

# Chapter 53

## Fuzzy Target Groups in Analytic Customer Relationship Management

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### ABSTRACT

*Scoring models yield continuous predictions instead of sharp classifications. Scoring customers for profitability, loyalty, or product affinity corresponds to an inductive fuzzy classification: The model represents a continuous membership function mapping the set of customers into the fuzzy set of interesting customers – the fuzzy target group. This chapter presents a method for membership function induction based on normalized likelihood ratios. Applications of this method are proposed for selection, visualization, and prediction in the field of analytics in general, and for customer profiling, target group definition and customer scoring specifically for analytic customer relationship management. A real world case study is described. Furthermore, an implementation of the proposed method, developed at the research center for fuzzy marketing methods (FMsquare<sup>1</sup>), is presented.*

### INTRODUCTION

#### Management Summary

In this Chapter, the application of analytics (quantitative decision support) to customer relationship management (CRM) is discussed. It is shown how three analytic techniques, selection (find-

ing relevant attributes), visualization (plotting relevant associations) and prediction (estimating relevant class membership) help increase success of CRM-based marketing activities. Furthermore, it is shown how inductive fuzzy logic techniques provide a technical means to support these three types of analyses, and a prototype implementation is presented.

The benefit of analytic CRM is its *focusing on relevant information in order to increase ef-*

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*ficiency*. Selection, visualization and prediction can help optimize efficiency of CRM and Marketing resource investment by *quantitative decision support*. The fuzzy logic method presented in this chapter, *inductive fuzzy classification (IFC)*, is a research approach which can be applied to support decisions in CRM-based marketing either in a human oriented or automated approach. Its benefit is (1) a selection *and relevance filtering* algorithm which works for both numeric and symbolic data; (2) a standardized semantically *intuitive visualization* technique for human decision makers; and (3) a method *to increase predictive accuracy* of existing models by transforming enterprise information into the fuzzy domain.

The basic idea is to compute fuzzy membership degrees to desirable targets from existing data (likelihood-based inductive approach). The resulting models, called *membership functions*, can be used in targeted database marketing in order to identify relevant customer attributes regarding a target such as product affinity; to plot the corresponding data-based target associations of relevant customer attributes in two dimensions; and *to improve campaign response rates* and maximizing efficacy of predictive models by transforming customer attributes into membership degrees to target likelihood. Specific visual examples can be found in Figures 2, 3, and 5. The section Case Study shows a real world instance.

## **Fuzziness**

The world is not just black and white: Sometimes, statements are in-between true and false. This gradual concept of truth is the basis for fuzzy logic or approximate reasoning, as proposed by Zadeh (1975) and Bellman & Zadeh (1977). Fuzzy Logic, based on the concept of fuzzy sets introduced by Zadeh (1965) allows propositions with a gradual truth value and thus supports approximate reasoning, gradual and soft consolidation and non-exclusive classification. Fuzziness is an imprecision of boundaries, of concepts that are

not clearly defined. Fuzzy logic provides a mathematically precise definition of fuzzy concepts, if those concepts are ordinal, by assigning a gradual membership degree to its elements. Fuzzy propositions lead to fuzzy classes, which allow gradual, fuzzy class boundaries. Fuzzy classification is a method for imprecise data consolidation, where the degree of membership in classes is gradual (Del Amo, Montero, & Cutello, 1999). The application of fuzzy classification to analytical customer relationship management (aCRM) has the advantage of precisiation of fuzzy concepts (Zadeh, 2008, p. 14) in the context of decision support for direct customer contact (Werro, 2008). This precisiation can be achieved by inducing membership functions to fuzzy target classes (Setnes, Kaymak, & van Nauta Lemke, 1998).

## **Analytics**

Analytics is *the method of logical data analysis*<sup>2</sup>. According to Zimmermann (1997), data analysis is the *search for structure in data*. The more data is available, the more complex it becomes to find relevant information. Consequentially, enterprises analyze their data in order to gain useful insights. *Business Analytics* is defined as “a broad category of applications and techniques for gathering, storing, analyzing and providing access to data to help enterprise users make better business and strategic decisions (Turban, Aronson, Liang, & Sharda, 2007, p. 256).

The ability of enterprises to analyze the potentially infinite space of available data— their capacity of business analytics — is a major competitive advantage. Companies that use analytics as key strategies are called analytics competitors by Davenport (2006). They can differentiate themselves through a better customer understanding in a time when products and technologies are becoming more and more comparable. Analytics competitors apply predictive modeling to a wide range of fields such as customer relationship management, supply chain management, pricing,

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