Can order of access to learning resources predict success ?

Hema Soundranayagam[1] and Kalina Yacef[2]
{hsou2856, kalina}@it.usyd.edu.au
[1] School of Arts and Sciences, Australian Catholic University, Australia
[2] School of Information Technologies, University of Sydney, Australia

Abstract. Learning management systems capture student's interactions with the course contents in the form of event logs, including the order in which resources are accessed. We build on past research which indicates there are learning benefits if students determine their own ordering of use of learning materials. We report our exploration of sequential data mining that aims to help teachers determine whether some patterns of access to learning resources are predictive of performance, especially where this may signal the need for remediation. We report first explorations of the data in a graphics course and these indicate that sequence of resource access varied between the low, medium and high achieving student groups.

Introduction

The sequence in which learners should make use of learning materials is important in designing online courses. Learning management systems (LMS) provide one-size-fits-all solution where every student is presented with the same set of learning materials in one particular order. Previous research [1] indicates that the order in which the online learning materials are accessed may have an important relationship with student learning.

Our research study explores the order in which resources students access as they solve set assessment tasks, such as tests, assignments and Exams. The presentation order of the problems (for instance easy questions followed by difficult ones) in these activities determines the sequence in which resources will be assessed in order to solve them. For instance, in a study by Pardos and Heffernan [2], the relationship between the sequence of problem order and learning in Intelligent Tutoring systems was explored using Bayesian methods. We explore the use of data mining techniques to analyse patterns of such access. While Pardos and Heffernan explored the relationship between problem order and performance, we analyse the order of resource usage and its links with learning.

Approach

The context of our work is a graphics course delivered in mixed mode. Each week students complete activities after reviewing the resources online. The resources consisted of a comprehensive tutorial guide and additional video and text based tutorial guides .Skills acquired during the weekly activities are tested using a mid-semester test and final exam. Student log data for file accesses during each week are extracted. Students were grouped, based on their achievement on the mid-semester test into high, medium and low achievement groups. The patterns within each group were analysed to identify distinctive sequences associated with each group. A key goal of the approach is to identify sequences that are more frequent among the weak students since such patterns might be used as an "early warning sign" by instructors.

Our dataset comprises 66 students taking a Multimedia system course in Semester, 2010, using the Blackboard learning management system. As an indicator of initial knowledge, students completed an eighteen question self assessment questionnaire at the start of the semester. Event logs(1421) over two weeks were analysed to obtain the patterns.

Preliminary results: Distinctive patterns of access were found for each group and patterns showed that high and medium groups frequently accessed the compressive tutorial in order to complete their tasks successfully.

References

[1]   K. Scheiter and P. Gerjets, The impact of problem order: Sequencing problems as a strategy for improving one's performance, *Proceedings of the 24th Annual Conference of the Cognitive Science Society,* pp. pp. 798-803, 2002.

[2]   Z. Pardos and N. Heffernan, Determining the Significance of Item Order In Randomized Problem Sets, *The Second International Conference on Educational Data Mining* 2009.