RESEARCH ARTICLE   OPEN ACCESS

Customer Relationship Management Based On Decision Tree Induction

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ABSTRACT

With the rampant competition in the domestic and international business, the Customer Relationship Management (CRM) has become one of matters of concern to the enterprise. CRM takes the customers as the center; it gives a new life to the enterprise organization system and optimizes the business process. In an effort to help enterprises understand their customers' shopping behavior and the ways to retain valued customers, we propose data mining techniques. As a rising subject, data mining is playing an increasingly important role in the decision support activity of every walk of life. This paper mainly focused on the research of the customer classification and prediction in commercial banks based on Decision Tree classifier that accommodates the uncertainty inherent in predicting customer behavior.

Keyword:- Customer Relationship Management; Data Mining; Decision Tree Classifier.

I. INTRODUCTION

With the rampant competition in the domestic and international business, the Customer Relationship Management (CRM) has become one of matters of concern to the enterprise. CRM can be defined as the process of predicting customer behavior and selecting actions to influence that behavior to benefit the company, as in [1], usually leveraging on information technology and database-related tools. This important concept has been given a new lease of life because of the growth of the Internet and E-business. Customer Relationship Management takes the customers as the center.

It gives a new life to the enterprise organization system and optimizes the business process. By predicting customer needs in advance, business can then market the right products to the right segments at the right time through the right delivery channels. Customer satisfaction can also be improved through more effective marketing. One of the important issues in customer relationship management is customer classification and prediction, by which a company classifies its customers into predefined groups with similar behavior patterns. Usually, companies build a customer prediction model to find

the prospects for a specific product. In this case. we classify prospects into either purchasing or non-purchasing groups. This kind of knowledge may create a variety of marketing opportunities for the company such as one-to-one marketing, direct mailing, and sales promotion via telephone or e-mail.

As a rising subject, data mining is playing an increasingly important role in the decision support activity of every walk of life, as in [2]. Data mining uses sophisticated statistical processing or artificial intelligence algorithms to discover useful trends and patterns from the extracted data so that it can yield important insights including prediction models and associations that can help companies understand their customer better. Examining and analyzing the data can turn raw data into valuable information about customer's needs.

For example, faced with the increasingly serious situation in customer churning, enterprises need data mining technology to analyze the churning in order to take measures to maintain valuable customers, and reduce customers churning to lower economic losses. Therefore customer classification and prediction is the base of the implement of CRM. It's the precondition to analyze and forecast customer's

pattern of consumption, and the premise of personalized marketing services and management. In this study, we suggest a customer classification and prediction model in commercial bank that uses collected information of customers as inputs to make a prediction for credit card proposing. In particular, we chose Decision Tree classifier from the various data mining methods because it is easy to design, apply and maintain.

The paper is organized as follows. Section 2 provides a brief review of previous research and the next section describes our proposed model, the Decision Tree classifier approach. In Section 4, the research of the example is given to apply the algorithm to customer classification and prediction in commercial bank. The final section presents the contributions and future researches of this study.

II. LITERATURE REVIEW

In recent years, data mining has gained widespread attention and increasing popularity in the commercial world, as in [3],[4]. According to the professional and trade literature, more companies are using data mining as the foundation for strategies that help them outsmart competitors, identify new customers and lower costs, as in [5]. In particular, data mining is widely used in marketing, risk management and fraud control, as in [6].

Although recent surveys found that data mining had grown in usage and effectiveness, data mining applications in the commercial world have not been widely. Literature about data mining applications in the fields about economic and management are still few. With the realization of importance of business intelligence, we need to strengthen the research on data mining applications in the commercial world.

III. DECISION TREE CLASSIFIER ALGORITHM

Decision Tree classification is based on Decision Tree Induction. We had several algorithms for decision tree construction apart from that this paper chooses simple and efficient algorithm i.e., HUNT'S algorithm. Decision Tree classifiers have also exhibited high

accuracy and speed when applied to large databases.

Hunt's algorithm:

The Decision Tree classifier works as follows,

In Hunt's algorithm, a decision tree is grown in a recursive fashion by partitioning the training records into successively purer subsets. Let D_t be the set of traini9ng records that are associated with node t and $y=\{y_1,y_2,y_3,\ldots\ldots,y_c\}$ be the class labels. The following is a recursive definition of Hunt's algorithm.

