

ZHEN BAI

Current Position: Assistant Professor, Department of Computer Science, University of Rochester

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Education

- 2010 – 2015 **PhD, Computer Science, University of Cambridge, UK**
Cambridge Overseas Trust Scholarship, Raymond and Helen Kwok Scholarship, Lundgren Research Award, Cambridge Philosophical Society Research Studentship and Travel Award, Jesus College Graduate Research Travel Grant, finalist of Qualcomm Innovation Fellowship
- 2006 – 2009 **M.Eng., Software Engineering, Peking University, China**
- 2002 – 2006 **B.Sc., Computer Science, Beijing University of Technology, China**

Research Experience

- August 2018 - present **Assistant Professor, Department of Computer Science, University of Rochester**
Research interests include creating embodied and intelligent interfaces that transcend learning, communication and wellbeing for people with diverse abilities and backgrounds. Main research areas include human-computer interaction, augmented reality, tangible user interface, embodied conversational agent, learning technology, and assistive technology
- October 2015 – August 2018 **Post-doctoral Fellow, HCII/LTI, Carnegie Mellon University**
PI Collaborators: Dr. Justine Cassell, Dr. Jessica Hammer, Dr. Louis-Philippe Morency
Leading the project “Sensing Curiosity in Play and Responding” as a post-doc PI. This project investigates how social factors influence curiosity in scientific inquiry for elementary and middle school students who are underrepresented in STEM education via the development of:
 - *A theoretical framework of curiosity* in social context based on a combination of theory-driven and data-driven approaches
 - A mixed-reality learning environment involving an *Embodied Conversational Agent* and a *tangible tabletop game* that enables real-time understanding and elicitation of curiosity in collaborative hands-on scientific inquiry
- October 2010 – April 2015 **PhD, