

BACKGROUND

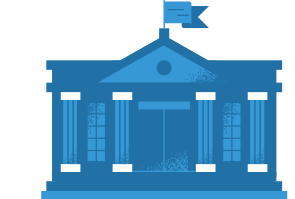
About Republic Finance

Founded in 1952, Republic Finance is a financial services institution headquartered in Baton Rouge, Louisiana that specializes in providing consumer loans



400K+

Active Customers



250+

Branch Locations

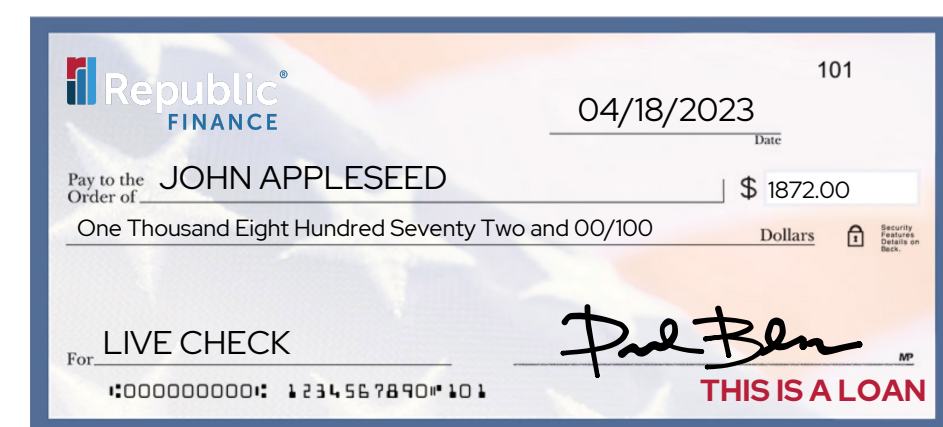


\$4B+

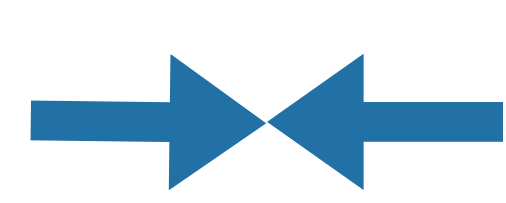
Loaned since 2015

Opportunity

Reduce the total number of live checks sent out in their Direct Mail Acquisition Campaigns by utilizing a Response Model



