Lightning Introductions

Computer-Aided Personalized Education

November 12-13, 2015

CCC

Computing Community Consortium

Catalyst

Rajeev Alur / University of Pennsylvania

Penn Engineering

How can tools for automated logical reasoning be effectively used to analyze students' answers, provide feedback, suggest solution strategies, and teach rigorous thinking ?

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Nina Amla/NSF

Personal Photo

Topic of interest you would like to discuss

Erik Andersen/Cornell

Cornell University

How can we design engaging learning experiences through ***automatic generation of content*** and ***large-scale experimentation***?

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Anindya Banerjee/NSF

Personal Photo

Topic of interest you would like to discuss

Mimi McClure/NSF

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

National Science Foundation
WHERE DISCOVERIES BEGIN

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Richard Baraniuk/Rice

openstax™

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, ...

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Lida Beninson/NSF

AAAS
ADVANCING SCIENCE, SERVING SOCIETY

How can we effectively adapt personalized education technology to mobile devices so people across our nation and in developing nations can learn?

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Gautam Biswas/Vanderbilt

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?

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Rastislav Bodik/University of Washington

University of Washington
Computer Science & Engineering

How does learning happen?

How can interactive textbooks support learning?

How can we rapidly author interactive textbooks?

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Emma Brunskill/CMU

Carnegie Mellon

How can we create tools to allow +95% of people to accomplish +95% of their goals during their 95 years of life?

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Andy Butler/UT Austin

THE UNIVERSITY OF TEXAS AT AUSTIN

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?

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Isaac Chuang/MIT

Massachusetts Institute of Technology

How can experience with and data from open online courses be used to help improve educational content and methods, and contribute to residential education?

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Loris D'Antoni/U Wisconsin, Madison

WISCONSIN
UNIVERSITY OF 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?

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Luca de Alfaro/UC Santa Cruz

UNIVERSITY OF CALIFORNIA
SANTA CRUZ

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?

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Sidney DMello/Notre Dame

UNIVERSITY OF NOTRE DAME

How can we expand personalized models to encompass what students feel and think in addition to what they know and do?

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Khari Douglas/CCC

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How do we use computing advances to enable personalized education?

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Ann Drobnis/CCC

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How can we use technology to empower students in their learning?

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Barbara Ericson/Georgia Institute of Technology

Georgia Tech College of Computing

Interactive electronic books and personalized and dynamically adaptive learning. How to crowdsource ebook development and personalization.

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Michael Gleicher/Wisconsin

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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?

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Kathi Fisler/WPI

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

openstax™

RICE

- When is personalized learning likely to be effective/ineffective?
- What is the role of self-regulated learning in an automated learning system?

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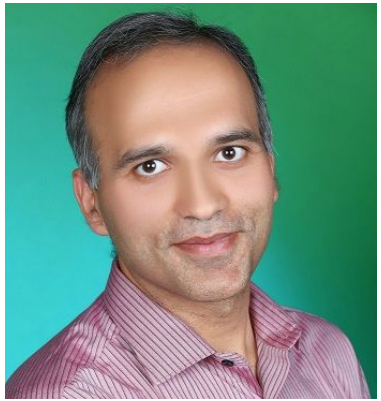
Jonathan Grudin/Microsoft Research

Microsoft

Are we considering computer-aided personalized education (professional development) for teachers, to teach them about computer-aided personalized education for students?

Sumit Gulwani/Microsoft



Microsoft

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?

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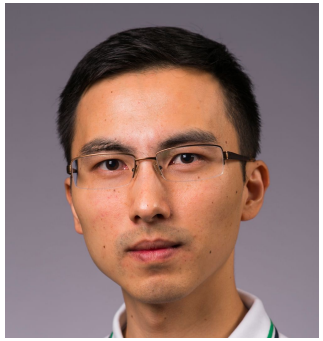
Philip Guo/University of Rochester



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?

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Greg Hager/CCC, Johns Hopkins

JOHNS HOPKINS UNIVERSITY

Topic of interest you would like to discuss

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Fox Harrell/MIT

How virtual identities (e.g., avatars and social media profiles) can support learning.

Massachusetts Institute of Technology

Imagination, Computation, and Expression Laboratory

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Peter Harsha/CRA

What does a research agenda in CAPE look like and how can we convey it to policymakers?

CRA
Computing Research Association

CRA
Government Affairs
For America!

(Unofficial logo)

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Marti Hearst/UC Berkeley

Berkeley SCHOOL OF INFORMATION

Berkeley EECS
ELECTRICAL ENGINEERING & COMPUTER SCIENCES

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

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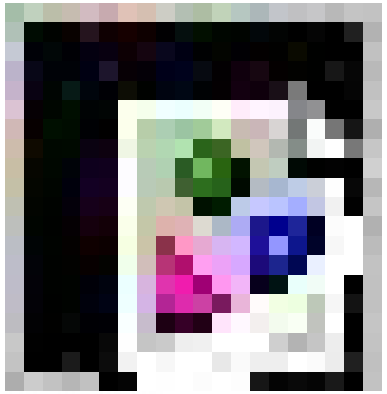
Mike Jones/Indiana

INDIANA UNIVERSITY

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



Graduate School of Education
Penn GSE

How can we provide scaffolded feedback?
How can we provide meaningful feedback in open-ended design environments?

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Jeffrey Karpicke/Purdue

PURDUE
UNIVERSITY

What are the upsides and downsides of personalizing learning?

What are gaps that need new research?

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Caitlin Kelleher/WUSTL

Washington University in St. Louis

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?

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Anthony Kelly/NSF

National Science Foundation
WHERE DISCOVERIES BEGIN

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Ken Koedinger/CMU

Academia or
Industry Logo

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

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

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Mark Liberman/Penn

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.

Linguistic Data Consortium

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Qusay H. Mahmoud/UOIT

UNIVERSITY OF ONTARIO INSTITUTE OF TECHNOLOGY

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?

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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?

ASU Arizona State University

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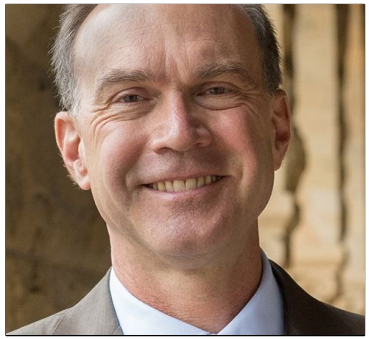
John Mitchell/Stanford



STANFORD UNIVERSITY

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?

Mike Mozer/University of Colorado, Boulder

University of Colorado Boulder

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?

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Zoran Popovic/University of Washington

UNIVERSITY of WASHINGTON

Topic of interest you would like to discuss

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Debra Richardson/UCIrvine

Donald Bren School of Information & Computer Sciences
University of California · Irvine

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.

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SCIENCE & TECHNOLOGY
POLICY FELLOWSHIPS
AAAS

Beth Russell/AAAS

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?

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Carolyn Rose/CMU

Carnegie Mellon

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?

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Majd Sakr/CMU

Carnegie Mellon

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?

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Sanjit Seshia/UC Berkeley

Berkeley

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/

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Beth Simon/Coursera & UC San Diego

Adaptations of evidence-based active learning practices for online

coursera
UC San Diego

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Rishabh Singh/Microsoft Research

Microsoft Research

How to build upon automated logical reasoning techniques for providing automated **teacher-like** feedback?

How to leverage **MOOC datasets** for improving these techniques?

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Armando Solar-Lezama/MIT

Massachusetts Institute of Technology

Topic of interest you would like to discuss

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Candace Thille/Stanford

STANFORD UNIVERSITY

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?

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Mihaela van der Schaar/UCLA

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

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?

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Helen Wright/CCC

What can we do after this workshop to continue the discussion of technology for effective and personalized education?

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Jerry Zhu/Wisconsin

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Machine teaching
=
Can we reverse engineer machine learning to design optimal lessons for students?

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Ben Zorn/Microsoft Research

Microsoft

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?

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