

RESEARCH STATEMENT

In my research, I tackle how to instrument digital learning environments to support a better experience by better recognizing the motivations and non-cognitive abilities of students. My work enables:

- Live measurement of student motivations using available log data
- Human-AI collaborative discovery of measurement models

while advancing our understanding of how such student characteristics affect behavior moment-by-moment. I am interested in how to prepare students for success in the 21st century by improving our systems ability to support their social and emotional learning.

EDUCATION

Carnegie Mellon University **Aug 2021 (expected)**

Doctorate of Philosophy in Human Computer Interaction

Advisor: Ken R. Koedinger

Committee: John Stamper, Geoff Kaufman, Artur Dubrawski, Sidney D’Mello

Carnegie Mellon University **Dec 2015**

Masters in Educational Technology and Applied Learning Science

Georgia Institute of Technology **May 2007**

Bachelor of Science in Electrical Engineering

RESEARCH PROJECTS

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Dissertation: Discovery of Item-based Measures of Student Motivation **Jun 2020 – Present**

Method for automatically identifying behavioral indicators of motivational constructs

- Extended Item response theory approach for dichotomous responses for more reliable student latent estimation
- Demonstrate via simulation, ability of method to differentiate cognitive and other motivational factors while recovering a target latent motivation

Live Measurement of Student Motivations **Aug 2015 – Present**

Developing measures of student motivation with fine-grained learner log data

- Demonstrated how characteristics of when particular student behaviors occur can be leveraged as indicators of latent student motivations
- Showed utility of task-switching and ego-depletion theory to predict trends in when learners partially/fully disengage
- Improved reliability of student diligence estimation using social information embedded in log data
- Adapted psychometric behavioral task measures to context of tutor log data

Data-Driven Discovery of Models (DARPA D3M) **Nov 2017 – Sept 2019**

Developing Human-AI collaboration tools to enable non-data-science experts to use advanced machine learning tools to tackle data science tasks

- Ran think-aloud studies to contrast novice and expert data analysis processes
- Collaborated with machine-learning research teams to develop user-facing web-based tool to utilize autonomous machine-learning services

Personalized Learning Squared

Jan 2019 – Dec 2019

Prototyping an instructor tool for supporting student progress and motivation

- Conducted focus groups identifying social and resource constraints that interfered with dashboard use as originally design
- Improved analytics to differentiate low-engagement high-performers

ShareSight

Jan 2015 – Aug 2015

Using human-centered methods to improve low-level management skills learning

- Used qualitative UX research methods to identify and validate learners desire for more contextually detailed examples of course principles in action
- Iterated 4 prototypes to explore viability of crowd-sourced learning content

PROFESSIONAL EXPERIENCE

University of Maryland: Institute for Advanced Computer Studies

Aug 2012 – May 2013

Research Programmer

College Park, MD

- Created Python Library for open scene OCR experimentation with big data

Lockheed Martin

Aug 2007 – Apr 2011

Software/Systems Engineer (Clearance TS-SCI)

Gaithersburg, MD

- Led 4 geographically distributed teams on development of mobile service architecture for on-demand soft-power support for warfighters
- Coordinated visual design, fabrication, electronics, and software teams to develop augmented reality warfighter helmet concept prototype resulting in \$1.5M award

NASA Ames: Intelligent Robotics Group

May 2007 – Aug 2007

Robotics Intern Team Lead

Mountain View, CA

- Mentored 4 interns on independent robotics research projects
- Developed novel visual sensor calibration algorithm

PUBLICATIONS

Steven Dang and Kenneth Koedinger "The Ebb and Flow of Student Engagement: Measuring motivation through temporal pattern of self-regulation" In: Proceedings of The 13th International Conference on Educational Data Mining (EDM2020), Anna N. Rafferty, Jacob Whitehill, Violetta Cavalli-Sforza, and Cristobal Romero (eds.) 2020, pp. 61 - 68

Steven Dang and Kenneth R. Koedinger. "Opportunities for Human-AI Collaborative Tools to Advance Development of Motivation Analytics." Workshop on Learning Analytic Services to Support Personalized Learning & Assessment at Scale at The 10th International Conference on Learning Analytics & Knowledge (LAK20).

