



Shayan Doroudi

Computation, Constructivism, and Curriculum Design

Thursday, November 16, 2017 – 12:00 p.m. – GHC 6501

My dissertation will demonstrate some of the limitations of existing approaches to automated curriculum design and propose a new approach that leverages learner-generated resources to create new educational content.

Existing approaches to automated curriculum design, such as mastery learning and reinforcement learning-based approaches, largely focus on the adaptive sequencing of content and educational activities. I begin by describing three types of limitations that face these techniques: lack of empirical evidence, computational infeasibility, and incompatibility with constructivism. As part of this, I use a novel educational data mining approach to reexamine the assumption that knowledge can be decomposed into independent components---an assumption that underlies existing approaches to automated sequencing.

I then propose a more constructivist approach to automated curriculum design that focuses on the creation of new educational content. I will describe results from a series of experiments in online educational settings that demonstrate how to effectively use learner-generated resources to help future students learn and how algorithms can be combined with learning theory to determine which resources should be used when. The vision of this approach is that if we start with no educational resources to teach a subject, we can use the crowd of learners and data-driven algorithms to create new resources---and if we do start with existing expert resources, using learner-generated resources can still enhance the existing curriculum.

While my dissertation is rooted in constructivism and challenges notions from information processing psychology, my work also builds upon results from information processing psychology. In order to dispel the seeming cognitive dissonance and situate my work in a way that is meaningful to researchers from different epistemological bents, I undertake a qualitative inquiry to identify the meaningful distinctions between different epistemologies in the learning sciences.

Finally, throughout my dissertation, I will describe a number of insights that can be gained by reasoning about robustness to different models of student learning. I show how this emergent theme of model robustness can impact our understanding of learning, approaches to teaching, and approaches to education research.

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Thesis Summary: <http://www.cs.cmu.edu/~shayand/Thesis-Proposal.pdf>