

# ADMI: A Multi-Agent Architecture to Autonomously Generate Data Mining Services

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**Abstract**—This paper presents a case for an intelligent agent based framework for knowledge discovery in a distributed environment comprising multiple heterogeneous data repositories. Data-mediated knowledge discovery, especially from multiple heterogeneous data resources, is a tedious process and imposes significant operational constraints on end-users. We demonstrate that autonomous, reactive and proactive intelligent agents provide an opportunity to generate end-user oriented, packaged, value-added decision-support/strategic planning services for professionals, managers and policy makers of an organization, without the need for a priori technical knowledge. Since effective progress of an organization is grounded in good communication, experience sharing, continuous learning and proactive actions, we present an Agent-based Data Mining Info-structure (ADMI) that deploys a suite of Data Mining (DM) algorithms coupled with intelligent agents to facilitate data access, DM query specification, DM algorithm selection and DM result visualisation—i.e. automated generation of data-mediated decision-support/strategic-planning services.

**Index Terms**— Agents, Multiagent systems, Multiagent methodology, Data mining and Healthcare

## I. INTRODUCTION

Data Mining is a prevalent activity in a variety of domain whereby the operational data collected is used to provide insights into the workings of the enterprise and to use the gleaned information/knowledge to both strategise and improve performance and outcomes.

Dynamically-generated data mediated services are designed to provide strategic insights, as per a user request, from static operational data. The vantage point of these services are that they provide insights to assists healthcare analyst and policies makers to make strategic decisions or predict future consequences by taking into account the

actual outcomes of current operative values. In a healthcare context, typical services may include: Analysis, planning, trending, examine, forecasting, predicting bench marking and best practices reporting, outcomes measurement, what-if scenario analysis, comparing organization practice with organization rules, market research, effectiveness on outcomes of treatment, data analysis for organization financing, health surveillance and resource allocations.

Manually, the generation of services is a non-trivial exercise as it involves a sequence of tasks such as, the analysis of the user's request, selection of the data pertinent to the request [1], selecting and deploying an apt data mining method and finally presenting the results to the user. A preferable way of system working is to construct agent wrappers around KDD (knowledge discovery in databases) systems [2]. These agent wrappers interface to the information sources and information consumer, providing a uniform way to accessing data as well as offering additional functionalities, such as monitoring the changes and provide the services on demand. The critical question then is how to structure and organize these multiple agents to achieve user-specific dynamic data-driven services.

In our work, we investigate the dynamic and autonomous generation of data-driven services in response to a user request for a service. We present a data-mediated services system that builds on multiple intelligent agents to dynamically generate user-specific services. In this paper we present an Agent-based Data Mining Info-structure (ADMI) that deploys a suite of Data Mining (DM) algorithms coupled with intelligent agents to facilitate data access, DM query specification, DM algorithm selection and DM result visualisation—i.e. automated generation of data-mediated decision-support/strategic-planning services. ADMI is designed to service four functional components—(i) end-user interface; (ii) remote data access network; (iii) data mining engine; and (iv) strategic services—and hence comprises of multiple autonomous intelligent agents such as Interface agent, Data Mining Agent, Service Generation agent, Data Collection Agents and Agent Manager.

The aim of this paper is to introduce the intelligent agent based paradigm for distributed Data Mining (DM) from heterogeneous data repositories. The features of ADMI is its ability to realize a dynamic agent organization in which each individual agent acts to meet the user's request whilst hiding the data mining complexities from the user. This is accomplished by designing each ADMI agent with specific plan file and knowledge bases (Task schemata) which

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