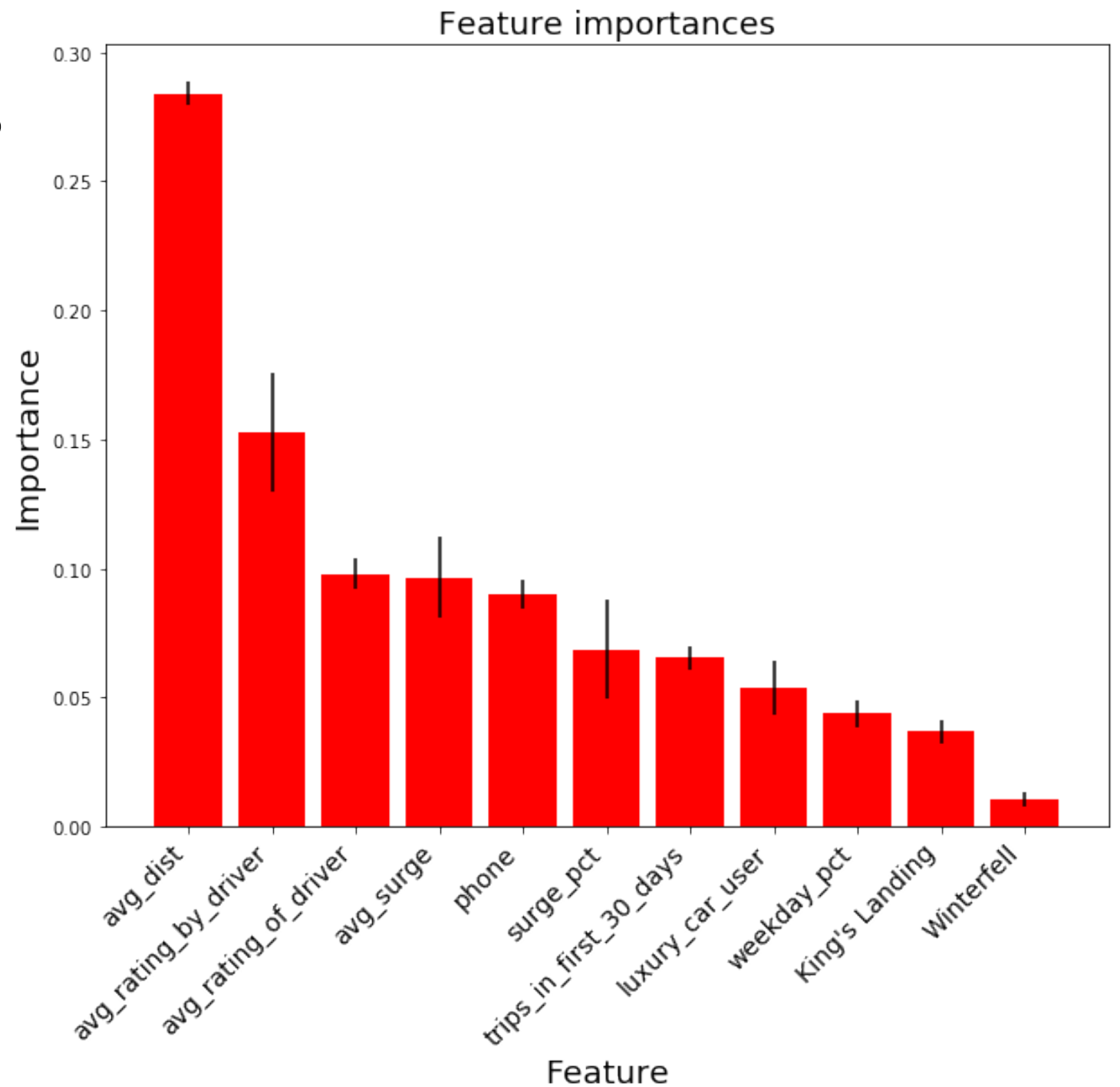
- Add a new column['Churn?'] based on two date columns, which were removed later to avoid data leakage
- Null values were replaced
- Categorical features were converted to numeric type or replaced by several dummy features

