A Moodle Block for Selecting, Visualizing and Mining Students' Usage Data

C.Romero, C.Castro, S.Ventura
Department of Computer Science
University of Cordoba, Spain
cromero@uco.es, i82cavic@uco.es, sventura@uco.es

ABSTRACT

This paper describes a tool that enables instructors to select, visualize and mine students' usage data in Moodle courses. The tool has been developed in PHP language and integrated in Moodle as a block.

Keywords

Student usage data, Moodle block, data visualization, data mining.

1. INTRODUCTION

Nowadays, there are a great number of general free and commercial DM tools and frameworks [2], such as: Weka, RapidMiner, KNIME, R, SAS Entreprise Miner, Oracle Data Mining, etc. These tools can be used for mining datasets from any domain or research area. However, none of these tools is specifically designed for pedagogical/educational purposes and problems. So they are cumbersome for an educator to use since they are designed more for power and flexibility than for simplicity. Due to this fact, an increasing number of specific mining tools have been developed to solve different educational problems [5]. Of all of them, only one small subgroup of tools is specifically oriented to using Moodle data, such as:

- GISMO [1] for visualizing graphically what is happening in Moodle courses.
- Meerkat-ED [4] for analyzing student participation in Moodle discussion forums using social network analysis techniques.
- MMT tool [3] for carrying out data mining processes of Moodle data for newcomers.
- DRAL [6] for discovering relevant e-Activities for Moodle learners.

However, most of these tools are standalone applications that are not integrated into the actual Moodle interface alongside the Moodle resources, activities, modules and blocks. Only GISMO [1] is integrated into the Moodle system, but it only visualizes data and does not perform data mining. In this paper, we describe a specific tool that we have developed as a new Moodle block for visualizing and mining student usage data.

2. TOOL DESCRIPTION

Our tool has been developed in PHP language and integrated into Moodle as a new block (an item which may be added to the left or right or centre column of any page in Moodle). It consists of two main tabs or components:

2.1 Data Selection and Visualization

This tab allows instructors to select and visualize usage information about the students enrolled on a Moodle course (see Figure 1). It provides basic statistics and graphics about the students registered on the course and the resources provided in it. Instructors can select one item (student or resource) manually or the full set of students or resources. There are different types of available statistics or information (grading, historical record, questionnaires forums, resources and an overall summary).

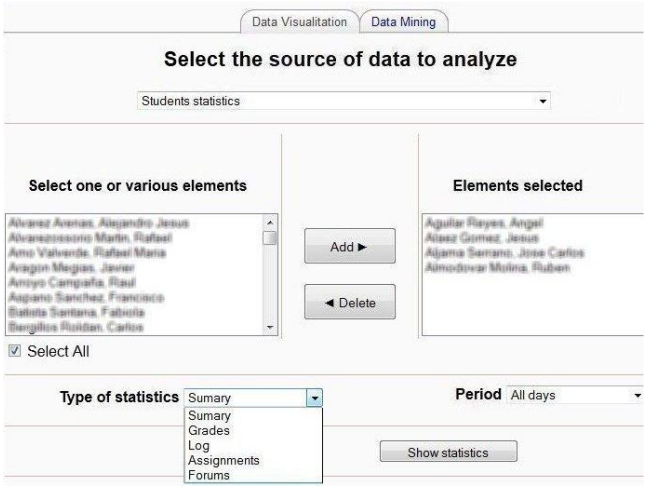

Figure 1: Main window for selecting and visualizing data.

The results can be shown in graphic mode in a pop-up window (see Figure 2) or in table mode in the current window (see Figure 3).

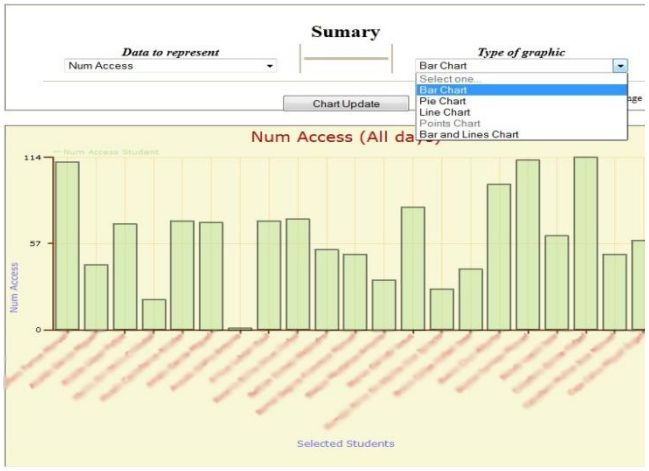

Figure 2: Bar diagram about the number of resources accessed.

In the new pop-up window (Figure 2), the instructor can select the attribute and type of graphics to visualize.