Objectives



Decrease Mail Volume by 20%



Maintain Current Origination Volume



Increase Response Rate to 1.2%

IMPACT

23.4%

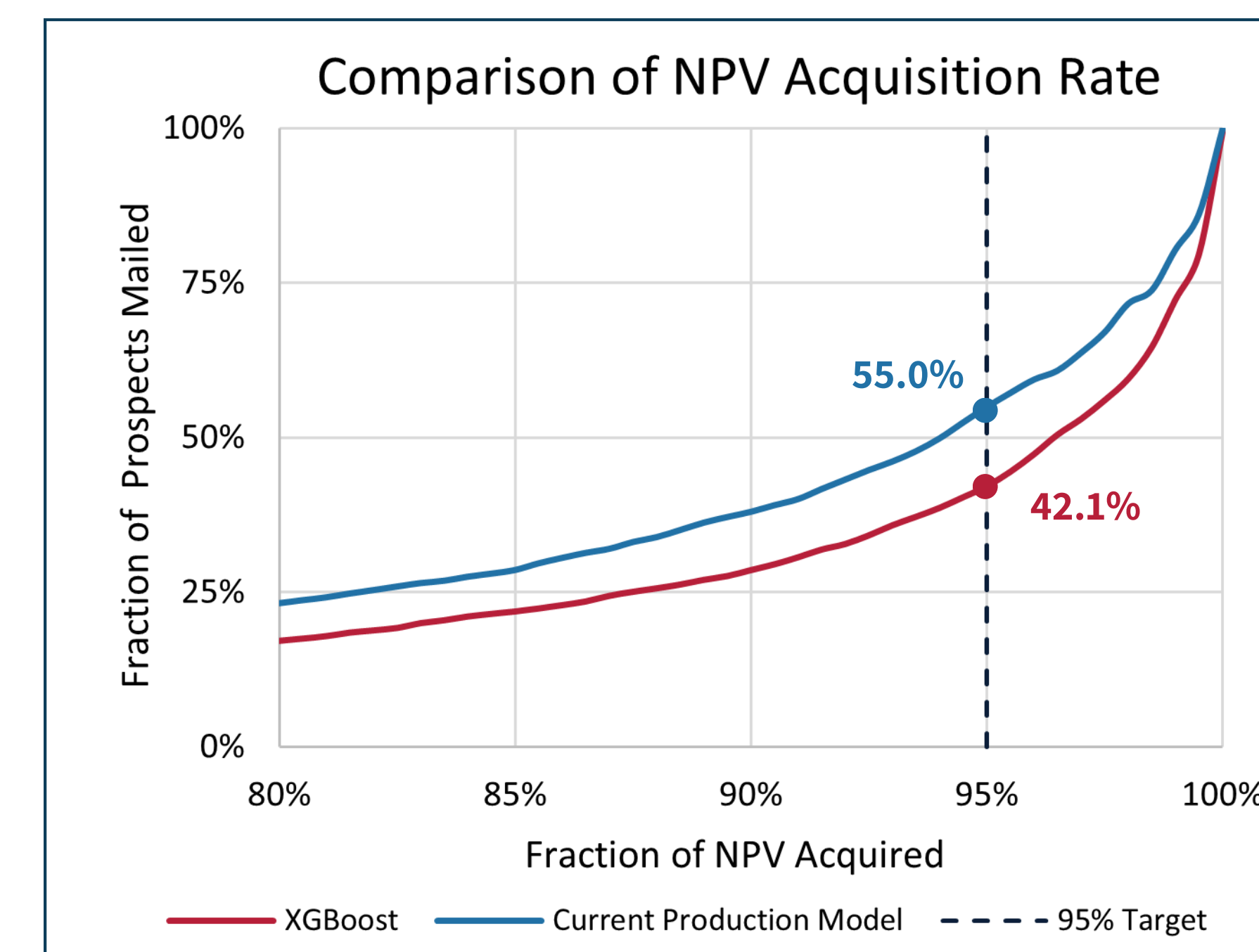
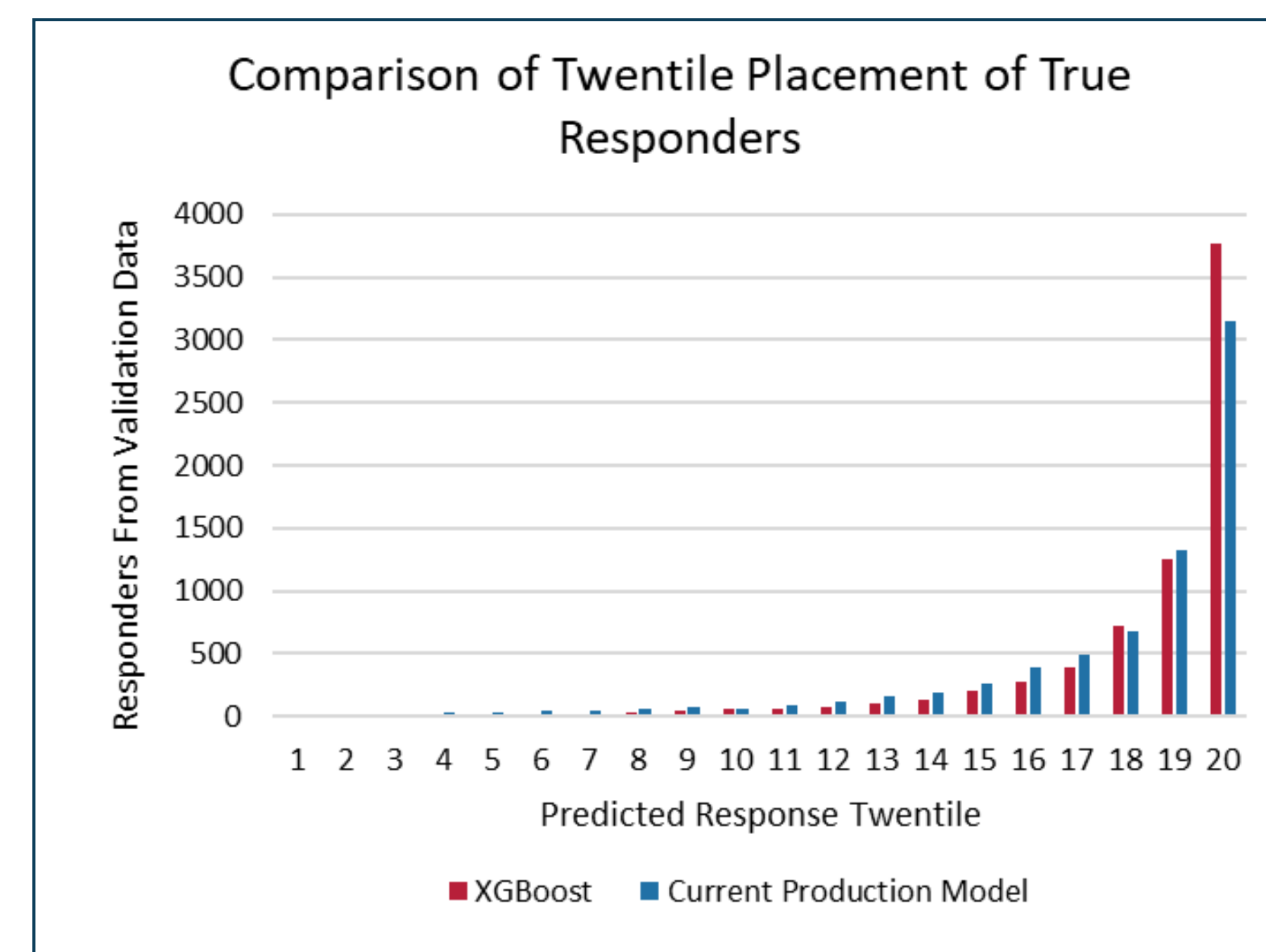
Mail Volume Decreased