Model - Random Forest

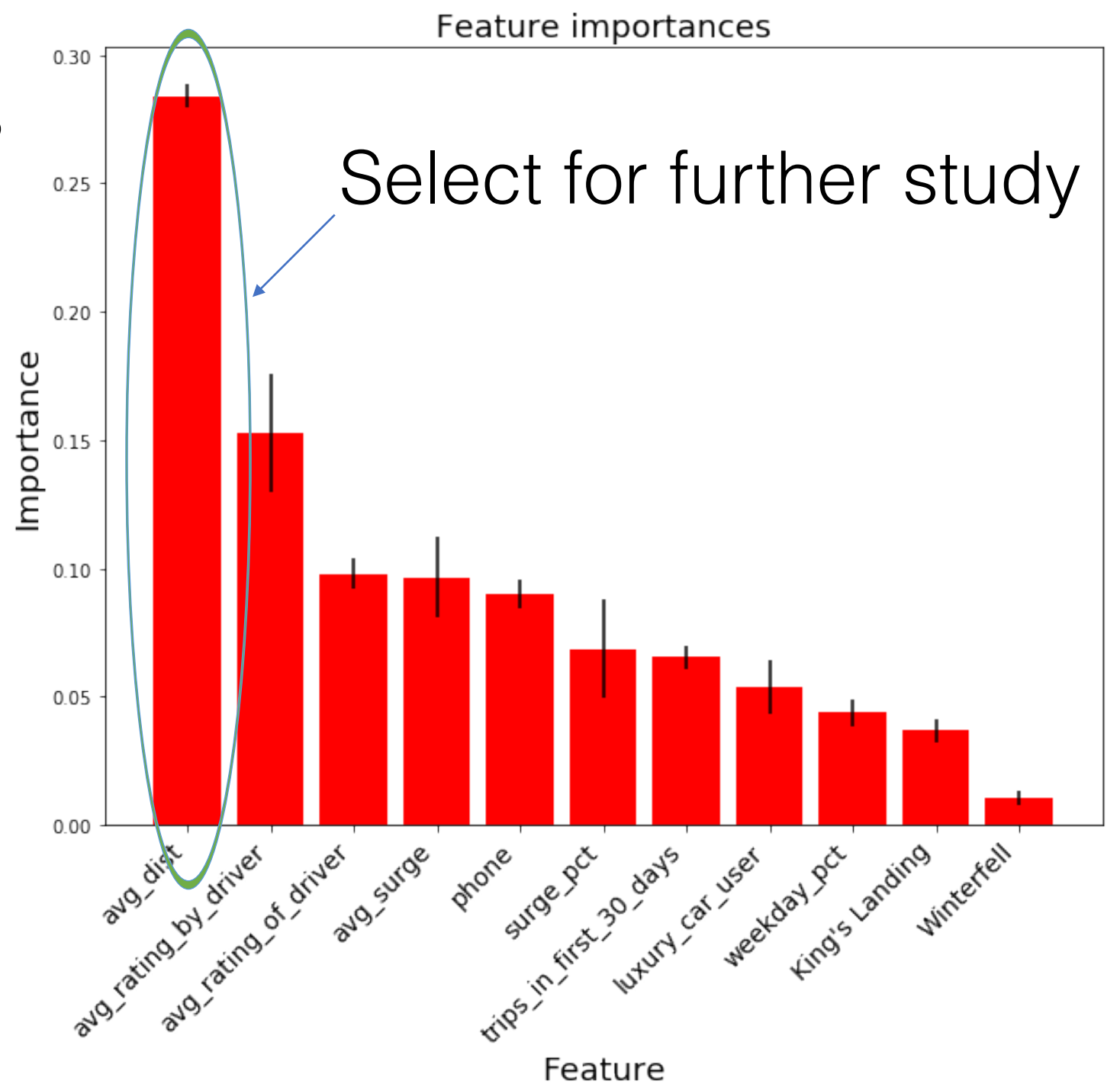
- Why?
 - Flexible
 - Easy explained
 - Fast implementation
 - Works well for non-linear classification
- How?
 - Study feature importances
 - Find the optimal parameters by cross-validated grid search
 - Fit optimal model
 - Test model with confusion matrix and ROC curve



