

SUCCESS STORIES - SUMMARY

Project Name	Client	Brief Description	Key Analyses
Credit Modeling	Financial services firm	Evaluated advanced classification algorithms and developed a new approval model using machine learning algorithms (such as Random Forest and XGBoost) to identify & reduce default risk and improve profitability from the customers approved for financing	

CREDIT MODELING

ABOUT THE CLIENT

Client is a **financial services** company that provides point-of-sale financing to consumers making purchases at stores across the United States



SITUATION

- The **company was facing higher rates of unpaid loans due to riskier consumers being approved for financing** which led to a higher write-off rate
- Merilytics partnered with the company **to help build a new approval model to reduce default risk and improve profitability**



VALUE ADDITION

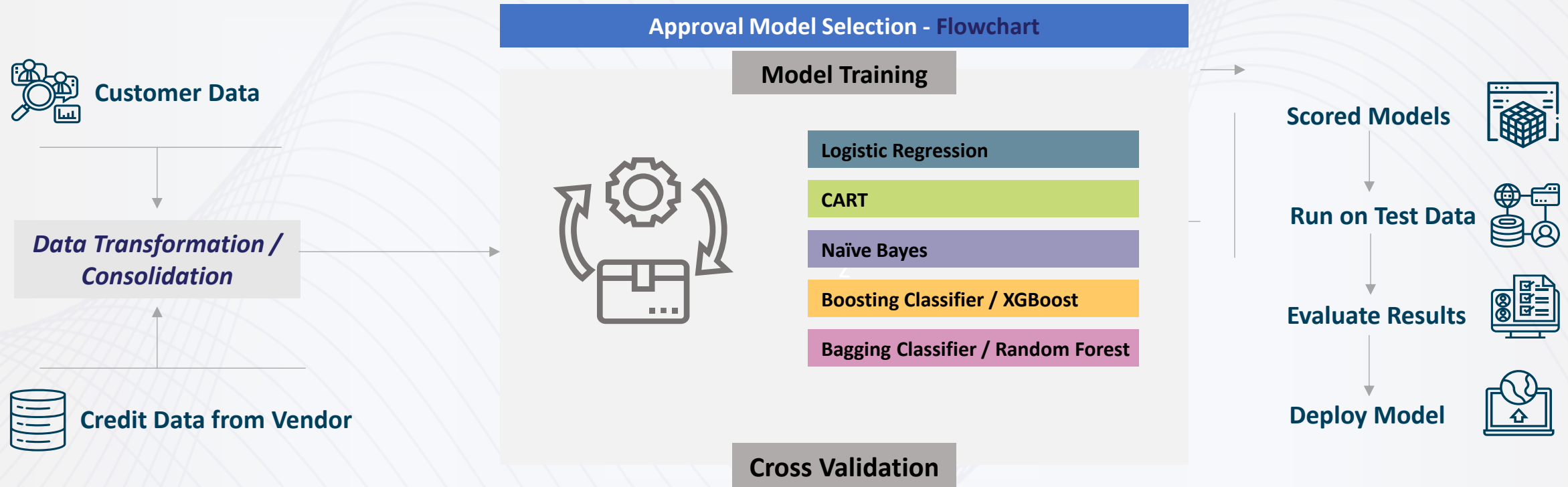
- **Evaluated advanced classification algorithms** to reduce the risk and improve the profitability of the basket of customers approved for financing
- Used machine learning algorithms (such as **Random Forest and XGBoost**) to predict the probability of customer making **payment at various stages** of the loan life cycle and probability of customer completing the entire cash flow cycle.
- Analyzed sensitivity & specificity and ROC characteristics to **select the best model** across the techniques/algorithms. The credit applications were then approved based on the classification by the newly deployed model.
- **Identified key features of the classification model** and monitored **their population stability** to trigger retraining of the model, by comparing the application pool against the validation set over time.