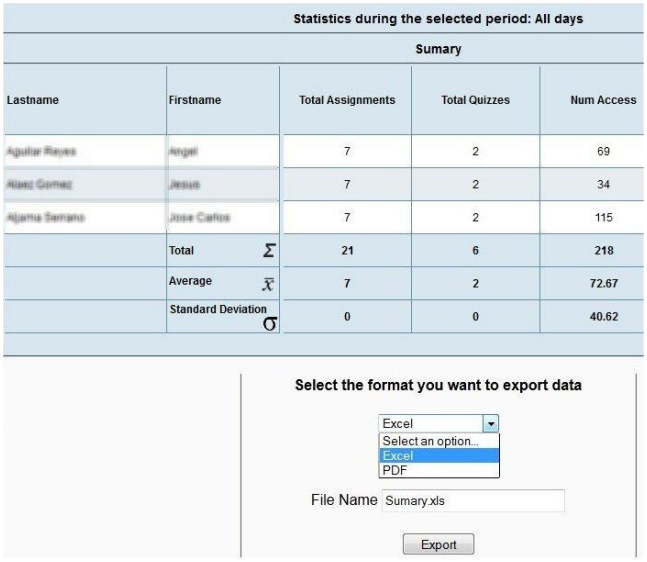

Figure 3: Summarization table of a course.

The table information (see Figure 3) shows data in columns together with the total, average and standard deviation. Finally, the table can be saved/exported to an Excel file (for mining purposes) or to a PDF file (for reporting purposes).

2.2 Data Mining

This tab enables the instructor to do data mining starting from a previously saved Excel data file. Currently, it allows three different types of data mining methods/tasks to be performed: classification, association and clustering by using C4.5, Apriori and K-means algorithms, respectively (see Figure 4).

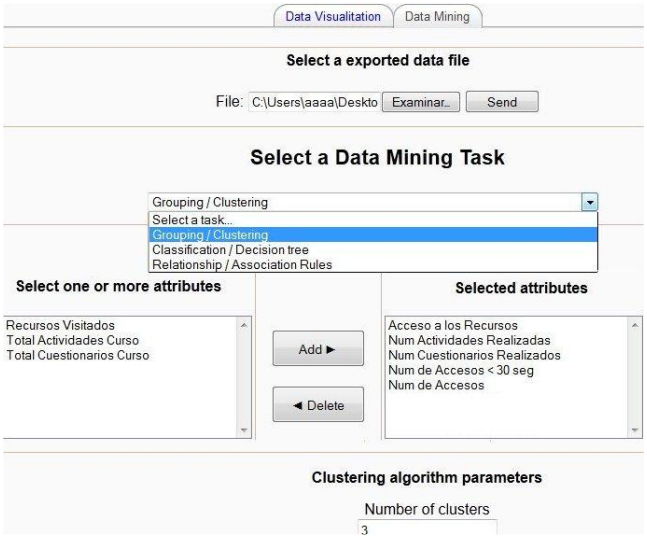

Figure 4: Main window for mining data.

The instructor also has to select both the attributes to use from the data file and the parameter values of the algorithm. Once the algorithm has been executed, the model obtained/discovered is shown and can be saved as a PDF or plain text file.

For example, Figure 5 shows the model or result (the instances together with the assigned cluster, and the centroids information) obtained after executing the clustering algorithm.

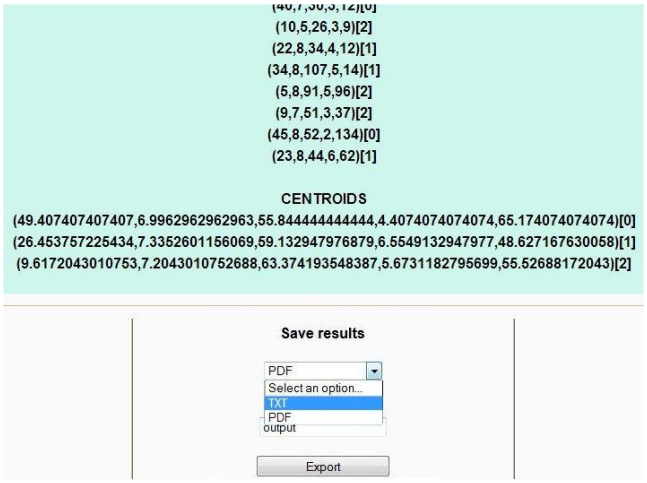

Figure 5: Result window of clustering algorithm.

3. CONCLUSIONS

In the future, we intend to add various new data mining algorithms in order to provide for more advanced algorithms of each type. Also, we would like to add a specific pre-processing step/tab that lets the instructor modify the selected data before running the data mining.

4. ACKNOWLEDGMENTS

This work was supported by the Regional Government of Andalusia and the Spanish Ministry of Science and Technology projects, P08-TIC-3720 and TIN-2011-22408, respectively, FEDER funds.

5. REFERENCES

[1] Mazza, R., Milani, C. GISMO: a Graphical Interactive Student Monitoring Tool for Course Management Systems, In International Conference on Technology Enhanced Learning, Milan, 1-8. 2004.

[2] Mikut, R., Reischl, M. Data Mining Tools. Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery, 1,5, 431–443. 2011.

[3] Pedraza-Perez, R. Romero, C., Ventura, S. A Java Desktop Tool for Mining Moodle Data. In International Conference on Educational Data Mining, Eindhoven, 319-320. 2011.

[4] Rabbany, R., Takaffoli, M., Zaïane, O. Analyzing Participation of Students in Online Courses Using Social Network Analysis Techniques. In International Conference on Educational Data Mining, Eindhoven, 21-30. 2011.

[5] Romero, C., Ventura, S. Data Mining in Eduation. Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery, In Press. 2013.

[6] Zafra, A., Romero, C., Ventura, S. DRAL: A Tool for Discovering Relevant e-Activities for Learners. Knowledge and Information Systems. In Press. 2013.