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A Web Service-Based Framework for Mining E-Learning Data

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Abstract : E-learning is an evolutionary form of distance learning and has become better over time as new technologies emerged. Today, efforts are still being made to embrace E-learning systems with emerging technologies in order to make them better. Among these advancements, Educational Data Mining (EDM) is one that is gaining a huge and increasing popularity due to its wide application for improving the teaching-learning process in online practices. However, even though EDM promises to bring many benefits to educational industry in general and E-learning environments in particular, its principal drawback is the lack of easy to use tools. The current EDM tools usually require users to have some additional technical expertise to effectively perform EDM tasks. Thus, in response to these limitations, this study intends to design and implement an EDM application framework which aims at automating and simplify the development of EDM in E-learning environment. The application framework introduces a Service-Oriented Architecture (SOA) that hides the complexity of technical details and enables users to perform EDM in an automated fashion. The framework was designed based on abstraction, extensibility, and interoperability principles. The framework implementation was made up of three major modules. The first module provides an abstraction for data gathering, which was done by extending Moodle LMS (Learning Management System) source code. The second module provides data mining methods and techniques as services; it was done by converting Weka API into a set of Web services. The third module acts as an intermediary between the first two modules, it contains a user-friendly interface that allows dynamically locating data provider services, and running knowledge discovery tasks on data mining services. An experiment was conducted to evaluate the overhead of the proposed framework through a combination of simulation and implementation. The experiments have shown that the overhead introduced by the SOA mechanism is relatively small, therefore, it has been concluded that a service-oriented architecture can be effectively used to facilitate educational data mining in E-learning environments.

Keywords : educational data mining, e-learning, distributed data mining, moodle, service-oriented architecture, Weka
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