Case Study of Churn Prediction

Objective

- Predicting rider 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

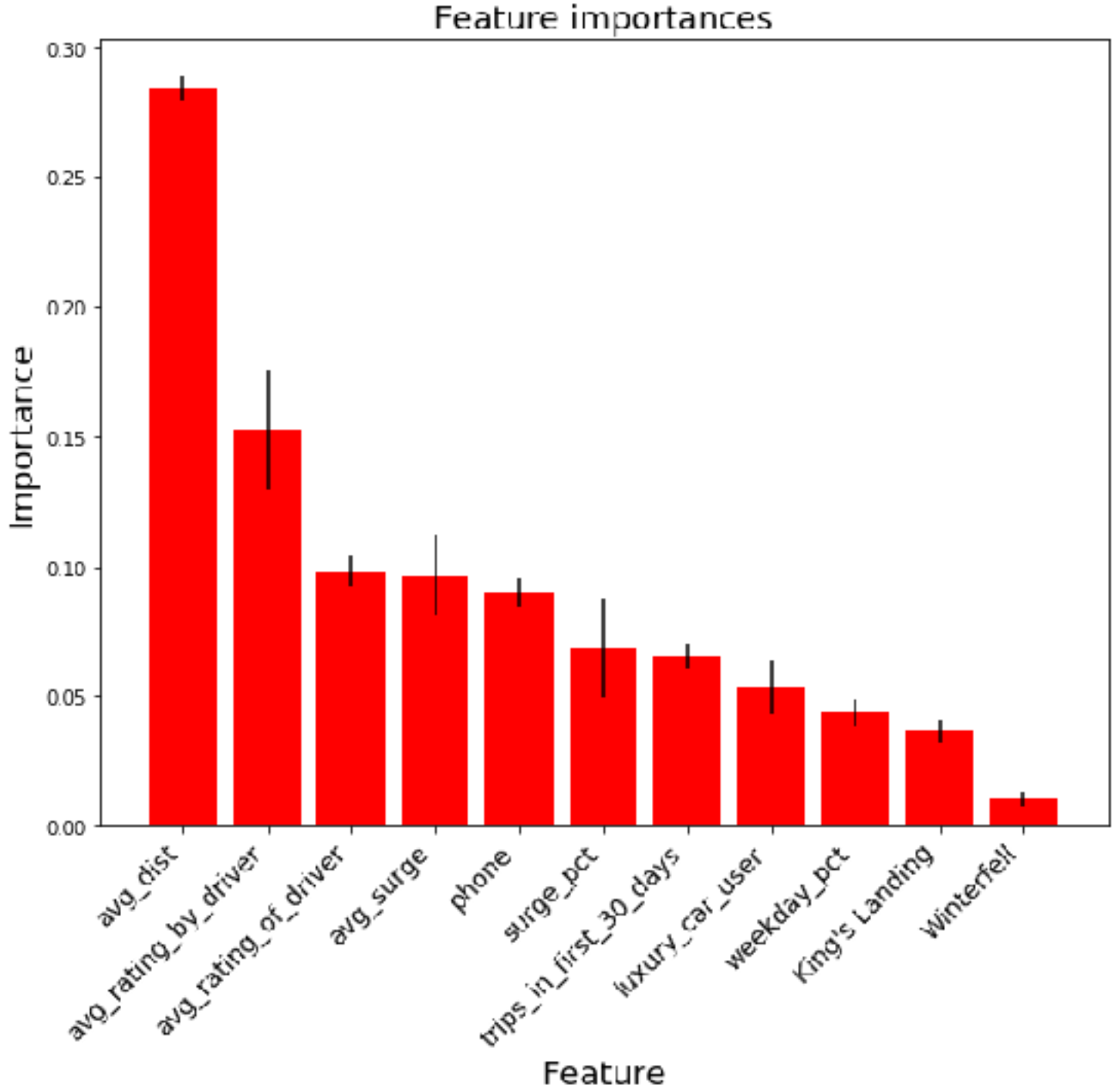
- Categorical features were converted to numeric type or replaced by several dummy features

