



## **Chapter XIX**

# **Data Mining in Designing an Agent-Based DSS**

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## **ABSTRACT**

*The aim of this work is to present a data-mining application to software engineering. Particularly, we describe the use of data mining in different parts of the design process of an agent-based architecture for a dynamic decision-support system.*

*The work is organized as follows: An introduction section defines the characteristics of a dynamic decision-support system and gives a brief background about the use of data mining and case-based reasoning in software engineering. A second section describes the use of data mining in designing the system knowledge bases. A third section presents the use of data mining in designing the learning process of the dynamic decision-support system. Finally, a fourth section describes the agent-based architecture we propose for the dynamic decision support system. It implements the mechanisms designed by using data mining to satisfy the system functionality.*

## INTRODUCTION

Enterprise management involves making many different decisions. An enterprise can be generally considered as being organized in several domains in which different types of activities are performed and decisions are made. These decisions are associated to their corresponding activities but are usually closely related to decisions already made in other domains of the enterprise; that is, the different decision points of an organization often need information to be available in other enterprise domains. The enterprise integration systems provide the automatic communication among these points by transferring previously specified data (Shen & Norrie, 1999). These systems are designed based on the habitual requirements of each domain. But there exist non-foreseen situations that require information exchange. This occurs whenever new or non-habitual decisions must be made. In these cases, it is necessary to use a dynamic Decision-Support System (DSS) (Cabral et al., 2000).

*A dynamic Decision Support System is a system able to look for information, analyzing where it is available or can be generated.*

A dynamic DSS establishes contact among domains for the acquisition of necessary information for decision making. This implies that the information to be transferred and the domains to be communicated with are not specified on the system design time. The DSS itself should interpret the information requirement and infer which domain can answer it on the run time.

A dynamic DSS must operate in the following way: When a user of the system needs some information, he/she makes a query in natural language, and the dynamic DSS transfers that information requirement to a domain that can satisfy it. For that purpose, the system determines the sites that offer a greater possibility of providing the required information and those are targeted first. This defines the main functionality of this information system. Then, when it gets the answer from a domain, it takes this information to the domain that asked for it.

To develop a system with the aforementioned functionality, it must be provided with: (1) knowledge about the information that can be provided by domains; and (2) the capacity for updating that knowledge, learning from the cases that result from its operation. This chapter will present a description of how data-mining techniques have been used for designing a system with the aforementioned characteristics.

Dingsoyr (1998) presents several possible uses of data mining and case-based reasoning. He classifies these uses into two groups: data mining in case-based reasoning, and case-based reasoning in data mining. He sketches the following six possible uses:

- 1) *Data mining search is the case.* That is, the information about the search results and the whole knowledge discovery in database process might be stored in a case so that extra time will not be spent on mining the same information more than once. Rodriguez, Ramos, and Henriques (2000) presented a heterogeneous architecture for knowledge extraction from data. The architecture combines the knowledge discovery in database process with a case-based reasoning system intended to record the successful knowledge extraction experiments to be shared later.
- 2) *Case-based reasoning provides information* that can be used in providing some background knowledge about features in a database, for instance, the weight of features for a classifier can be learned.

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