1. If all the records in D_t belong to the same class y_t, then t is a leaf node labeled as y_t.

2. If D_t contains records that belong to more than one class, an attribute test condition is selected to partition the records into smaller subsets. A child node is created for each outcome of the test condition and the records in D_t are distributed to the children based on the outcomes. The algorithm is then recursively applied to each child node. Let us consider the following example.

Tid	Refund	Marital Status	Taxable Income	Cheat
1	Yes	Single	125K	No
2	No	Married	100K	No
3	No	Single	70K	No
4	Yes	Married	120K	No
5	No	Divorced	95K	Yes
6	No	Married	60K	No
7	Yes	Divorced	220K	No
8	No	Single	85K	Yes
9	No	Married	75K	No
10	No	Single	90K	Yes

To illustrate how the algorithm works, consider the problem of predicting whether a person will cheat or not. In the above example each record contains a single node with class label cheat=no, which means most of the persons will refund the amount.
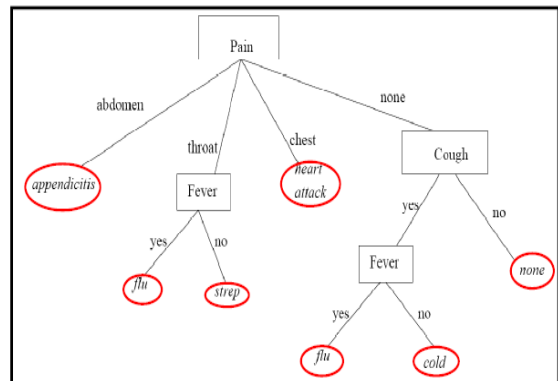
Decision Tree Classification Example
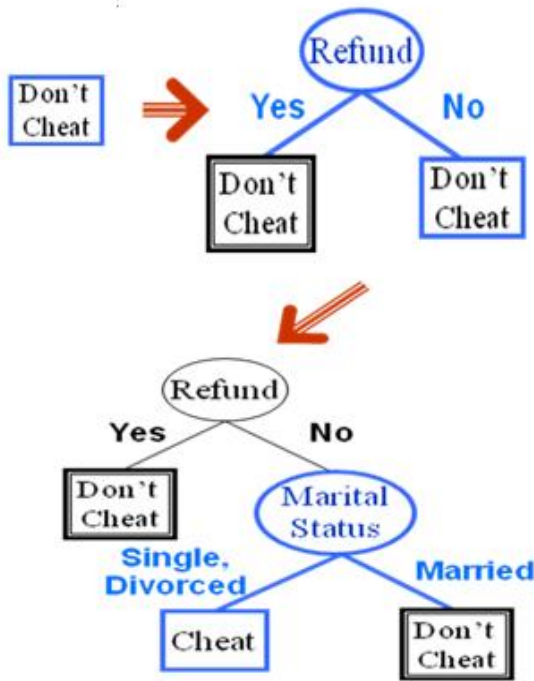
IV. DECISION TREE ALGORITHM

Algorithm 4.1 A skeleton decision tree induction algorithm.

TreeGrowth (E, F)
1: **if** stopping_cond(E,F) = $true$ **then**
2:   $leaf$ = createNode().
3:   $leaf.label$ = Classify(E).
4:   **return** $leaf$.
5: **else**
6:   $root$ = createNode().
7:   $root.test\_cond$ = find_best_split(E, F).
8:   let $V = \{v | v$ is a possible outcome of $root.test\_cond$ $\}$.
9:   **for** each $v \in V$ **do**
10:     $E_v = \{e \mid root.test\_cond(e) = v$ and $e \in E\}$.
11:     $child$ = TreeGrowth(E_v, F).
12:     add $child$ as descendent of $root$ and label the edge $(root \rightarrow child)$ as v.
13:   **end for**
14: **end if**
15:. **return** $root$.

V. CONCLUSION

Data mining provides the technology to analyze mass volume of data and/or detect hidden patterns in data to convert raw data into valuable information. This paper mainly focused on the research of the customer classification and prediction in Customer Relation Management concerned with data mining based on Decision tree classification algorithm, which have a try to the optimization of the business process. The study will help the company to analyze and forecast customer's pattern of consumption, and the premise of personalized marketing services and management. Although the paper focuses mainly on the banking industry, the issues and applications discussed are applicable to other industries, such as insurance industry, retail industry, manufacture industries, and so on.

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