IMPROVING CREDIT CARD RISK SCORING

FOR AN INDUSTRY LEADING FINANCIAL SERVICES COMPANY

Elder Research examined a dozen major data mining techniques to evaluate their performance and gain insight on which credit card accounts were likely to default compared to the client's world-class baseline model. The resulting model ensemble significantly improved early identification of bad credit risks.

INDUSTRY

» Retail Banking and Financial Services

BUSINESS NEED

» Improve the performance of the client's (already world-class) credit card default risk model using modern machine learning techniques

SOLUTION

» Applied expertise in machine learning, statistics, data mining, model testing strategies, and model ensembles to produce a more effective model

BENEFIT

» Reduced the client's exposure to sub-prime credit card default

» Expanded the client's analytic arsenal with modern machine learning techniques

THE CHALLENGE

The client's model had been developed and deployed by many dozens of expert statisticians over many years. However, it had stayed within a "tried and true" logistic regression framework, and the client was interested (though pessimistic) in whether any new insights would be produced by using modern data mining techniques. Any new model needed to have significantly better predictive performance and be suitable to run in the client's production scoring environment.

THE SOLUTION

Elder Research employed the client's model build data to investigate the effectiveness of a dozen algorithmic techniques — many not common in the industry — to find more effective techniques for predicting the probability that credit card accounts would default within three months, among credit card prospects in an underserved population. The client provided training data in addition to a hold out data sample used to confirm the improved performance.

Our goal in every modeling project is to produce an implementable model with the best out-of-sample error — i.e., the model that performs the best when given new, unseen data. To best achieve this goal, we have mastered many modeling techniques, and in each project we study many model options, as it is often surprising which algorithms perform best in new situations. For this project, Elder Research applied a robust testing framework to evaluate alternative machine learning approaches. We built and tested numerous advanced algorithms — including neural networks, support vector machines, Multivariate Adaptive Regression Splines (MARS), decision trees, and bundled trees — to determine which technique was most effective. We also tuned each individual model to perform competitively with the client's baseline model.

Because combinations of different methods or algorithms, called ensembles, usually outperform a single algorithm, we also tested and ranked the predictions from many combinations of the best algorithms and found an ensemble model that demonstrated record-breaking performance on out-of-sample data.

ELDER RESEARCH
— DATA SCIENCE · AI · MACHINE LEARNING —

Figure 1 shows the test results for the individual and combined models. The ensemble model combining multivariate adaptive regression splines, polynomial networks and neural networks was the most effective at predicting credit card accounts that would default. This approach of using a collection of techniques has become a best practice for predictive analytics.

This process resulted in a stable predictive model with performance that exceeded the client's production models, despite the considerable effort that had been invested in their existing model.

Results

The new model ensemble reduced the number of credit card accounts that defaulted on the client's evaluation dataset by more than 10% when compared to their production model. Furthermore, it expanded their knowledge of how modern tools and methods could improve the effectiveness of their predictive models in general.
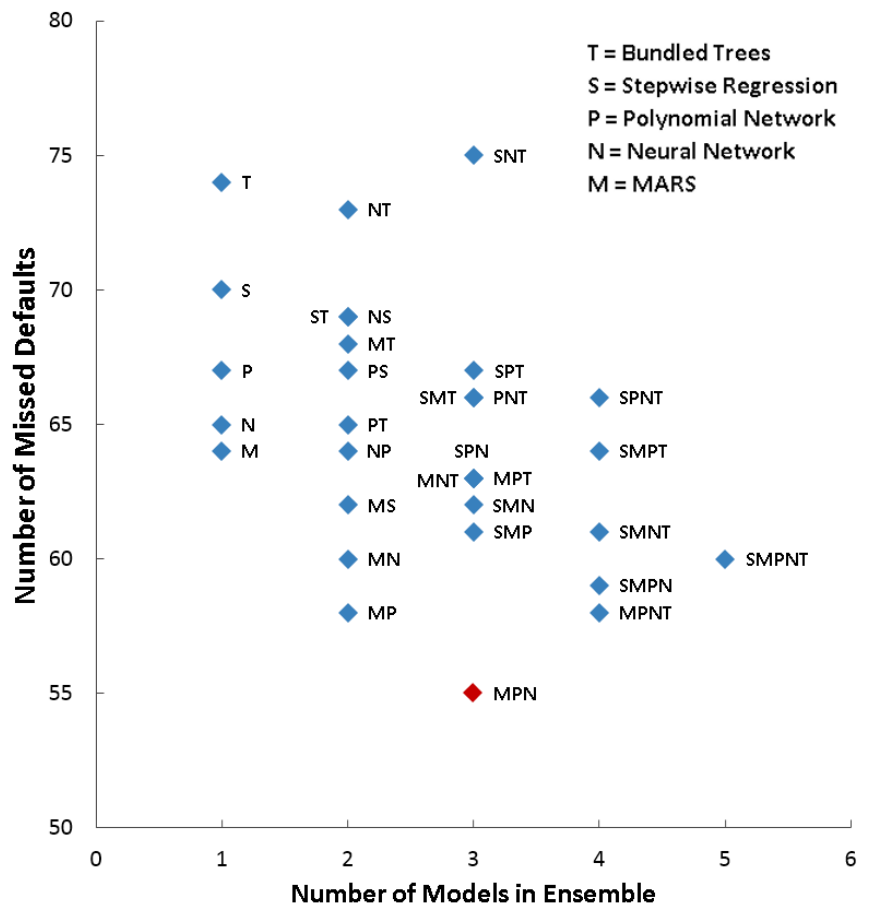

Figure 1. Comparison of the predictive performance of the individual and combinations (ensembles) of algorithms. The MPN ensemble (red marker) had the fewest number of missed defaults.

About the Client

The client for this project is a diversified bank offering a broad array of financial products and services to consumer and commercial customers. A Fortune 500 company specializing in credit cards, home loans, auto loans, banking and savings products, they are among the top ten largest banks in the United States.

About Elder Research

Elder Research is a recognized leader in the science, practice, and technology of advanced analytics. We have helped government agencies and Fortune Global 500® companies solve real-world problems across diverse industries. Our areas of expertise include data science, text mining, data visualization, scientific software engineering, and technical teaching. With experience in diverse projects and algorithms, advanced validation techniques, and innovative model combination methods (ensembles), Elder Research can maximize project success to ensure a continued return on analytics investment.