\$3.7M+

Dollars Saved Annually

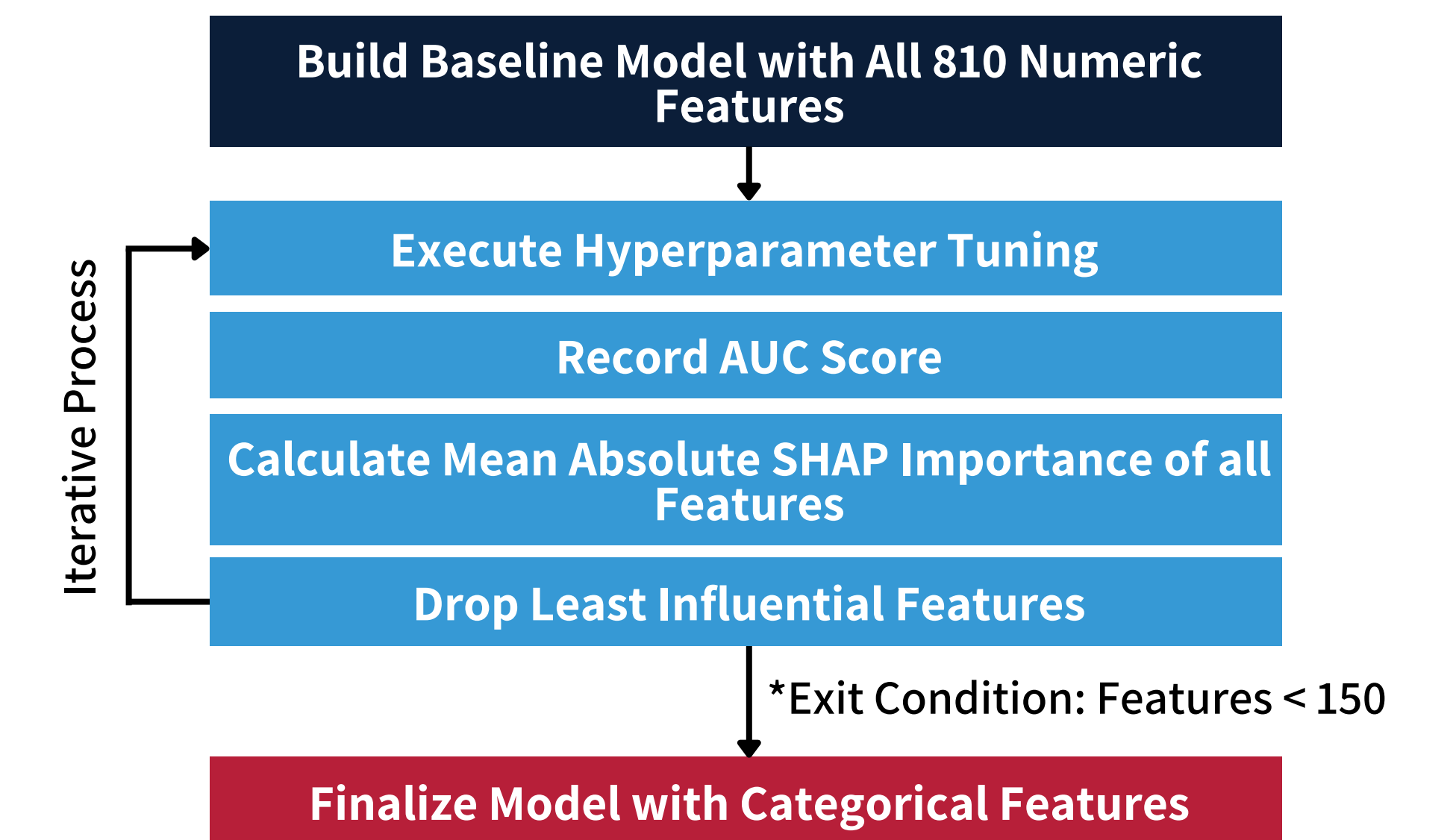
30.5%

Increase in Response Rate



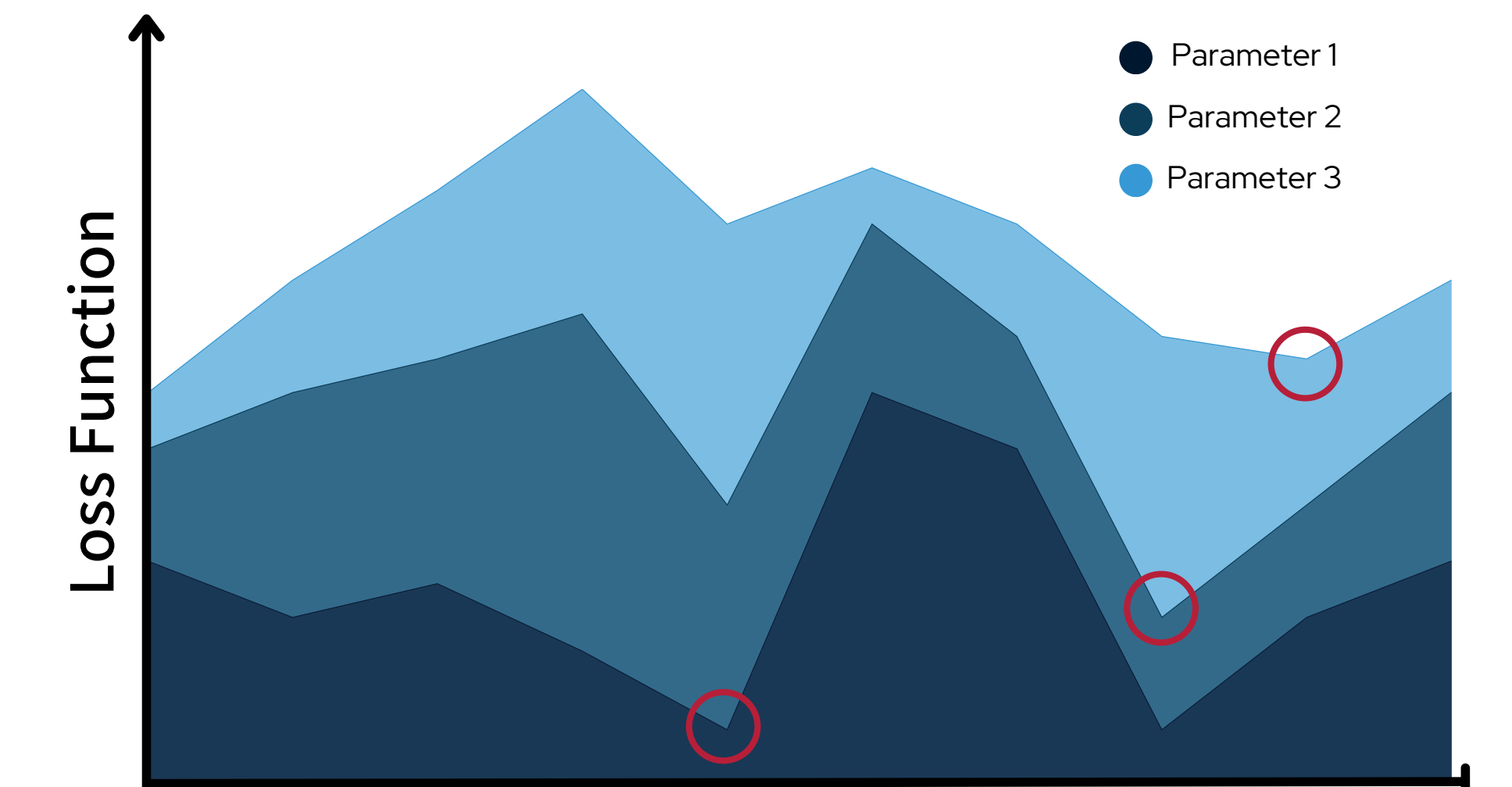
XGBoost acquires 95% of the potential Net Present Value (NPV) by mailing to 42.1% of prospects, while the current model has to mail to 55.0%

