Chapter 22

A Fuzzy Logic Approach for the Assessment of Online Customers

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ABSTRACT

A key challenge for companies in the e-business era is to manage customer relationships as an asset. In today's global economy this task is becoming simultaneously more difficult and more important. In order to retain the potentially good customers and to improve their buying attitude, this chapter proposes a hierarchical fuzzy classification of online customers. A fuzzy classification, which is a combination of relational databases and fuzzy logic, allows customers to be classified into several classes at the same time and can therefore precisely determine the customers' value for an enterprise. This approach allows companies to improve the customer equity, to launch loyalty programs, to automate mass customization, and to refine marketing campaigns in order to maximize the customers' value and, this way, the companies' profit.

INTRODUCTION

The growing importance of e-business in today's economy forces enterprises to adapt their behaviour towards the different players in the market. This is particularly true for the customer relationship management (CRM) as the traditional means based on human relationships are no longer available. In this area, the customer retention and the cross/add-on selling are special issues because the global economy enabled by the Internet allows, on the one hand, the companies to offer their products or services worldwide and, on the other hand, also allows the customers to easily compare the different products/services and their prices.

This chapter proposes a new approach for managing customer relationships based on the customer equity principle by the means of a fuzzy classification (cf. Meier et. al. 2005). Unlike a sharp classification, a fuzzy classification allows elements to be classified in several classes at the same time. The notion of partial membership in the different classes provides more information by integrating the potential and the possible weaknesses of the classified elements. This approach can therefore precisely determine the customers' value according to an enterprise. In order to better retain the potentially good customers and to improve their buying attitude, the fuzzy classification approach can improve the customer equity, launch loyalty programs, automate mass customization and refine marketing campaigns. Other strengths of the fuzzy classification approach are the ability to work on a semantic level and the possibility of decomposing complex classifications into a hierarchy of classifications. The decomposition mechanism allows classifications to keep a small number of classes with a proper semantic even if many attributes are taken into account.

In practice, information systems are often based on very large data collections, mostly stored in relational databases. Due to an information overload, it is becoming increasingly difficult to analyze these collections and to generate marketing decisions (Edmunds and Morris 2000). In this context, a toolkit for the analysis of customer relationships which combines relational databases and fuzzy logic is proposed. Fuzzy logic, unlike statistical data mining techniques such as cluster or regression analysis, enables the use of non-numerical values and introduces the notion of linguistic variables. Using linguistic terms and variables results in a more human oriented querying process.

The proposed toolkit reduces the complexity of customer data and extracts valuable hidden information through a fuzzy classification. The main advantage of a fuzzy classification compared to a classical one is that an element is not limited to a single class but can be assigned to several classes. Furthermore, each element has one or more membership degrees which illustrate to what extend this element belongs to the classes it has been assigned to. The notion of membership gives a much better description of the classified elements and also helps to reveal the potential or the possible weaknesses of the considered elements.

In everyday business life, many examples can be found where fuzzy classification would be useful (Zadeh et al. 1997; Cox 1995). In CRM for instance, a standard classification would sharply classify customers of a company into a certain segment depending on their buying power, age and other attributes. If the client's potential of development is taken into account, the clients often cannot be classified into only one segment anymore, i.e. customer equity. Other examples are risk management in an insurance company or client's credit worthiness in a bank. In the last case, studies have shown that with a sharp classification, clients with almost similar risks were classified very differently. The opposite happened too, that is with clearly different properties the clients' overall judgment was very similar.

FUZZY CLASSIFICATION TOOLKIT

The proposed fuzzy classification toolkit is based on an extension of the Structured Query Language SQL. SQL is the standard for defining and querying relational databases. By adding to the relational database schema a context model with linguistic variables and fuzzy sets, the query language has to be extended. The proposed extension is the fuzzy Classification Query Language fCQL, described by Schindler (cf. Schindler 1998).

The classification language fCQL is designed in the spirit of SQL. Instead of specifying the attribute list in the select-clause, the name of the object column to be classified is given in the classify-clause. The from-clause specifies the considered relation, just as in SQL. Finally, the

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