Welcome!

CDIPS Data Science Workshop

Real Estate Marketing for First.io

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Finding a Needle in a Haystack

Our gigantic dataset

- 700+ features
- ~ 2,000,000 households in the state of NC
- Two time records: 09/2016 and 06/2017

Our goal

 Predict and validate who has moved between the period of 09/2016 and 06/2017

Computational tools (BIG challenge)

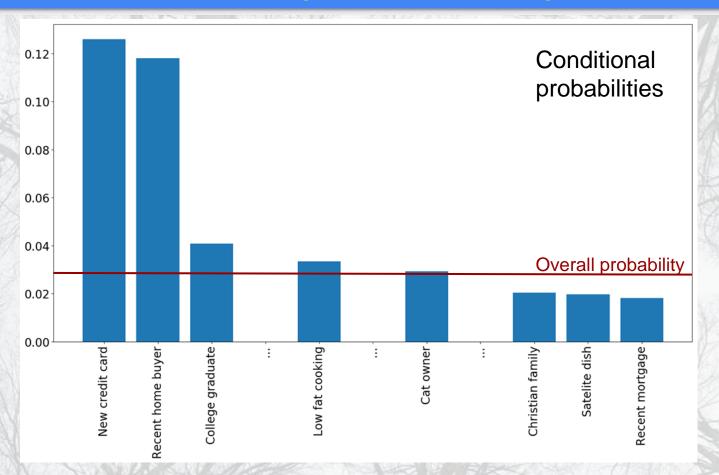
- Cloud computing resources:
- Distributed file system:
- Distributed computing environment:



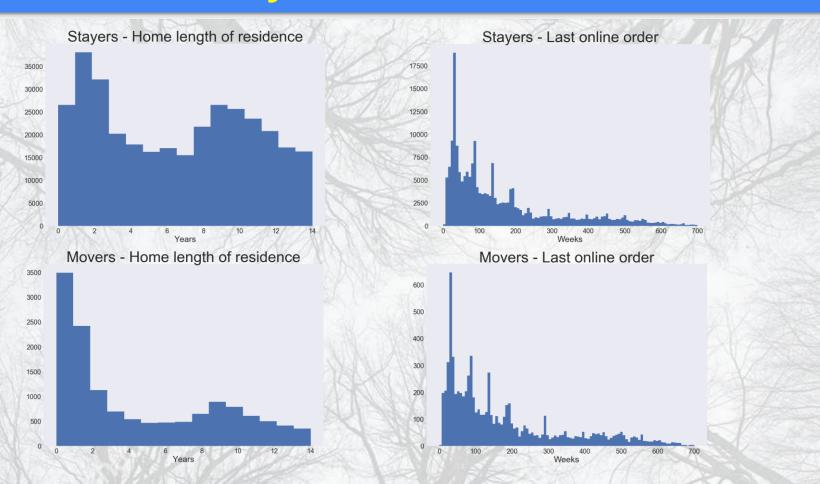
Movers 3.3%

Stayers 96.7%

Explorative Analysis - Binary Features



Explorative Analysis - Numerical Features



Hyperparameter Tuning - Logistic Regression

Hyperparameters

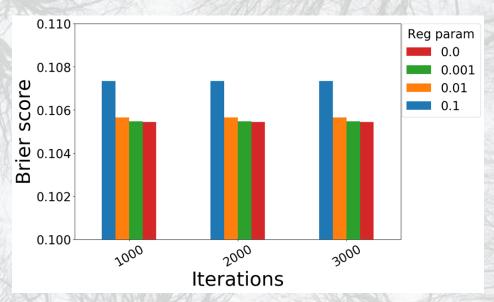
- 1. Regularization coefficient (λ)
- 2. L1/L2 regularization ratio (α)
- 3. # of iterations in gradient descent

Lessons Learned

- 1. No regularization is the best
- 2. LR model underfits the data
- 3. Need non-linear models for better performance

Model metric

Brier score = $(probability - label)^2$



Hyperparameter Tuning - Random Forest

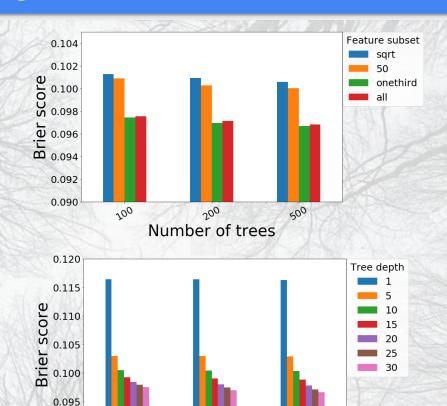
0.090

Hyperparameters

- 1. # of trees in the forest
- 2. Max depth of trees
- 3. # of features

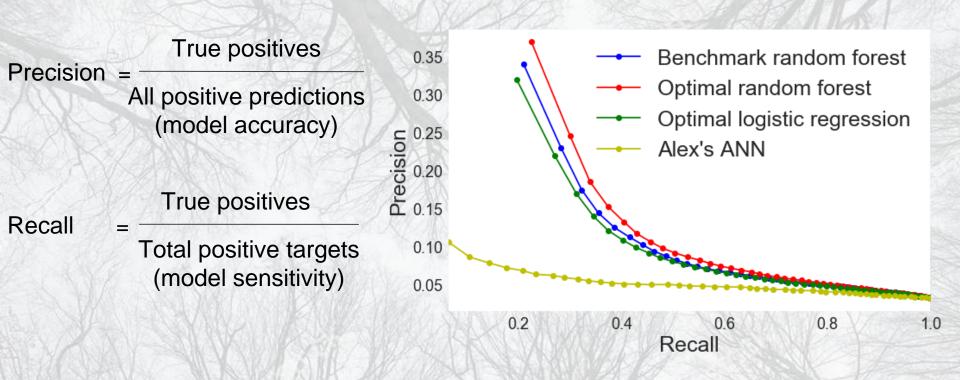
Lessons Learned

- Increasing tree depth and using ⅓ of total features are 2 critical factors in improving model performance
- 2. Increasing # of trees has no effect



Number of trees

Measuring Model Performance - P/R curve



Summary and Path Forward

Conclusion

 Our optimized RF model achieves 7% improvement in Brier score over the production model

Immediate Impact

Insights already applied to the national model

Long Term Prospects

 Moving decision-making is inherently a time dependent process. A time series model may offer unique perspectives and advantages