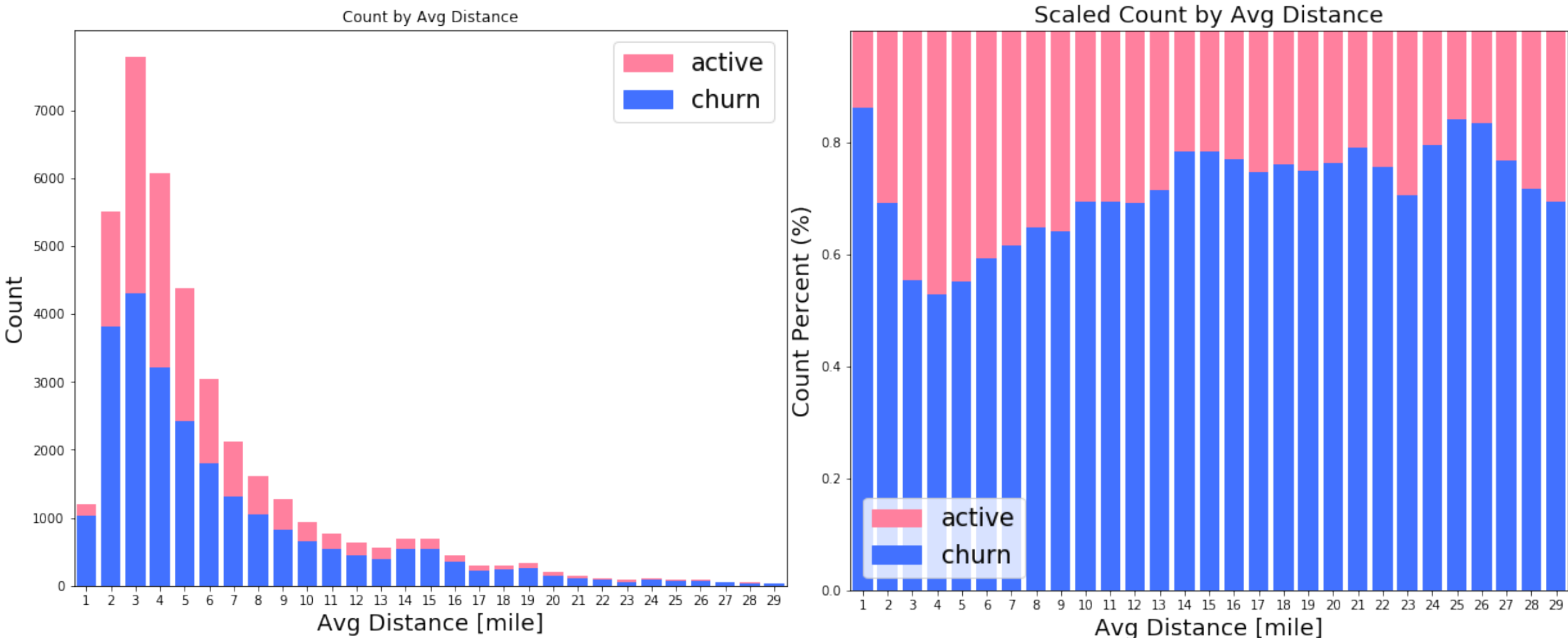
Feature Importances via Random Forest