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



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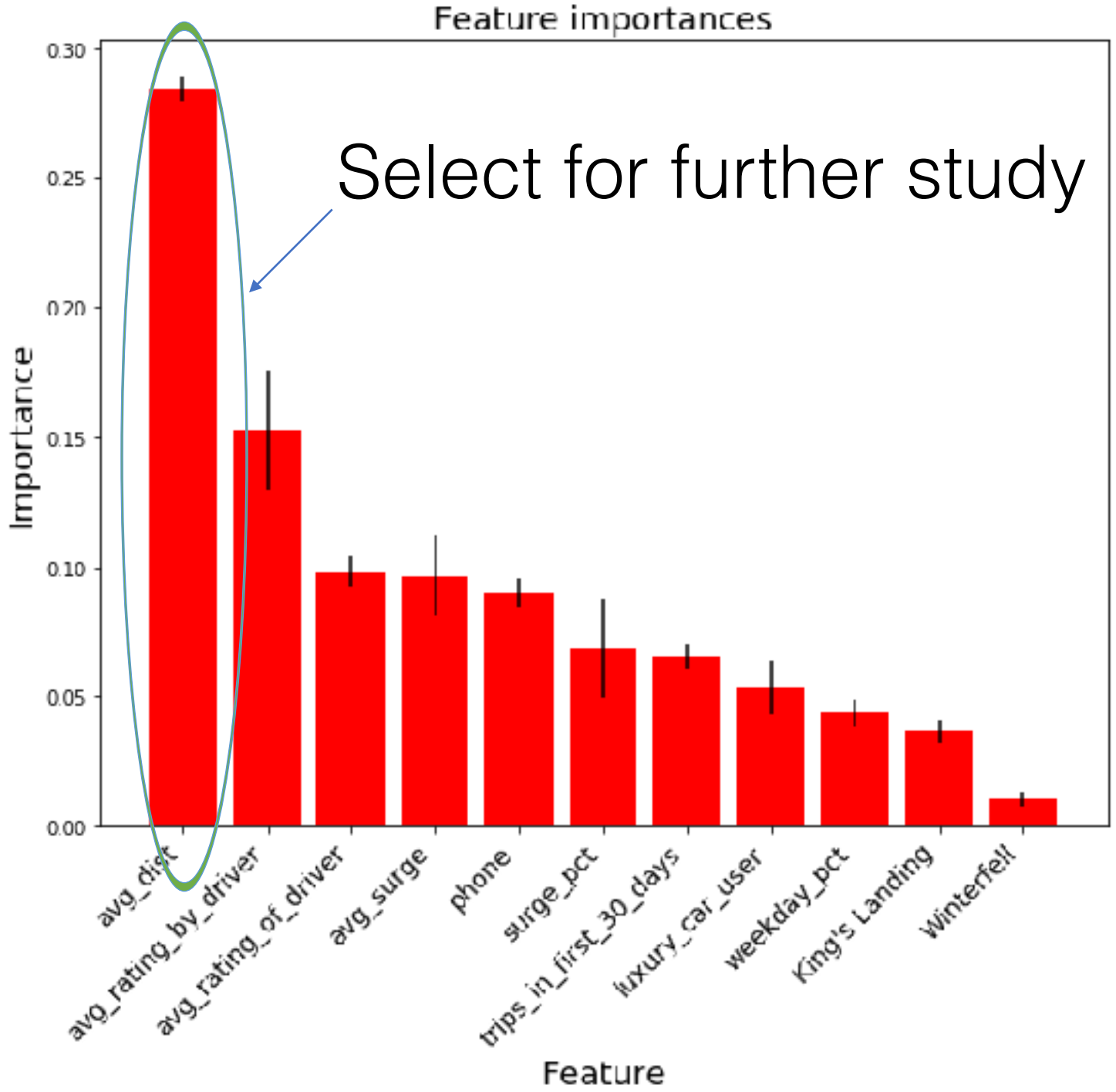
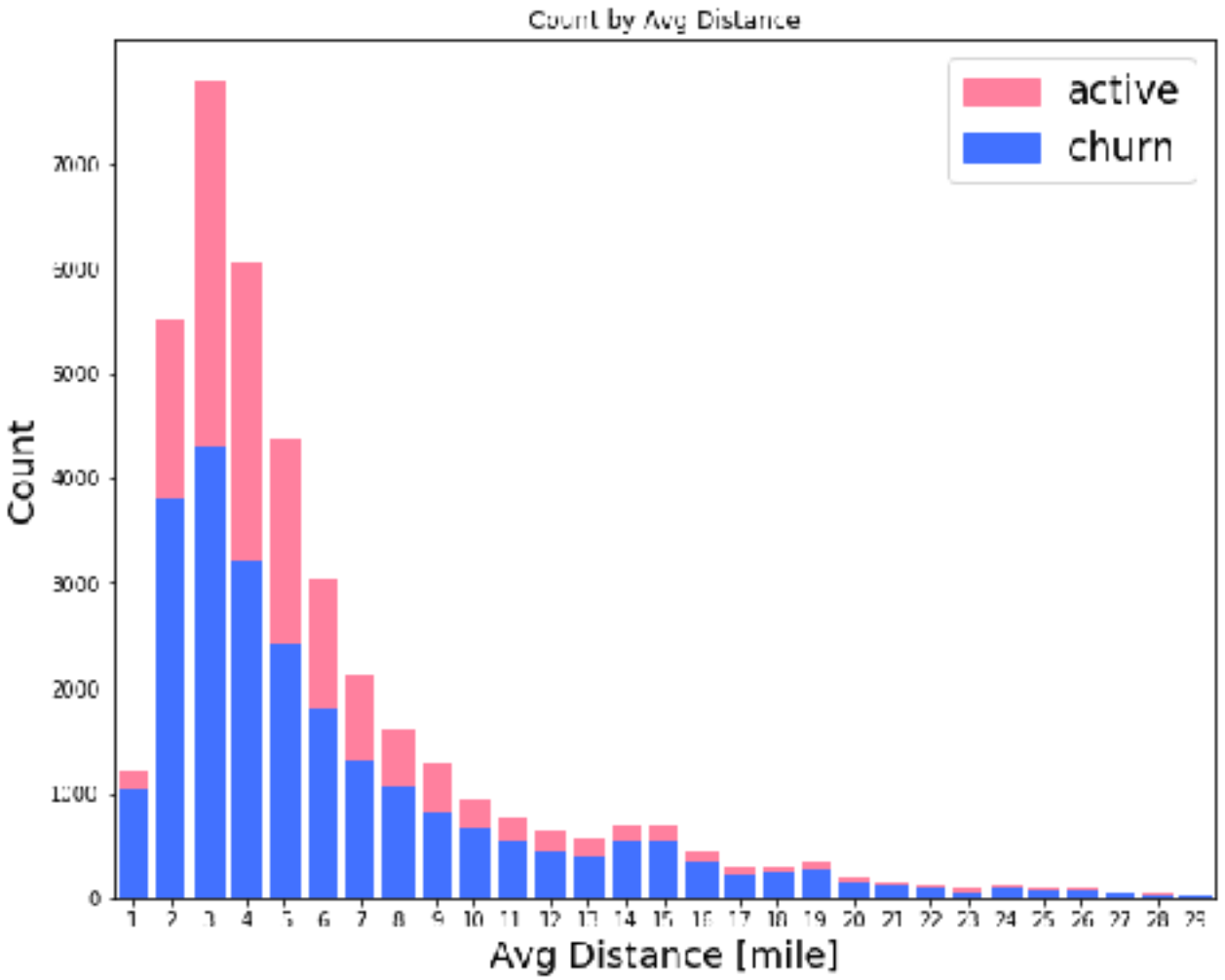
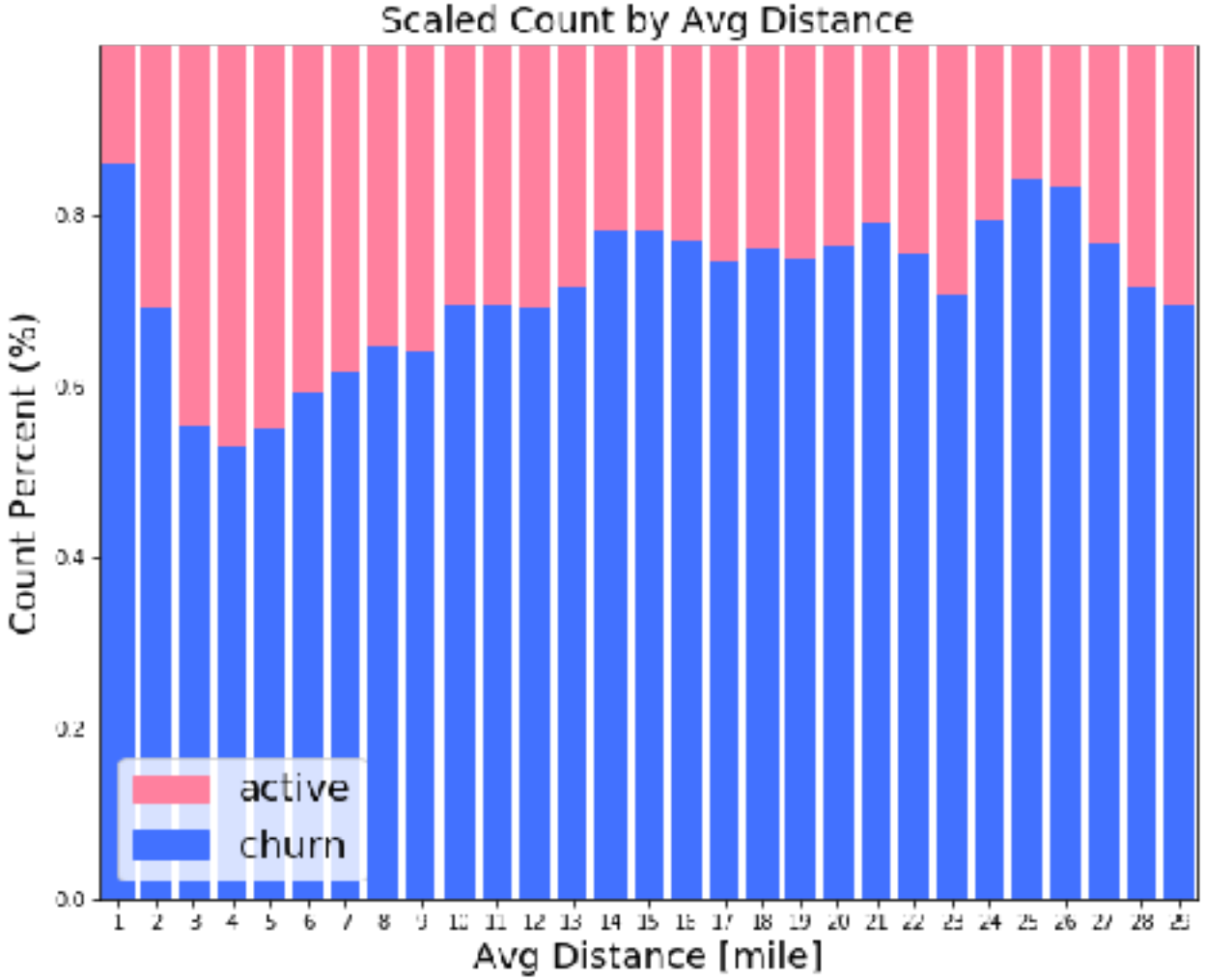


