The Impact of New Technologies on TeleLearning

Data Mining Assisting e-Learning
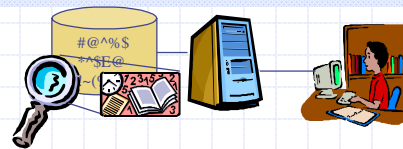
Osmar R. Zaïane
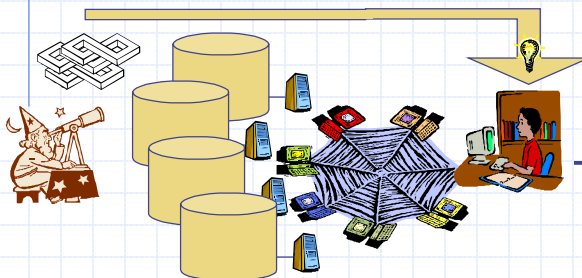
Database Systems Laboratory
Computing Science Department
University of Alberta, Canada

Today

- ➤ Web server collects data on every single click
- ➤ Logs are too big and contain gibberish
- ➤ We are overwhelmed with data and statistics
- ➤ What is collected is not really useful

Tomorrow

- ➤ A community of Web clients/servers (peer to peer) with very large bandwidth
- ➤ Logs will not only be huge but also distributed & e-learning application specific
- ➤ Intelligent automated agents will discover relevant and useful patterns
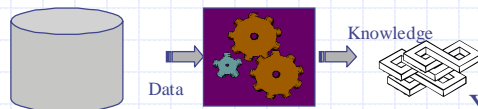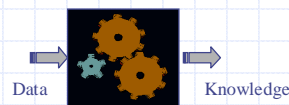- ➤ Patterns fed back to produce more intelligent e-learning applications

How ?

Our claim is that Data Mining can help to design better and more intelligent e-learning environments:
• Can help build tools to assist learners in their endeavour;
• Can help build tools to facilitate learners and course material assessment.

What is Data Mining?

Data Mining, a step in a knowledge discovery process, is the automatic extraction of <u>implicit</u> and <u>interesting</u> <u>patterns</u> from large data collections.

Data   Knowledge
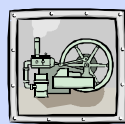

Data   Knowledge

Yes, servers are tracking learners' activities in large logs.

Yes, we could pass this data through this magic box to find some obscure patterns. So what?

Educators are not data mining savvy. How and who could use these tools to possibly interpret learners' behaviour?

Yes, the knowledge discovered could be analyzed and evaluated by knowledge experts (off-line web mining)

But what we want, and promise, is integrated web mining: The patterns discovered are fed back to a software system that seamlessly and transparently would make e-learning systems behave "intelligently".

Is it possible?

◆ Many techniques have been investigated in the e-commerce context and CRM
◆ Some can be adapted, some cannot
◆ The goals are different
◆ The user model is different
◆ But it is possible after overcoming some challenges

Enhancing web-based learning

◆ Tools to filter and classify information;
◆ Tools to find and retrieve the relevant information when you need it;
◆ Tools to find and retrieve the information when it appears or changes, and notify you;
◆ Tools that adapt to your pace and needs;
◆ Tools to predict information needs;
◆ Tools to recommend tasks and information sources;
◆ Tools that can be personalized, manually or automatically;
◆ Tools to automatically adapt course material;

Examples

You are about to start a test. Other students similar to you, who succeeded in this test have also accessed Section 3 of Chapter 2. You didn't. Would you like to access it now before attempting the test? | Yes | No |

Based on your previous visits and on your clicks today, I believe you are interested in these following subjects. You can use one of these shortcuts or simply ignore. I'll do my best next time ☺. | Ignore |
• Module 3.2 Watermarking
• Module 3.5 Encryption
• Module 4.1 Signatures

Someone answered the question you posted on the conferencing system yesterday. Would you like to read it now? | Yes | No |

3 new interesting messages on "Steganography" have been posted on 2 different conferences. Would you like to read them now? | Yes | No |
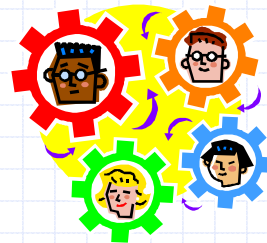
What we want

These tools should be
- ◆ Non-intrusive;
- ◆ Secure;
- ◆ Integrated;
- ◆ Adaptable;
- ◆ Controllable;
- ◆ Automatic or semi-automatic;
- ◆ Useful;
- ◆ For learners;
- ◆ For educators;

For Educators

- Assist in assessing the progress and achievements of individual learners;
- Classify learners in groups based on their needs in guidance and monitoring;
- Automatically categorize messages sent on conferences;
- Appraise the course structure effectiveness in terms of visits;
- Evaluate and measure the course structure effectiveness in terms of learners' achievements;
- Suggest path pruning and shortening;

Significant Challenges

- Web logs need to track learning activities and not simple clicks. We need a specific e-learning application server.
- Privacy of learners and learner's inhibition.
- Subjectivity of natural languages.
- Reliability
- The bias of adaptability.
- Flexibility for new learning models.
- Not compromising the learning process.
- Integrity of learning.
- New and specific data mining techniques.

Conclusion

- Educators using web-based courseware are in need of non-intrusive and automatic means to get objective feedback from learners in order to:
  - Follow the learning process;
  - Appraise the on-line course structure effectiveness;
  - Assess learners activities;
- On-line learners can benefit from an intelligent tracking system that could:
  - Restructure sites to personalize courseware;
  - Adapt to the progress of the learner;
  - Help the learner by giving hints and shortcuts.
- Both issues can and will be solved with Data mining and machine learning techniques.

Will we have more and better learning this way?