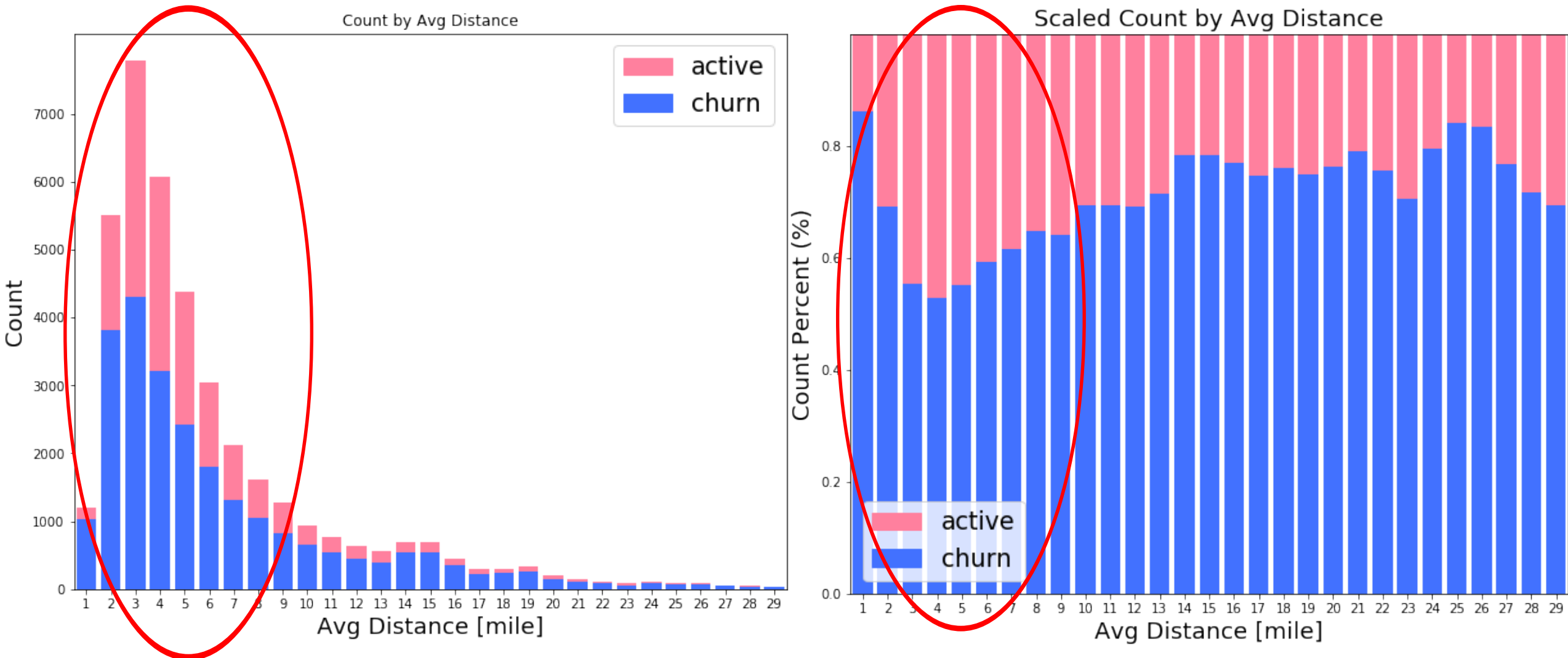
Feature Importances via Random Forest



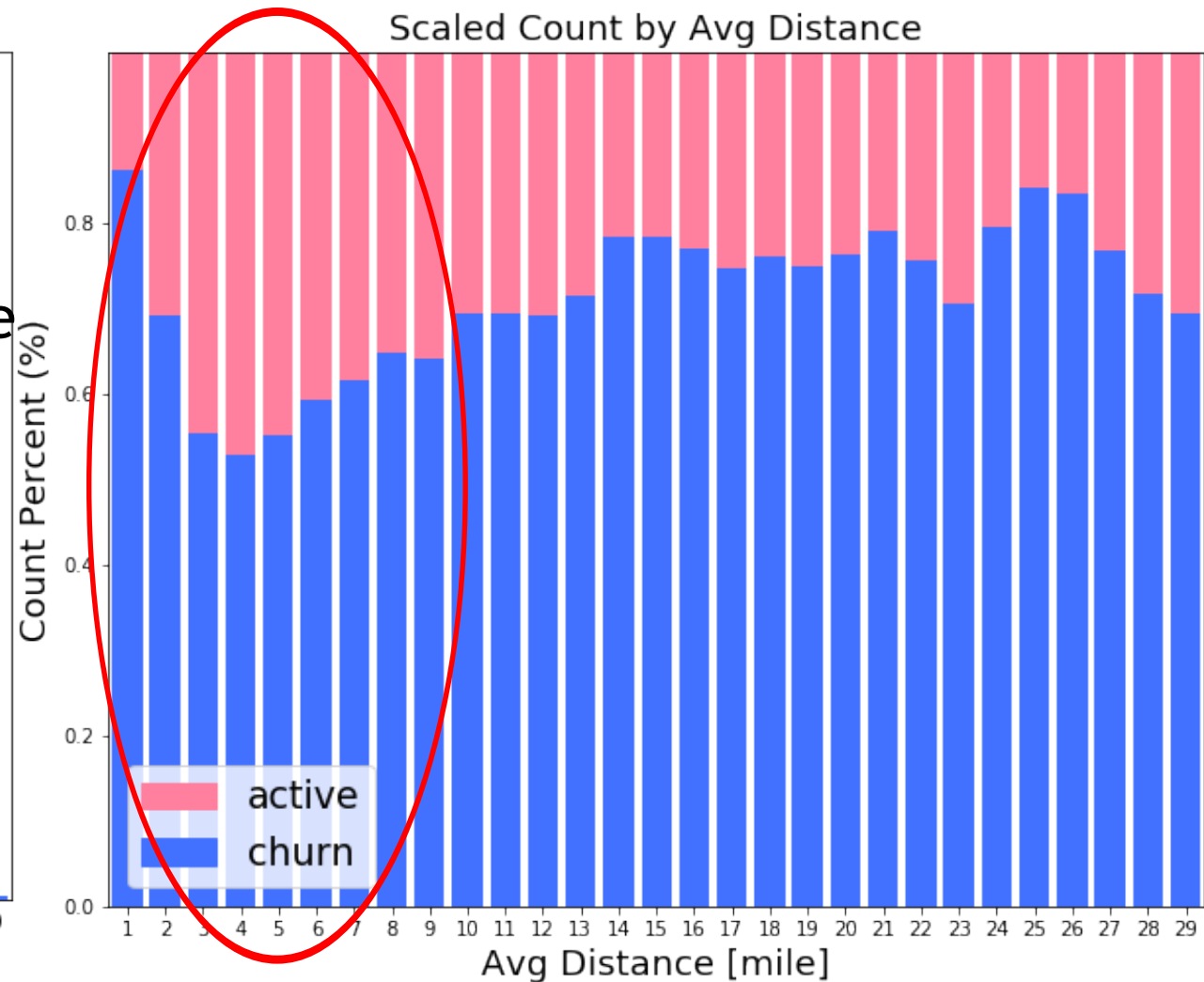