Average distance and churn relationship





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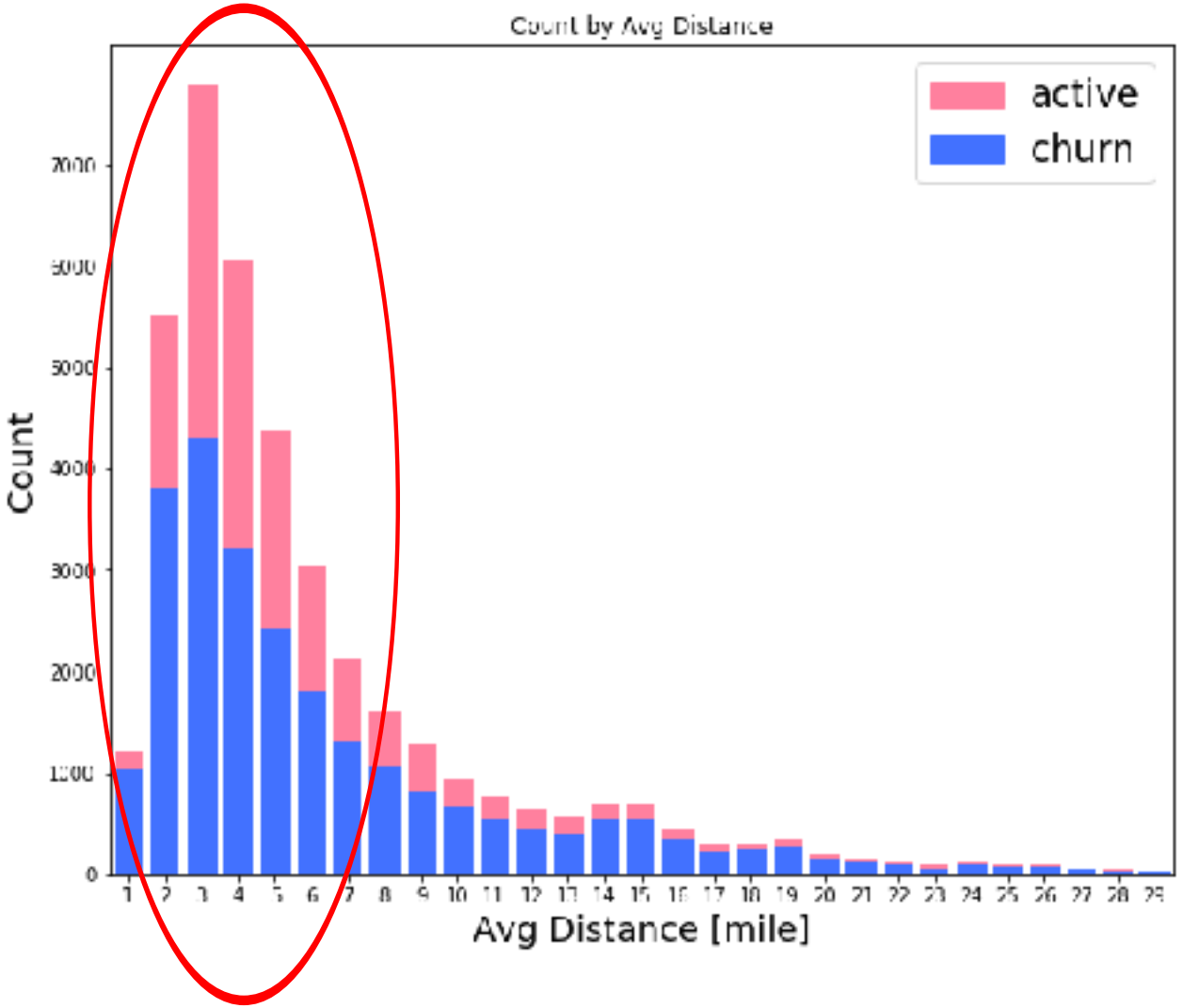

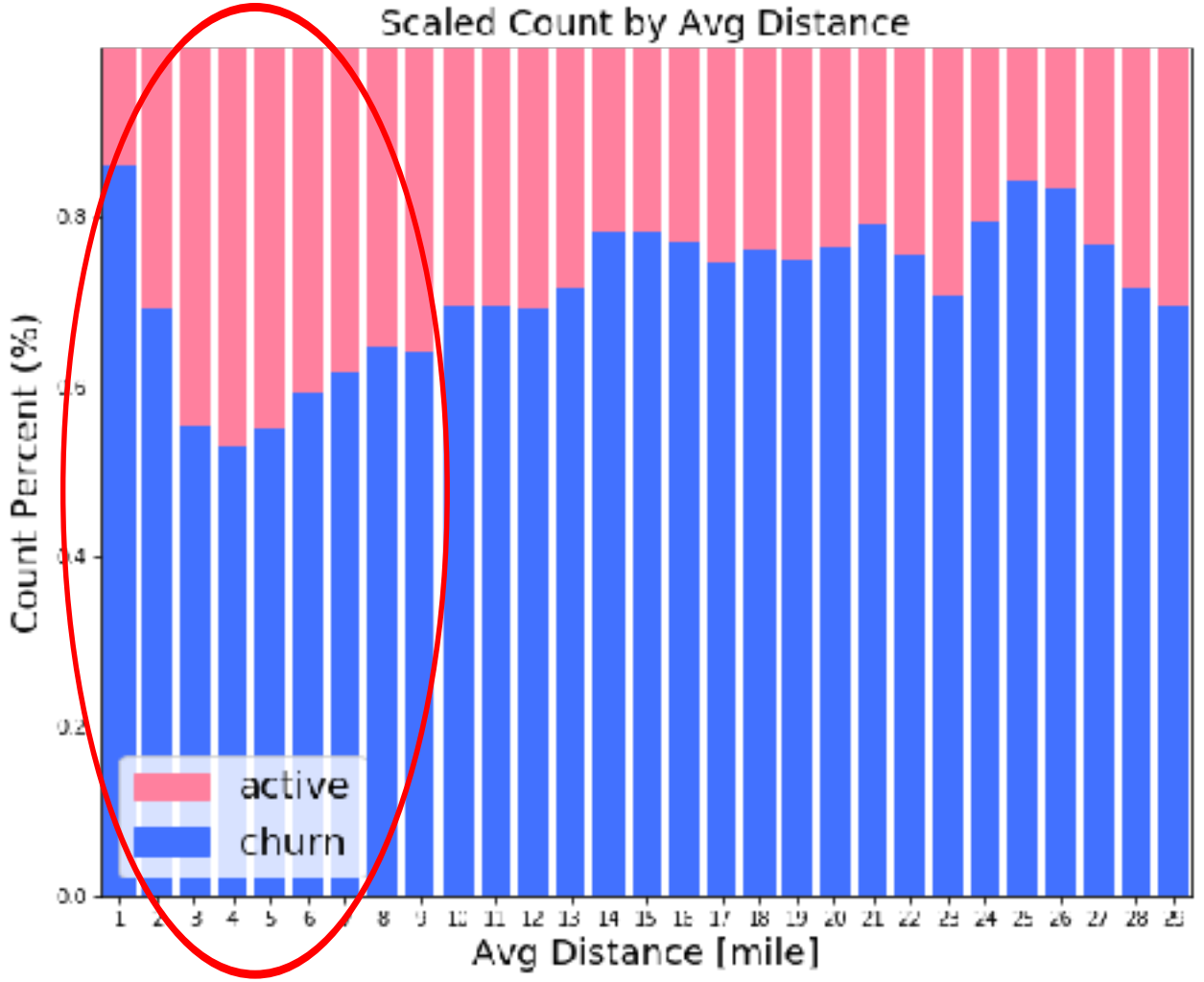

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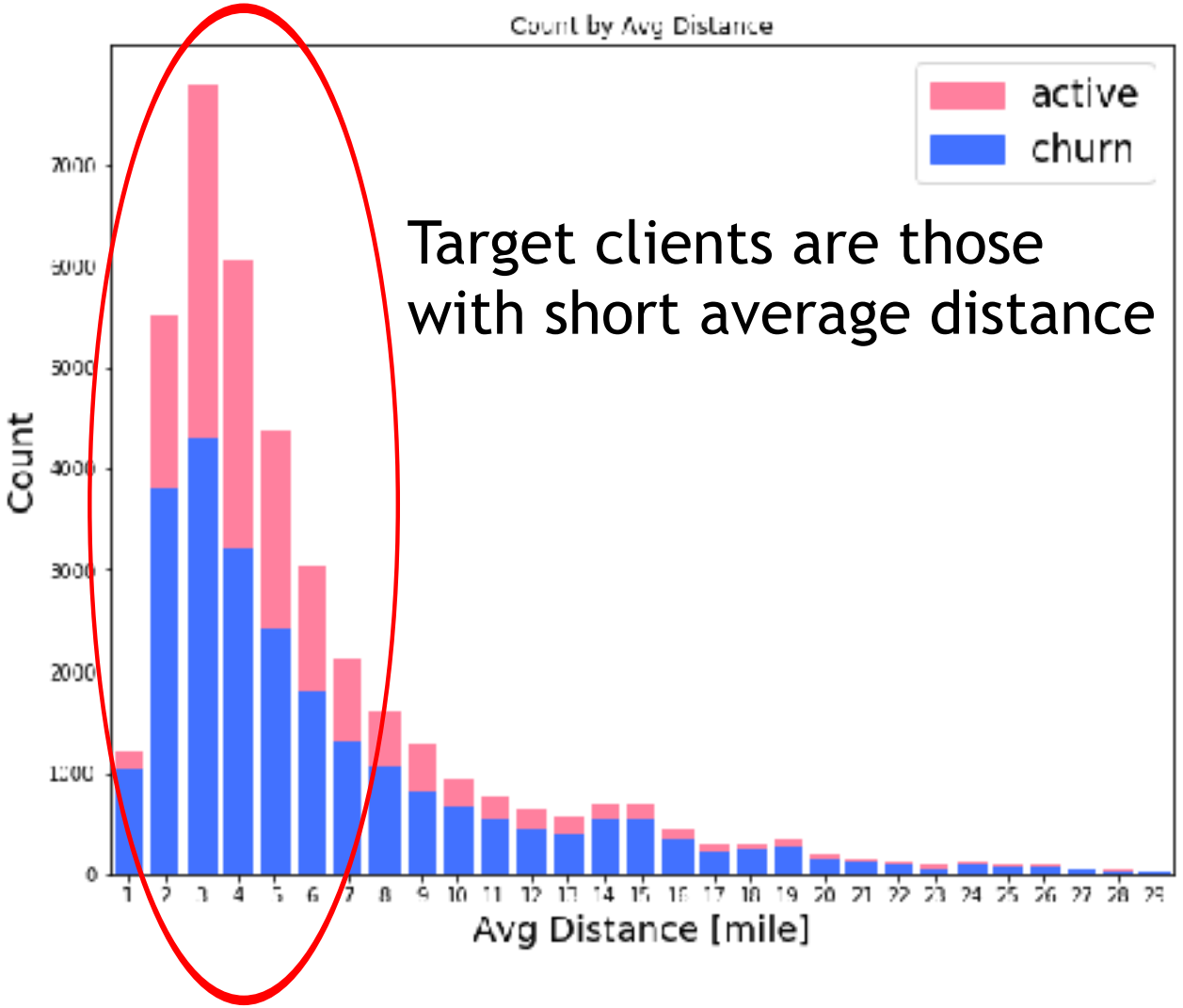
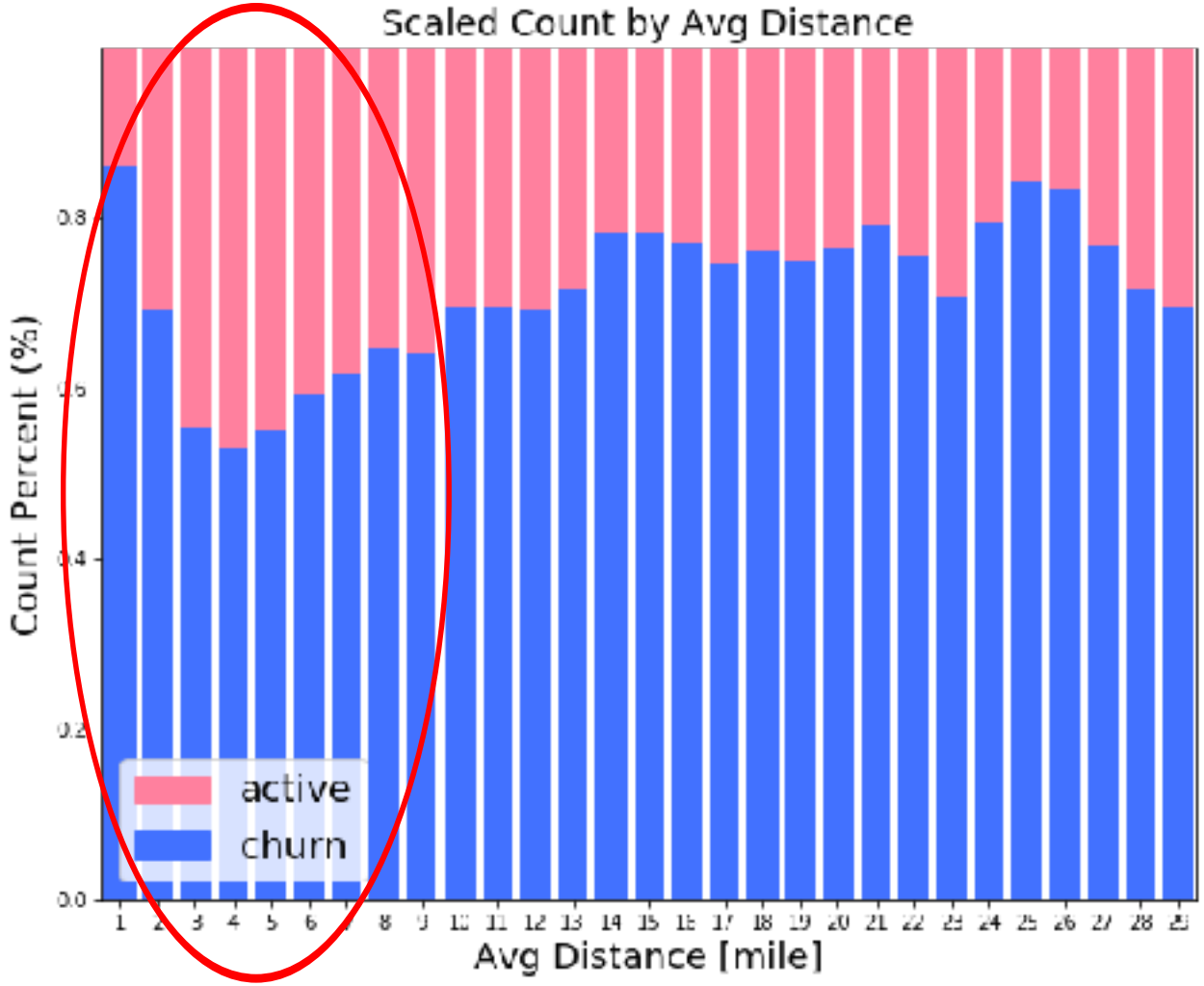
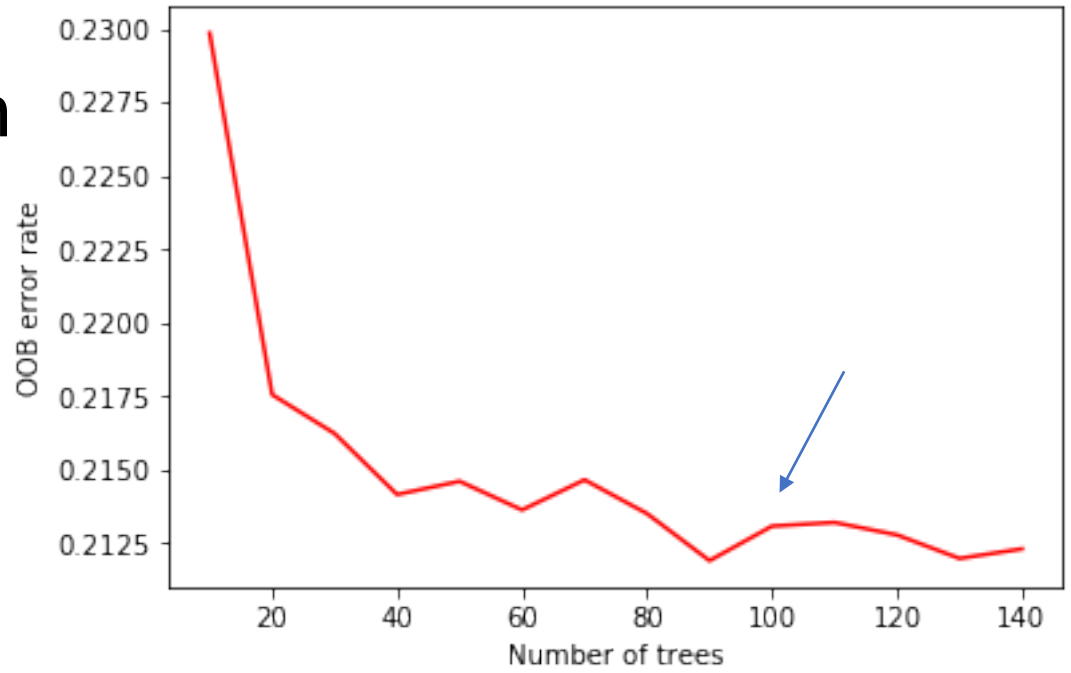