IMPROVEMENT ALGORITHM



HYPERPARAMETER TUNING

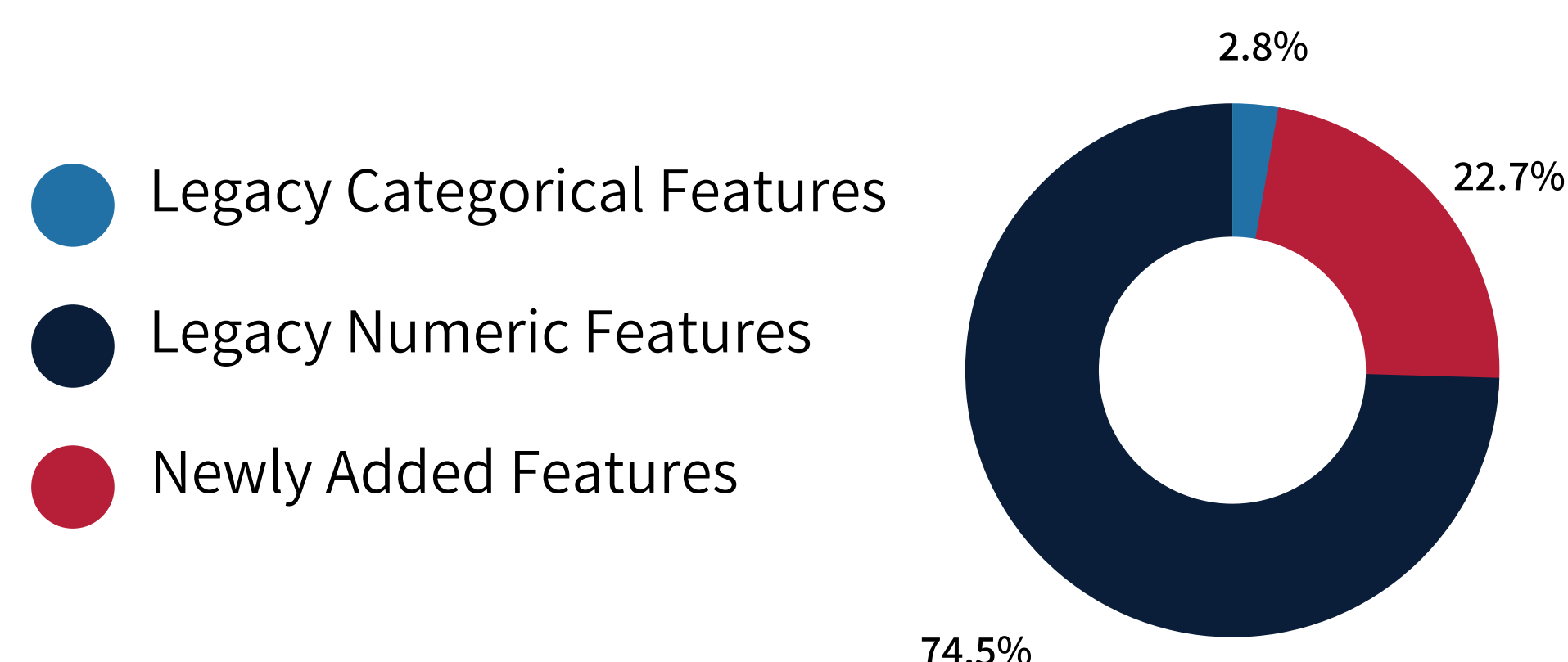
Hyperparameters are parameters that control the learning process of a machine learning model



High-level depiction of Bayesian Optimization
Circled points are parameter values that minimize the loss function