IMPACT

- The credit model built by Merilytics helped the client **reduce the charge-off rate** of their asset pool (by 6% on a tranche level average) and underwrite contracts within their risk appetite
- Helped the client to reduce the **delinquency rate** (by 9% on a tranche level average), improve **the terminal cash flow** and maintain borrowing balance in line with the company's annual targets

APPROACH & METHODOLOGY



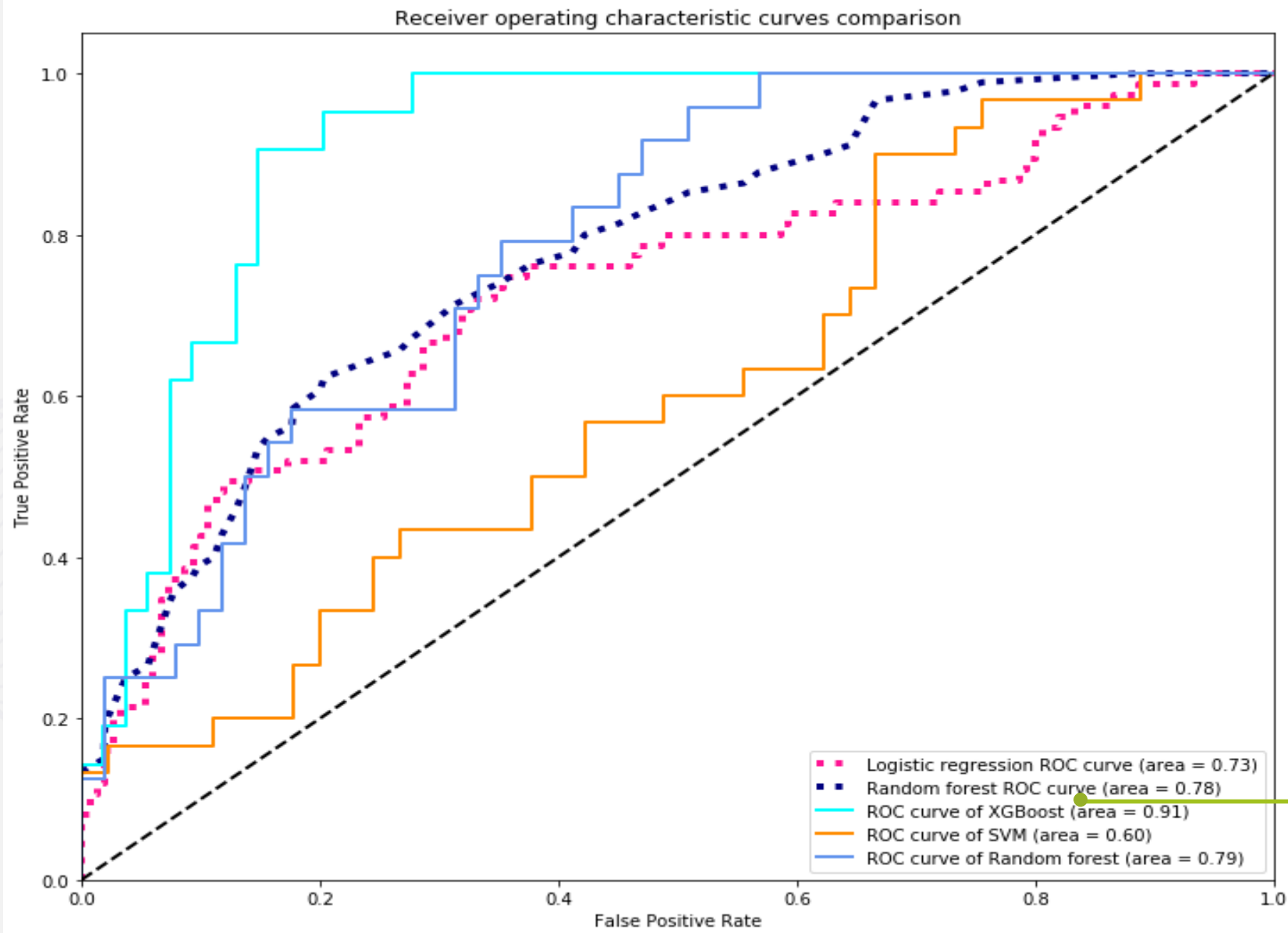
Objective and approach

- Deployed a model that would instantly approve credit applications based on customers' personal data, credit data and business' risk profile.
- Built on past 2 years return data of credit approvals made using thumb rules.
- Applied data science principles to arrive at the best classifier that would achieve business driven targets for return, delinquency and charge-off

Methodology

- Build set was created using customer personal data, income, credit scores & credit history
- Deployed machine learning algorithms like classification trees, Naïve Bayes classifier, bagging ensembles and boosting ensembles while performing 5-fold cross validation
- Models were scored on ROC characteristics & accuracy and tested on an out of time sample set and the best performing model was deployed

COMPARISON OF APPROVAL MODEL CLASSIFIERS

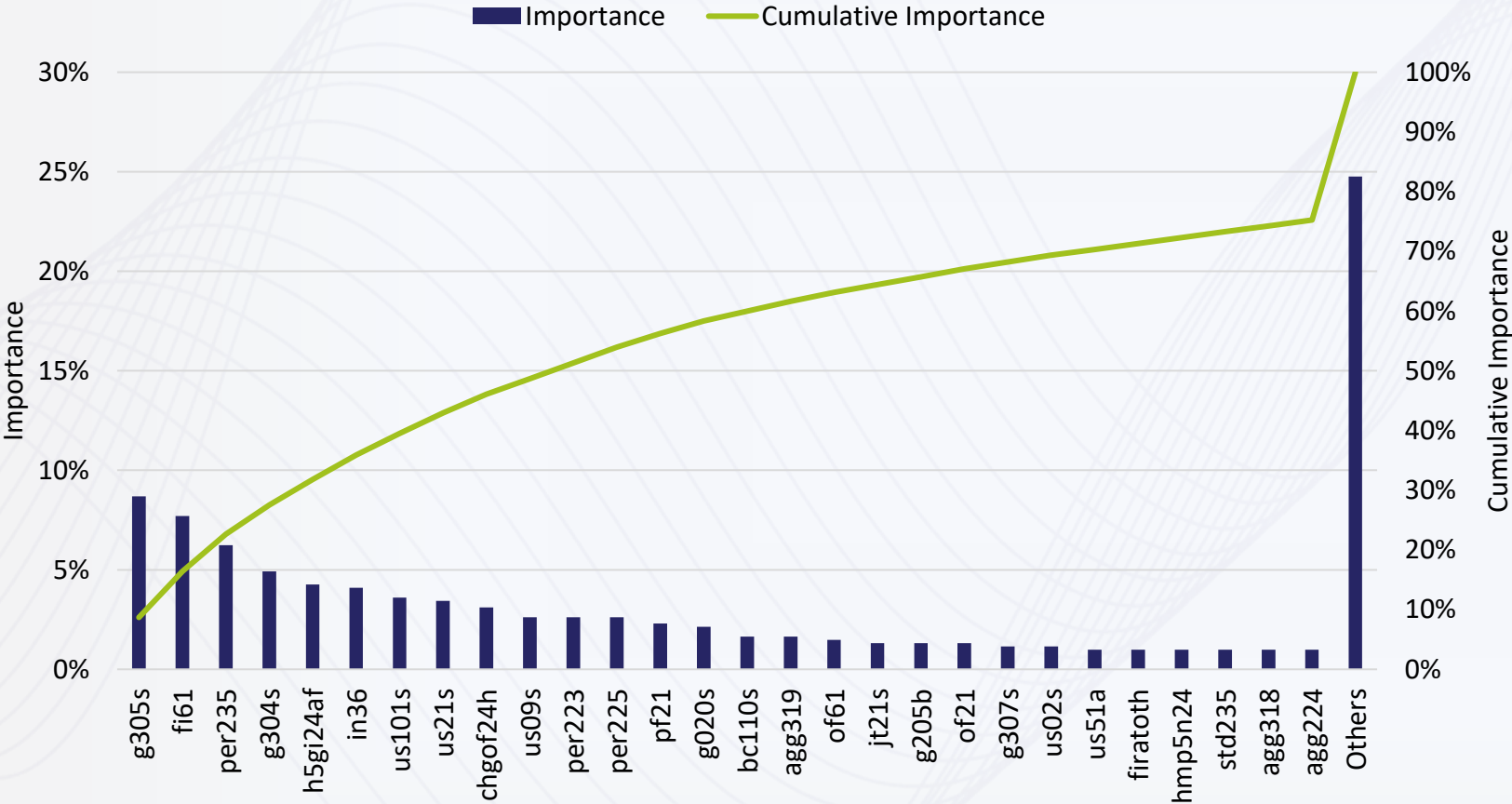


Model Selection

Based on the Return Operating Characteristics (ROC), the XGBoost algorithm, with an Area Under Curve (AUC) of 0.91 was the best performing model on the out of time test set and was thus deployed as the approval model

VARIABLE IMPORTANCE ANALYSIS

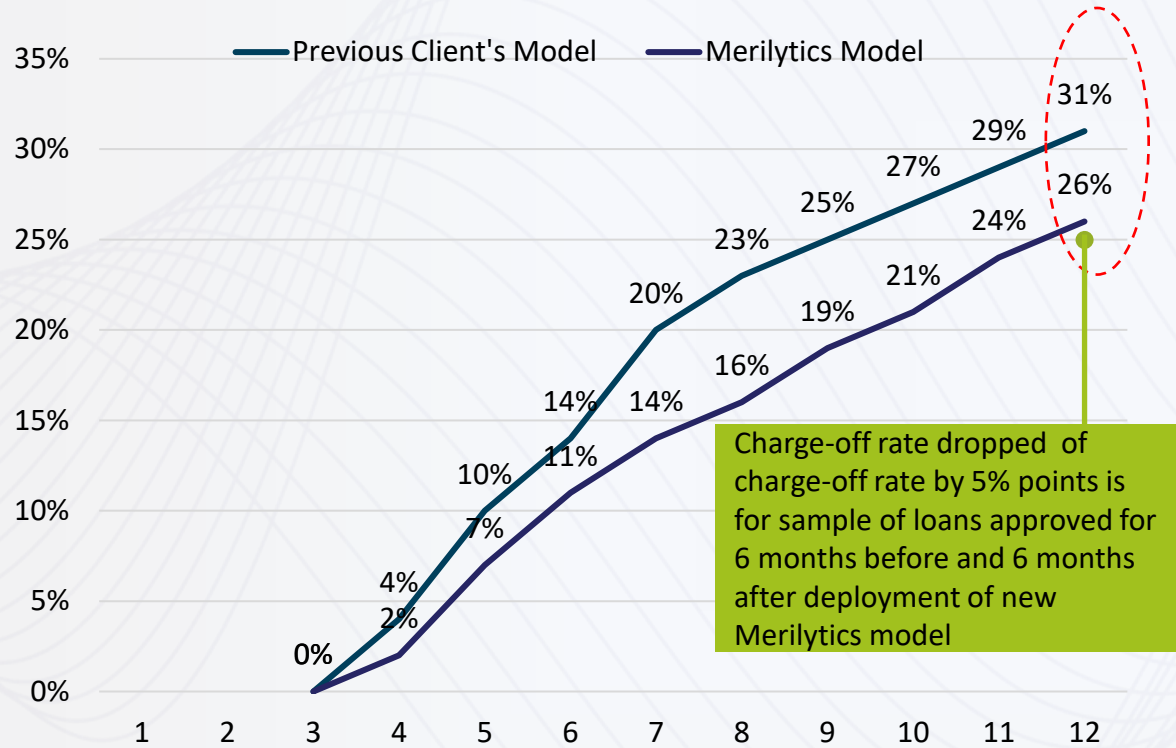
Feature importance from XGBoost



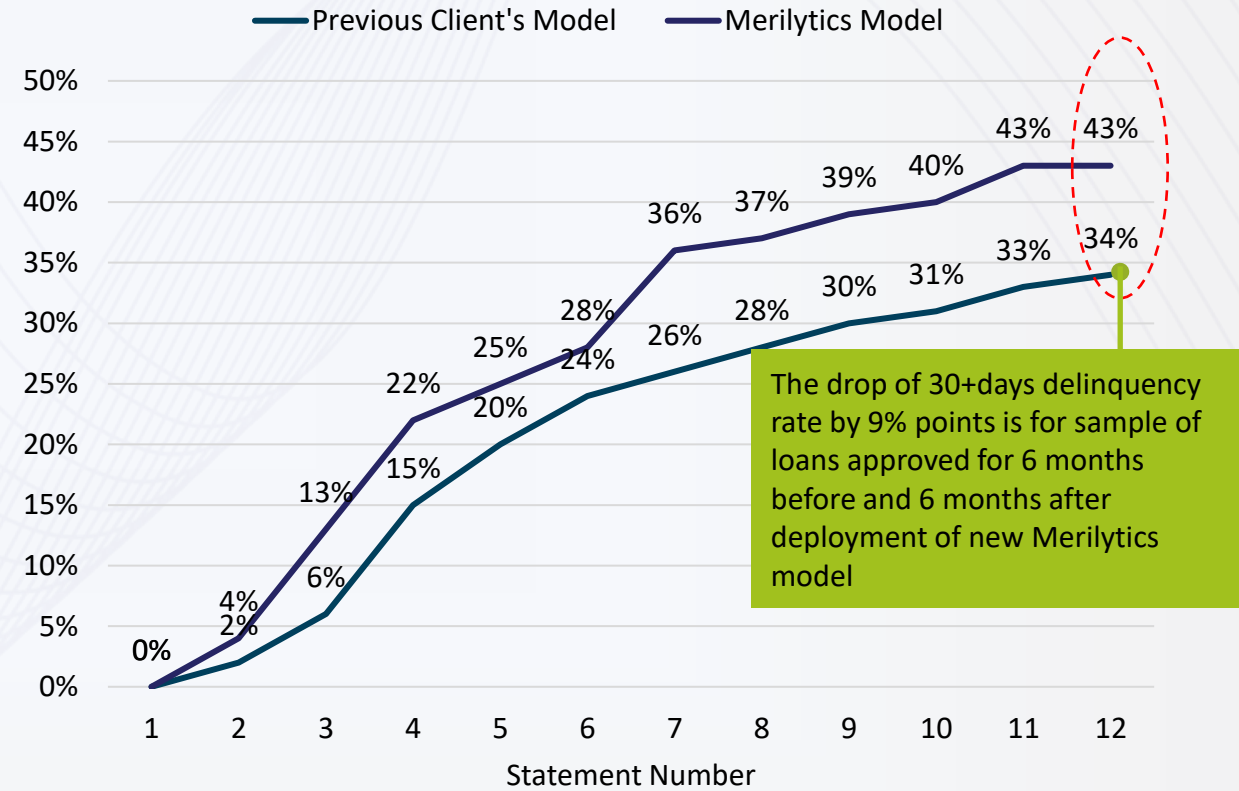
The top 28 variables (based on feature importance) of the XGBoost model include several credit scores, previous inquiry metrics, historical delinquency and payment pattern metrics