Target clients are those with short average distance



Model

- Get the optimal parameters by searching over gird parameter space
- Determine the number of trees based on plot of OOB error vs tree number
- Optimal parameters
  - number of tree = 100
  - max_features = 3
  - min_samples_leaf = 14

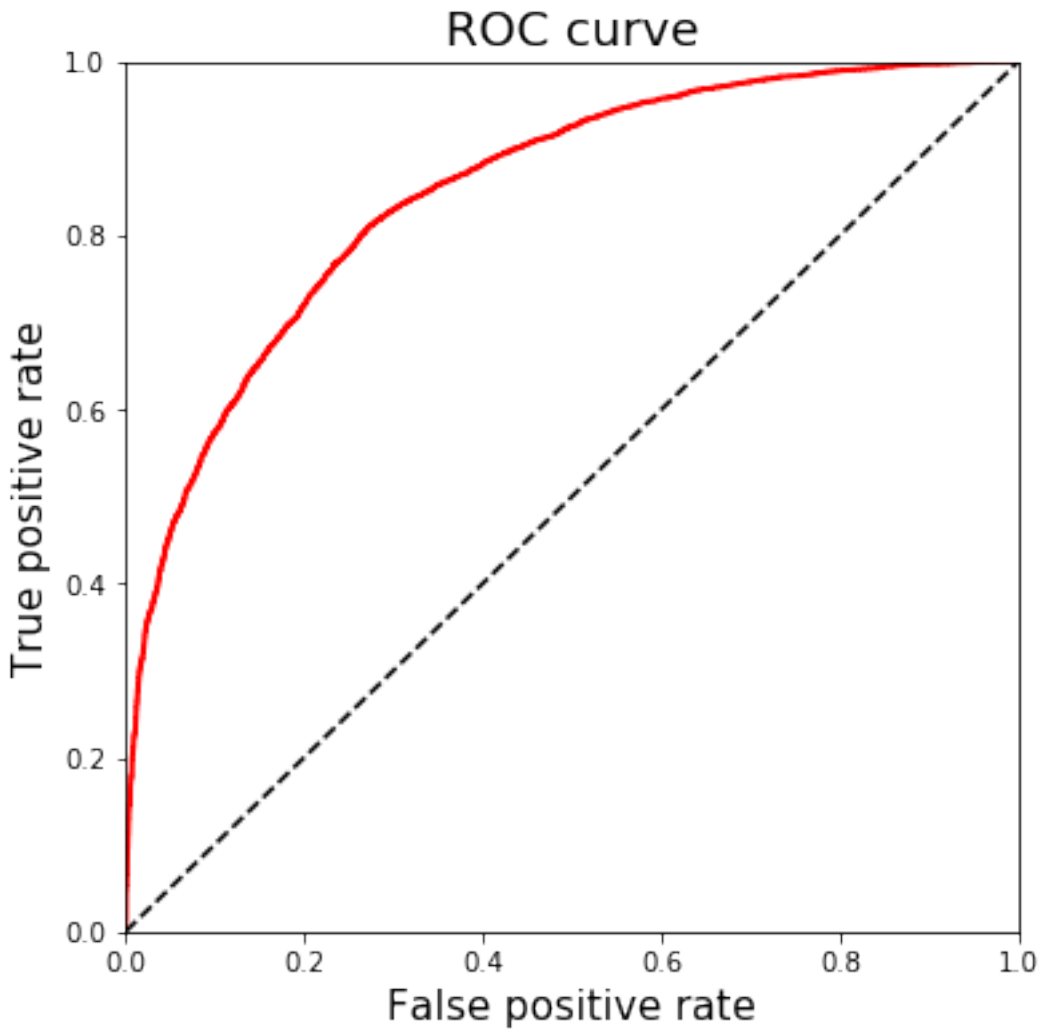


Metrics

Accuracy score on test:	0.778
Out of bag score:	0.787
Precision on test:	0.795
Recall on test:	0.866

Confusion Matrix on Test data

	Predict Churn	Predict Active
Act Churn	**5392**	**836**
Act Active	**1389**	**2383**



Benefit Matrix Simulations

Benefit Matrix

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

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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

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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