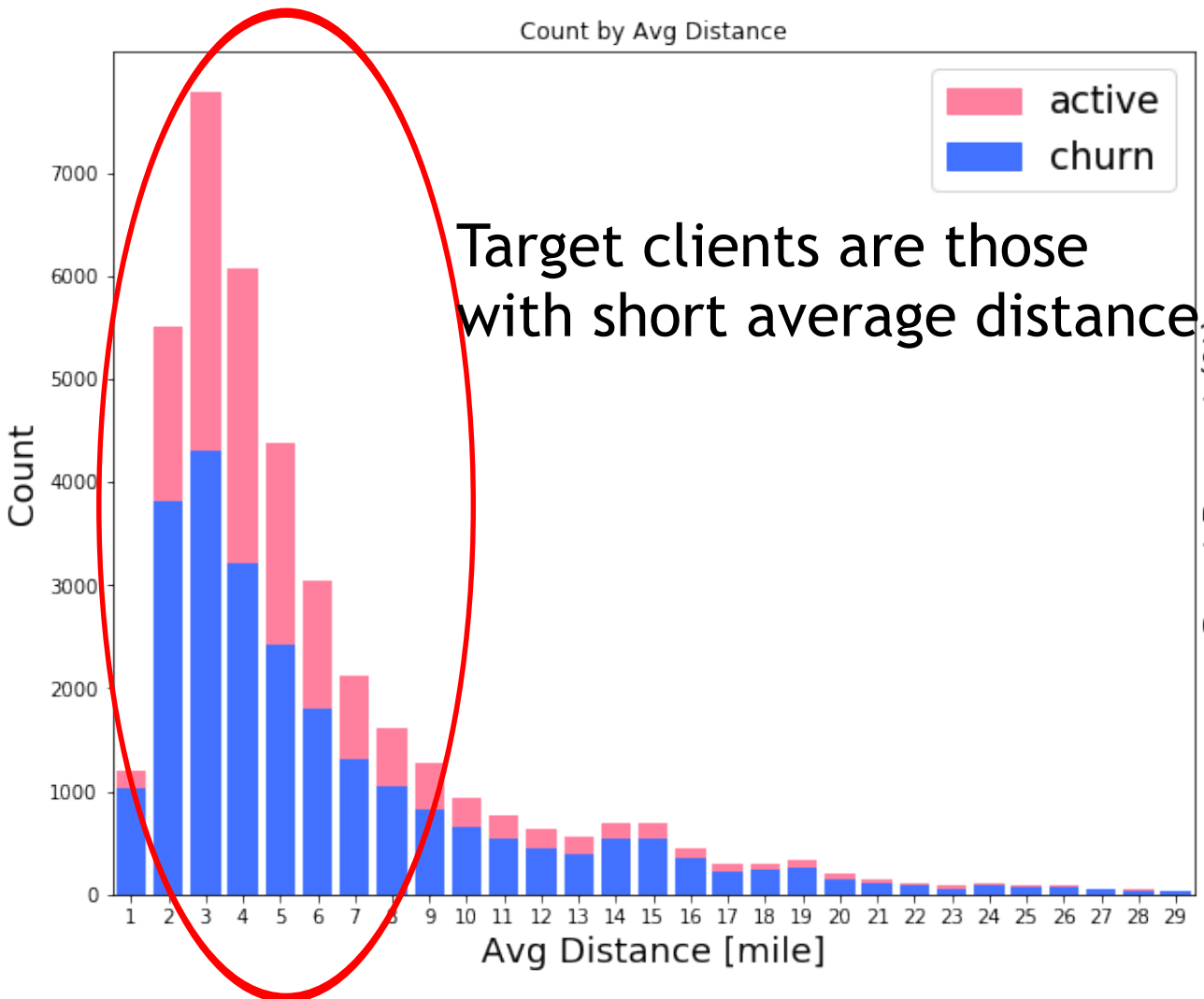
Average distance and churn relationship



