Using the MOOClet Framework as a Problem Formulation to apply Machine Learning to automatically improve modular online educational resources through Experimentation and Personalization

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Data-Driven Education
How do we improve courses and learners’ interactions with them using data, and algorithms?

Given a course, improvements can be made by creating alternative versions, and then testing which versions maximize learning.

On the other hand, this one-size-fits-all assumption neglects the option of testing which versions are best for which students.

How might we formalize the optimization problem of maximizing learning and engagement in online courses?

How to do this by changing which versions of a resource are presented?

One Problem Formulation

With respect to Software Implementation a MOOClet is defined as any modular component of an online course for which:

- Multiple MOOClet-Versions can be authored
- Which of these MOOClet-Versions is presented can be determined by a function (called the MOOClet-Function) applied to variables associated with each student in a User Variable Store.
- The User Variable Store allows dynamic updating and addition of variables, from any MOOClet and/or an external API.

Optimized with Multi-armed Bandit

Arms: (A-Video, B-Video + Question)

Reward: Quiz Score

Optimized: Eventually gives B-Video + Question to everyone.

Markov Decision Process

States: {LearnerGoal = FocusedBrowser, IntendedCompleter}

Actions: {A, B}

Policy: MOOClet Function, IF statement

Reward: Quiz Score

Personalized:
A-Video to FocusedBrowser
B-Video to IntendedCompleter

Also can use User Variable Store and MOOClet-Functions to represent User Models and Intelligent Tutoring Systems.

For details see tiny.cc/moocletframework Williams et al (2014). Improving Online Education through Experimentation and Personalization of Modules.