

Predictive Modeling for Imbalanced Big Data in SAS Enterprise Miner and R

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ABSTRACT

There have been a variety of predictive models capable of handling binary targets, ranging from traditional logistic regression to modern neural networks. However, when the target variable represents a rare event, these models might not be appropriate as they assume that the distribution in the target variable is balanced. In this article, the impact of multiple resampling methods on conventional predictive models is studied. These resampling techniques include the methods of oversampling of the rare events, undersampling of the common events in the data, and synthetic minority over-sampling technique (SMOTE). The predictive models of decision trees, logistic regression and rule induction are applied with SAS Enterprise Miner (EM) software to the revised data. The studied data set is of home mortgage applications which includes a target variable with an occurrence rate of the rare event being 0.8%. The authors varied the percentage of the rare event from the original of 0.8% up to 50% and monitored the associated performances of the three predictive models to see which one worked the best.

KEYWORDS

Data Mining, Imbalanced Data, Oversampling, Predictive Modeling, Rare Events, SAS Enterprise Miner, Synthetic Minority Over-Sampling Technique (SMOTE), Undersampling

1. INTRODUCTION

In binary classification, when the proportion of one class in the target variable is significantly smaller than the other class (imbalanced data), one faces the problem of classifying a rare event, or imbalanced classification. Traditional classification modeling techniques such as logistic regression and decision trees generally work quite well with a balanced data. However, with a rare event variable, when the data set is very large, and the event of interest is very small, most of these classification methods typically fail to detect the rare event. This can be particularly true when the percentage of the rare event is extremely small, as in the example presented here, where the rare event occurs in less than 1% of the observations. In this situation, all observations are predicted as being in the group consisting of the more dominant or common event.

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