Average distance and churn relationship

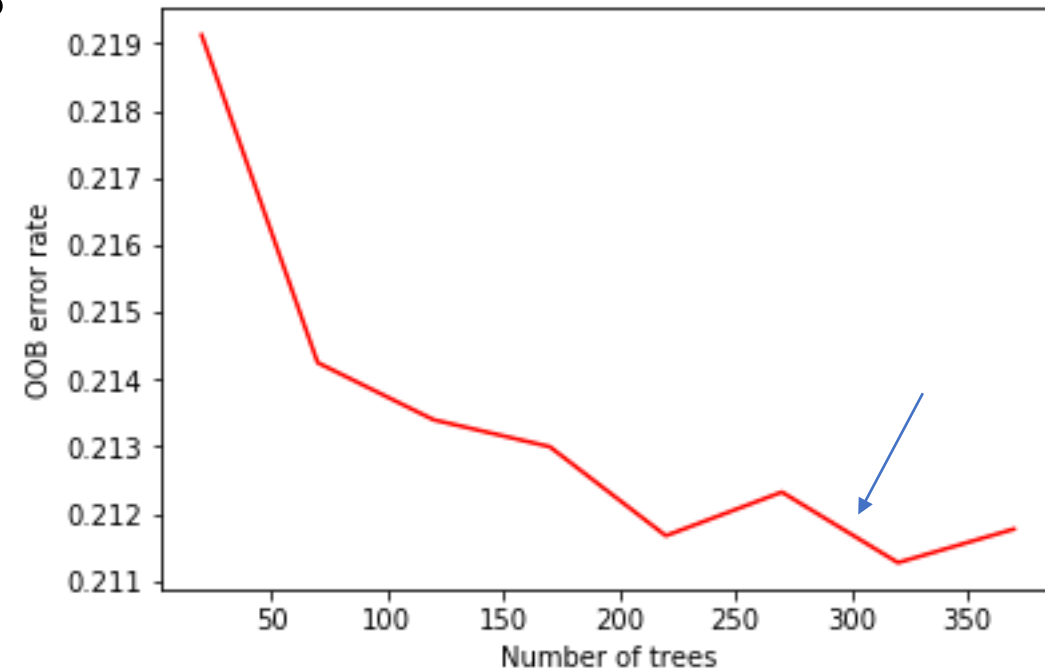


Average distance and churn relationship



Model

- Get the optimal parameters by searching over grid parameter space
- Determine the number of trees based on plot of OOB error vs tree number
- Optimal parameters
 - number of tree = 300
 - max_features = 3
 - min_samples_leaf = 10