DATA

Began with 833 Features



Features are the variable inputs to the response model

Train - 84K Records

Build the model

Test - 36K Records

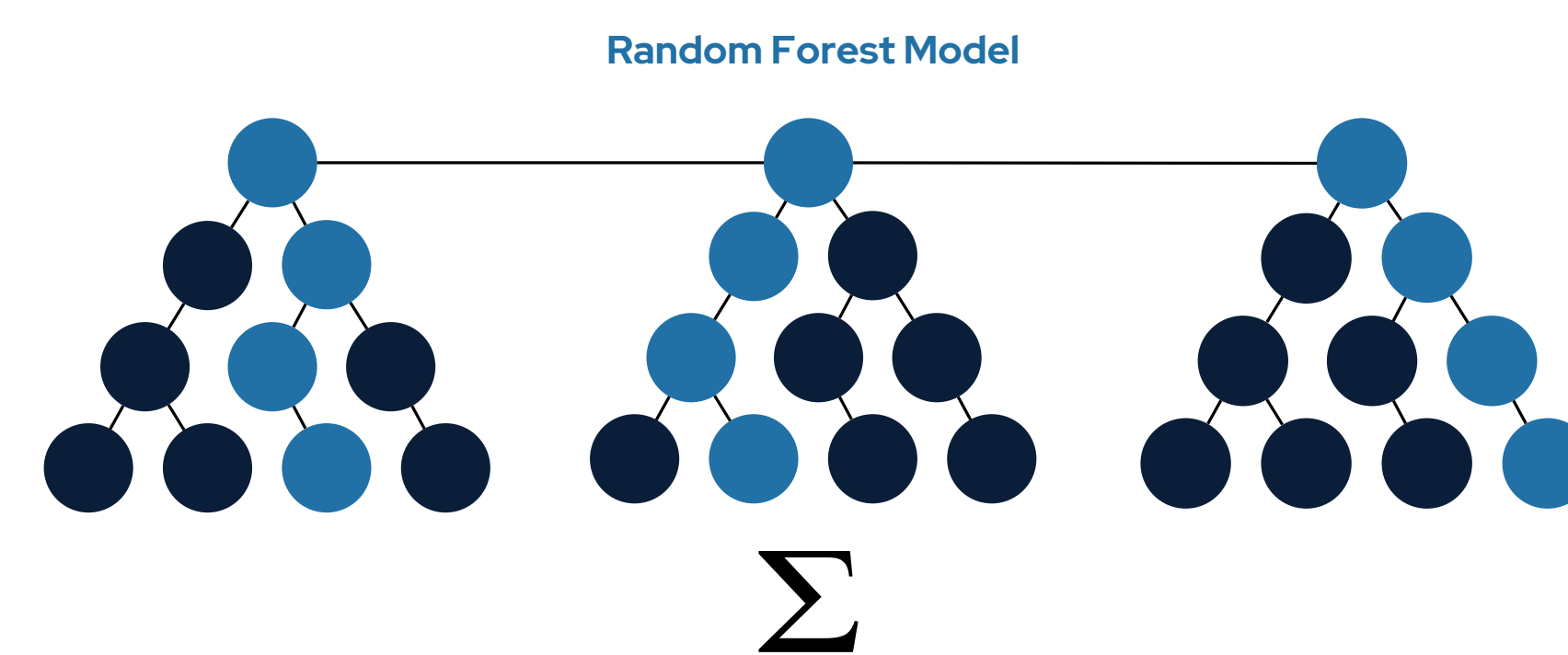
Evaluate the model's progress

Validation - 1.36M Records

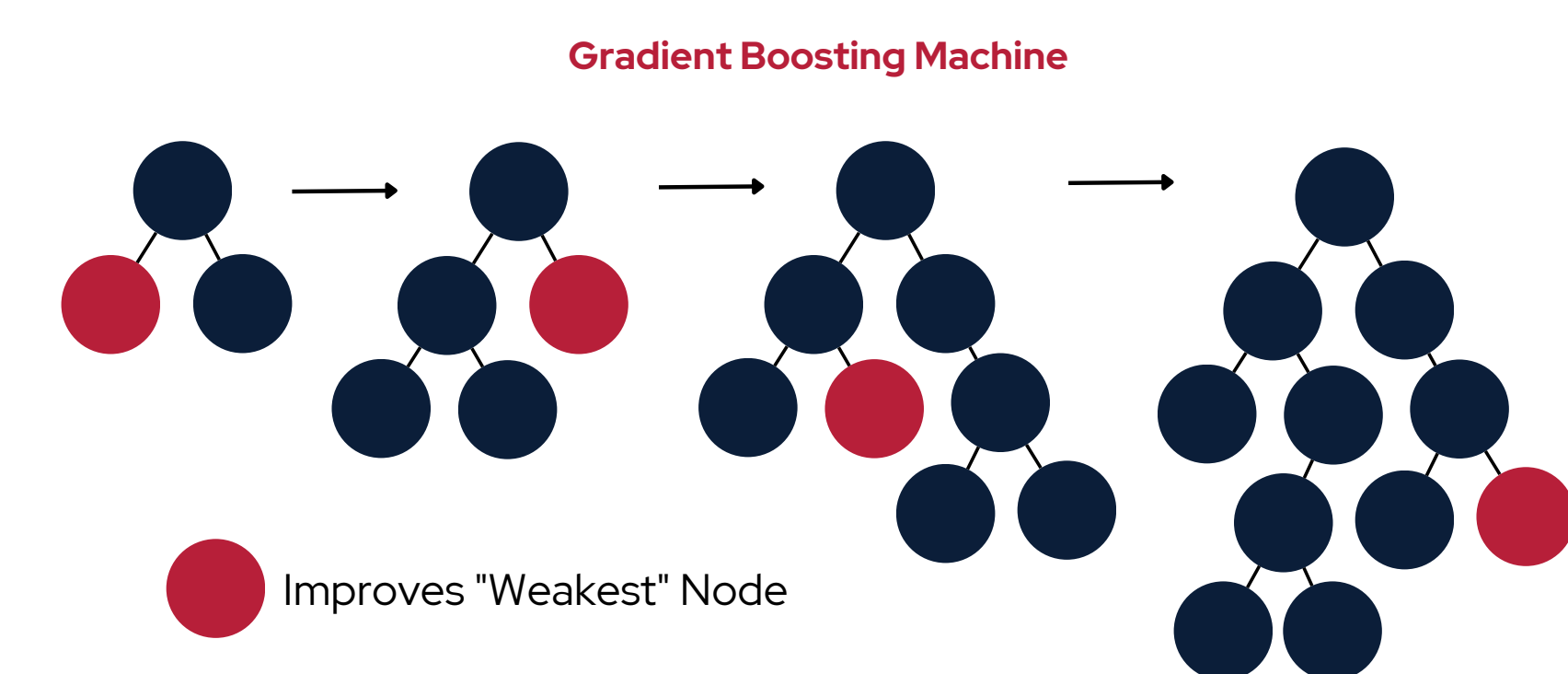
