UNIVERSITY OF MINNESOTA
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Personalized Online Self-Learning System (POSLS™)

A set of machine learning algorithms to enable hyper personalization of online learning.

IP Status: US Patent Pending; Application number US20230038173A1

Applications

- Online education - Massive Open Online Courses (MOOCs)

Key Benefits & Differentiators

- **Understand student trajectory** using course structure, student engagements, etc.
- **Predict student performance** on next exercise given performance on the past exercises
- **Dynamic thread recommendation** based on student's interests and evolving needs.
- **Optimize learning** by aligning student's implicit goals and recommending next activity

Overview - Adaptive Personalization of Online Learning

The Massive Open Online Courses (MOOCs) provided by learning platforms such as edX, Coursera, and Udacity have changed the educational landscape across the globe. While they offer numerous advantages over conventional education in regards to time, place, cost, accessibility, etc, these platforms face various issues. First, MOOCs currently offer a one-size-fits-all system. From learning content to taking tests, MOOCs today largely resemble linear, classroom teaching where learners fit within predetermined parameters that leave little room for individualization. Second, communication and information diffusion in MOOCs is limited, and thus the emergent learner behaviors are difficult to observe. Third, the overwhelming number of courses provided by the online learning platforms results in an overload of information for the learners, often leading to confusion, unproductive browsing, frustration, and dropouts.

Researchers at the University of Minnesota have developed a set of machine learning algorithms that can enable hyper personalization of online learning. By leveraging rich learning behavior data generated through learners' interaction in existing MOOC platforms, the researchers have developed models to predict student performance and their interest trajectory, and make recommendations accordingly. The Relation-aware self-attention model for Knowledge Tracing (RKT) is a recurrent neural network layer that incorporates the contextual information that integrates both the exercise relation information (through their textual content as well as student performance data) and the forget behavior information. The Student Interest Trajectory-based Recommendation (SITRec) models the dynamic nature of student interest, thread contents, and course structure using two recurrent neural networks. Deeper understanding of a student's interest and behavior using these models enable course content and thread recommendations that are individualized to the student's evolving needs.

This set of algorithms can be used for providing a better personalized online learning system that keeps students engaged. In addition, this service can help the teachers to understand the

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Software & IT/Algorithms
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different behaviors of learners enrolling in their courses. In the current online learning system, instructors are unaware of the behaviors of different learners such as, if they are facing difficulties on a particular course topic. This set of algorithms can help the teachers by notifying them the popular behaviors of learners enrolled in their courses.

Phase of Development

TRL: 5-6

Prototype tested in a relevant environment. Extensive experiments on real-world datasets show that this model outperforms state-of the-art knowledge tracing methods to predict student interest trajectories.

Desired Partnerships

This technology is now available for:

- License
- Sponsored research
- Co-development

Please contact our office to share your business' needs and learn more.

Researchers

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