Steven Dang and Kenneth Koedinger "Exploring the Link Between Motivations and Gaming" In: Proceedings of The 12th International Conference on Educational Data Mining (EDM2019), Collin F. Lynch, Agathe Merceron, Michel Desmarais, & Roger Nkambou (eds.) 2019, pp. 276 - 281

Steven Dang, Michael Yudelson, and Kenneth R. Koedinger. 2017. Detecting Diligence with Online Behaviors on Intelligent Tutoring Systems. In *Proceedings of the Fourth (2017) ACM Conference on Learning @ Scale (L@S '17)*. Association for Computing Machinery, New York, NY, USA, 51–59.

Joel Chan, Steven Dang, and Steven P. Dow. 2016. IdeaGens: Enabling Expert Facilitation of Crowd Brainstorming. In *Proceedings of the 19th ACM Conference on Computer Supported Cooperative Work and Social Computing Companion (CSCW '16 Companion)*. Association for Computing Machinery, New York, NY, USA, 13–16. DOI:<https://doi.org/10.1145/2818052.2874313>

Joel Chan, Steven Dang, and Steven P. Dow. 2016. Comparing Different Sensemaking Approaches for Large-Scale Ideation. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems (CHI '16)*. Association for Computing Machinery, New York, NY, USA, 2717–2728. DOI:<https://doi.org/10.1145/2858036.2858178>

Joel Chan, Steven Dang, and Steven P. Dow. 2016. Improving Crowd Innovation with Expert Facilitation. In *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing (CSCW '16)*. Association for Computing Machinery, New York, NY, USA, 1223–1235. DOI:<https://doi.org/10.1145/2818048.2820023>

Nadya Belov, Jeff Patti, Saki Wilcox, Rafael Almanzar, Janet Kim, Jennifer Kellogg, and Steven Dang. "Exploring the Human Fabric through an Analyst's Eyes." In *International Conference on Social Computing, Behavioral Modeling, and Prediction*, pp. 367-374. Springer, Berlin, Heidelberg, 2010.

SKILLS

Programming Languages:

Python, R, Javascript (ES6), HTML5, CSS3, SQL, Java, C, Objective C, C#

Primary Software Libraries:

Pandas, Numpy, Scipy, Sklearn, SimPy, plot.ly, bokeh, PyMongo, Flask, LME4, Angular 2, React, Meteor

Technologies:

Docker, Kubernetes, Git CI/CD, Node, NGINX, MySQL, MongoDB, Linux

AWARDS

Carnegie Mellon Program in Interdisciplinary Education Research (PIER) Fellow	Jun 2015
Lockheed Martin Special Recognition Award	Dec 2008
Georgia Institute of Technology President's Scholar	Aug 2003 – May 2007

TEACHING EXPERIENCE

User Centered Research and Evaluation Carnegie Mellon University, School of Computer Science, Teaching Assistant	Fall 2019
Human Computer Interaction Undergrad Capstone Carnegie Mellon University, School of Computer Science, Project Co-Advisor	Spring 2018
Creative Computing Remake Learning Digital Corps, Milliones 6-12 University Preparatory School, Instructor	Fall 2014
Mobile Services Innovation Carnegie Mellon University, School of Computer Science, Teaching Assistant	Spring 2014
Robotics Technology Enrichment Seminar Series for US FIRST Teams Georgia Intitute of Technology, Robojackets, Instructor	Fall 2003 – Fall 2007
Introduction to Engineering with Robotics Summer Scholars Program, University of New Orleans, Instructor	Jun 2004 – Aug 2005

MEMBERSHIPS & SERVICE

Pittsburgh Science of Learning Center, Graduate Student Organization President	Aug 2014 – Jul 2018
Pittsburgh Science of Learning Center, Executive Committee Representative	Aug 2014 – Jan 2016
Institute for Electrical and Electronic Engineering (IEEE)	2007 – Present
Association for Computing Machinery (ACM)	2014 – Present
Association for the Advancement of Artificial Intelligence (AAAI)	2014 – Present
American Education Research Association (AERA)	2014 – Present