IMPACT OF MODEL DEPLOYMENT

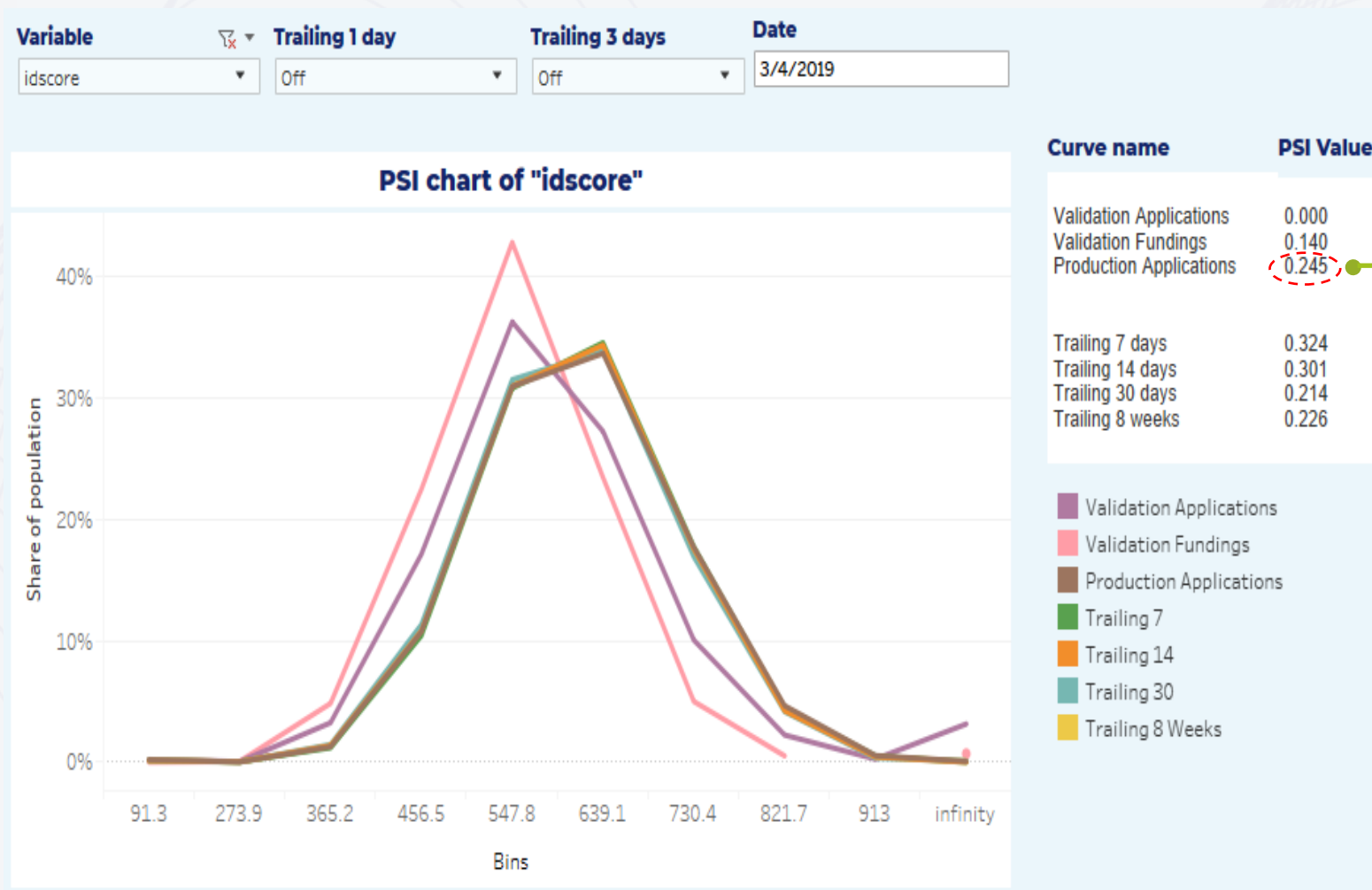
12-month term instalment loans charge-off rates - Client's naïve model vs. Merilytics model



12-month term instalment loans - 30+ days delinquency rates - Client's naïve model vs. Merilytics model



POPULATION STABILITY MONITORING



A high PSI value (> 0.2) for the production applications after benchmarking against the validation set applications would trigger a retraining of the model or reevaluating the metric

Evaluated population stability by benchmarking distribution of current applications against validation set

LEARNINGS

- Gained complete understanding on usage of Population Stability Monitoring that would be used to identify changes in the underlying model variable and trigger retraining of the model.
- Gained a good hold of a credit/loan application modelling and its linkages to risk monitoring, which can be seamlessly extended to other consumer/retail finance clients.