Determine the overall impact

MODELING SOLUTION

Gradient Boosting Machine (GBM) built using the XGBoost Library in Python

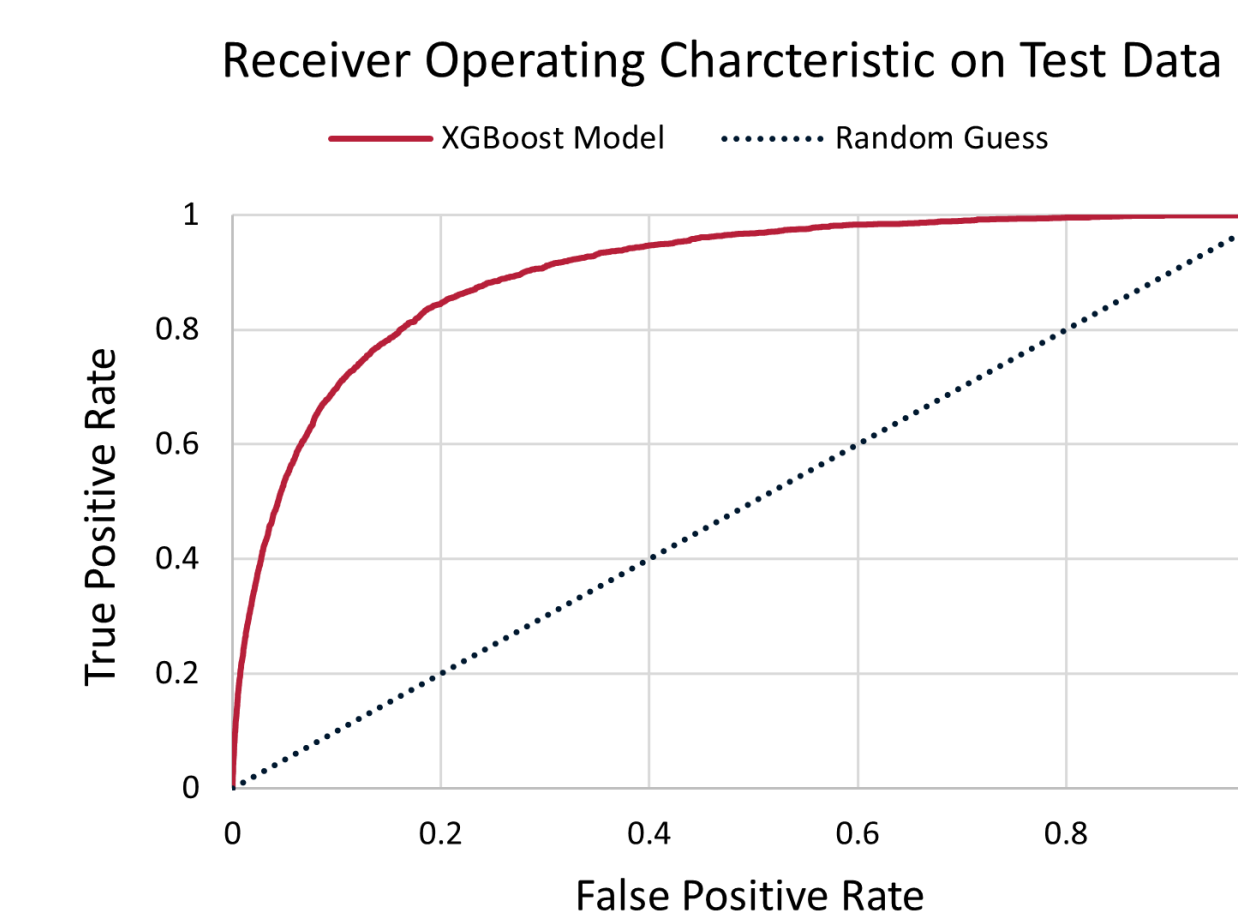


The current production model is a **Random Forest Model** made up of parallel decision trees that are aggregated to determine an output



