Lightning Introductions

Computer-Aided Personalized Education
November 12-13, 2015
How can tools for automated logical reasoning be effectively used to analyze students’ answers, provide feedback, suggest solution strategies, and teach rigorous thinking?
Nina Amla/NSF

Personal Photo

Topic of interest you would like to discuss
How can we design engaging learning experiences through automatic generation of content and large-scale experimentation?
Mimi McClure/NSF

What are the Grand Challenges and what are the research questions/technologies needed to address these challenges?
Richard Baraniuk/Rice

Machine learning to drive improved learning analytics and personalized learning

Machine learning to scale up grading of open-form responses like mathematical calculations, proofs, code, ...
How can we effectively adapt personalized education technology to mobile devices so people across our nation and in developing nations can learn?
How can we support and assess learning with understanding in Computer Based Learning Environments (CBLEs)?

How can we employ analytics and machine learning methods to monitor students' metacognitive and self-regulated learning?
How does learning happen?

How can interactive textbooks support learning?

How can we rapidly author interactive textbooks?
How can we create tools to allow +95% of people to accomplish +95% of their goals during their 95 years of life?
How can we use technology to conduct experimental research at scale that informs the science of learning and educational practice?

How can we use technology to revolutionize the process of learning in formal and informal contexts?
How can experience with and data from open online courses be used to help improve educational content and methods, and contribute to residential education?
Loris D’Antoni/U Wisconsin, Madison

How do we leverage formal methods in personalized education?

Can we standardize the evaluation process for education tools? What should we measure and how?
What new methods of learning become possible with technology?

What are the ethical and pedagogical limits of data analysis and machine learning on student learning data?
How can we expand personalized models to encompass what students feel and think in addition to what they know and do?
How do we use computing advances to enable personalized education?
How can we use technology to empower students in their learning?
Interactive electronic books and personalized and dynamically adaptive learning. How to crowdsource ebook development and personalization.
What about the experience of the teacher?

How to make it fun, engaging and scalable?

How do we create authoring tools that help create effective pedagogy?
How could computational methods support instruction in large, human-taught courses for students with varying prior preparation?

What’s the right interplay between computationally-driven techniques and old-fashioned human instruction?
Phillip Grimaldi/Rice

- When is personalized learning likely to be effective/ineffective?
- What is the role of self-regulated learning in an automated learning system?
Are we considering computer-aided personalized education (professional development) for teachers, to teach them about computer-aided personalized education for students?
How can we leverage technology and large amounts of student data to build systems that can help realize “one expert teacher per child”? What subjects and grades would be most useful to focus on initially, and how do we measure success?
How can we apply human-computer interaction (HCI) techniques to online learning at scale?

How can technology connect people to learn and teach together in a scalable way, in addition to leveraging automated techniques?
Greg Hager/CCC, Johns Hopkins

Topic of interest you would like to discuss
Fox Harrell/MIT

How virtual identities (e.g., avatars and social media profiles) can support learning.
What does a research agenda in CAPE look like and how can we convey it to policymakers?
Marti Hearst/UC Berkeley

Help formulate a research agenda including:

- Automating Feedback for Mastery Learning
- Innovating in Online Peer Learning
- Technology to Improve Writing Instruction
- Learning Sourcing Course Materials
Mike Jones/Indiana

Cognitive models to tailor learning and instruction; translating knowledge from cognitive science from the lab to the practical learning scenario

NLP techniques for automated scoring and feedback of open-ended written materials
Yasmin Kafai/Penn

How can we provide scaffolded feedback?
How can we provide meaningful feedback in open-ended design environments?
What are the upsides and downsides of personalizing learning?

What are gaps that need new research?
Caitlin Kelleher/WUSTL

How can we provide effective, personalized feedback at scale in open-ended contexts?

How can we use process and performance data to create in-context assessments of understanding?
Anthony Kelly/NSF

Topic of interest you would like to discuss
How do we get more folks to understand that they don’t understand learning?

Then, how do we help them -- students, instructors, & course developers -- use data to improve their understanding and improve learning?
Andrew Lan/Rice

How to develop decision making algorithms to maximize long-term rather than short-term retention

How to incorporate multi-modal data in item response modeling
How can we create and share data that tracks interactive learning (1) in enough detail to model and adapt to individuals, and (2) on a large enough scale to use modern (“machine learning”) methods? Current MOOC infrastructure is not even close.
How can we use personalized methods to enable different learning styles? What about personalized learning for students from different cultures?

How do personalized methods address accreditation issues of online programs?
Danielle McNamara/Arizona State

How can we leverage big data and automated technologies to get a *big picture* - develop a more complete and predictive understanding of student outcomes - using combinations of data types, sources, and analytic techniques?
How can we evolve a sustainable educational ecosystem with new learning models and tools that serve campus and distributed learning communities at large and small scales?
How can we leverage computational theories of human cognition to improve machine learning approaches to personalized learning?

Can personalized methods guide not only the initial acquisition of knowledge but also its long-term retention and accessibility?
Zoran Popovic/University of Washington

Topic of interest you would like to discuss
What new forms of interactions—between teachers and learners as well as among learners—that improve personalized education are possible because of technology?

Emerging feedback tools that recommend the next best learning activity based on student history.
What can Big Data from CAPE technologies tell us about how students learn? For individuals? For populations?

What type of variance is seen in learning improvement due to CAPE technologies?

How does the cost/benefit ratio of CAPE technology today fit into the distribution of ratios for different student/teacher relationships? How and when do we expect this to change?
How can we use *Discourse Analytics* to monitor and support collaborative and discussion based learning at scale?

What can we learn from analysis of social interaction in at scale learning environments towards fostering engaged learning?
We need more faculty to experiment with different modalities and to collect useful data. How do we build cloud-based easy-to-use infrastructure to administer course projects at scale to enable experimentation and data collection? How do we build effective plagiarism detection methods?
1. Effective technologies for personalized education in lab-based courses
2. The use of formal methods for computer-aided personalized education

http://cpsgrader.org
http://www.eecs.berkeley.edu/~sseshia/fmee/
Adaptations of evidence-based active learning practices for online
How to build upon automated logical reasoning techniques for providing automated *teacher-like* feedback?

How to leverage *MOOC datasets* for improving these techniques?
Armando Solar-Lezama/MIT

Topic of interest you would like to discuss

Massachusetts Institute of Technology
How do we build the infrastructure (human processes and technical tools) to shift the current relationship between learning research and teaching practice from a sub-optimal linear technology transfer model to a virtuous cycle?
Mihaela van der Schaar/UCLA

Machine Learning and Data Mining for Personalized Tutoring (One teacher for one student)
Life-long Education/Personal growth
Study and Support Networks
Incentivizing Collaborations
Kevin Wilson/Knewton

How is and how should personalized learning be used in the classroom and in the learning experience more generally?

What is the metric of success of personalized learning?
What can we do after this workshop to continue the discussion of technology for effective and personalized education?
Jerry Zhu/Wisconsin

Machine teaching

= 

Can we reverse engineer machine learning to design optimal lessons for students?
How to leverage machine learning and program synthesis to improve computer-aided education?

How to evaluate CAPE systems?

What is the learning impact and social impact of deploying CAPE systems at scale?