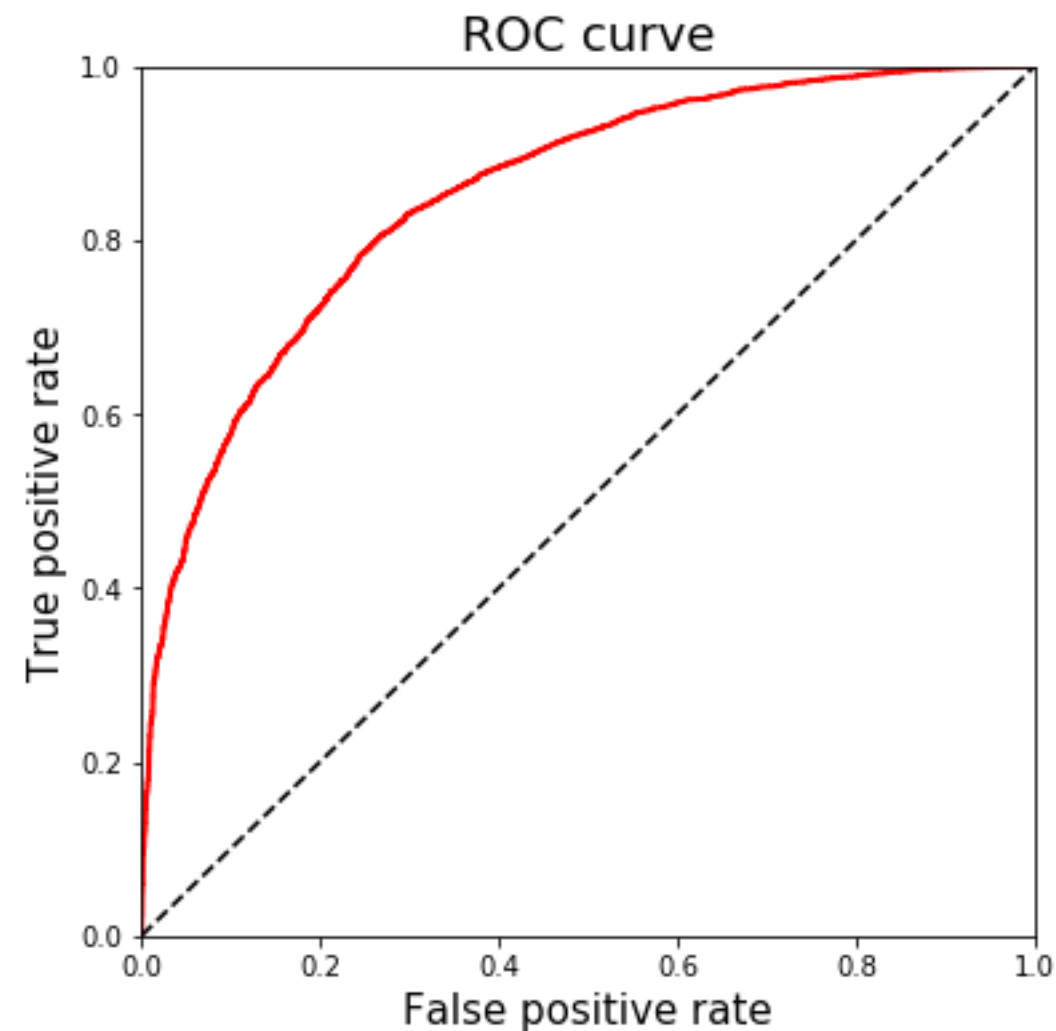


Metrics

Accuracy score on test: 0.778
Out of bag score: 0.788
Precision on test: 0.797
Recall on test: 0.864

Confusion Matrix on Test data

	Predict Churn	Predict Active
Act Churn	5384	844
Act Active	1369	2403



Benefit Matrix Simulations

Benefit Matrix

	Predict Churn	Predict Active
Act Churn	\$36	\$0
Act Active	\$180	\$200

Confusion Matrix on Test data

	Predict Churn	Predict Active
Act Churn	5384	844
Act Active	1369	2403

ASSUMPTIONS

1. Revenue per customer \$200/ month
2. 10% discount for those who we predicted Churn
3. With 10% discount, 20% of clients will stay

CONCLUSION

Prefer **Type I error**
to **Type II error**

Conclusion

- Build a model of churn prediction using Random Forest
- Study the feature importances
- Target clients with short average distance (< 8 miles)
- The model was evaluated using some metrics, e.g. confusion matrix, ROC curve, etc
- A benefit matrix was studied

Future work

- Try other models
- Study other important features
- Collect more data regarding trips made by each user
- Recommend creating a new campaign, for example,
 - Offer discount to users who travel long distance
 - Provide membership reward service