New model is a **GBM**, made up of serial decision trees where each tree improves upon previous iterations

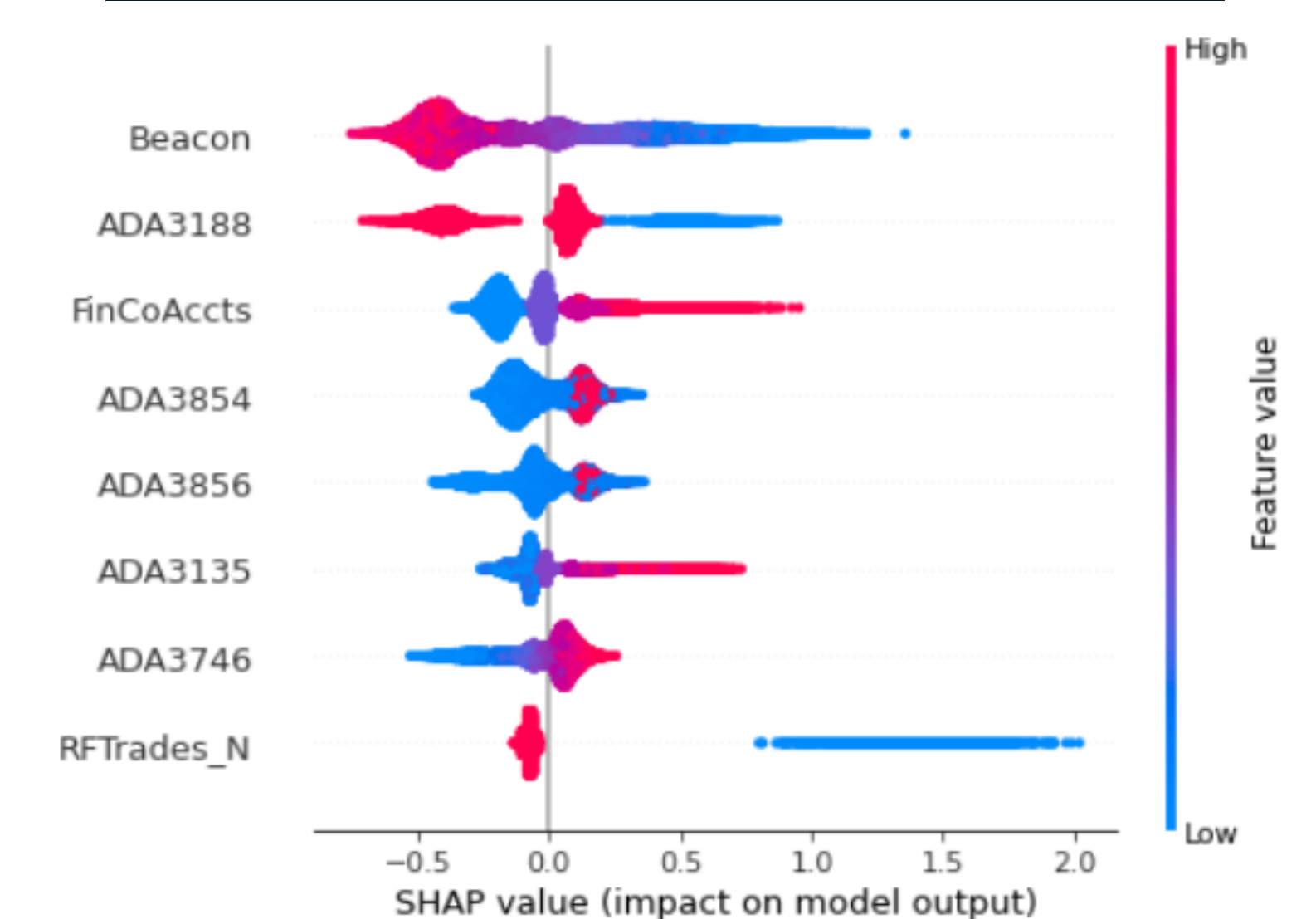
The output of these models is a predicted probability that an individual is a responder, which is used to graph the Receiver Operating Characteristic (ROC)



The Area Under the Curve (AUC Score) of the ROC is the main metric that is used to compare classification models

AUC SCORE COMPARISON		
0.900	0.871	0.862
XGBoost	Production Model	Last Year's Team

FEATURE IMPORTANCE



Relative importance of the top features in our model determined using Shapley Additive Explanations (SHAP)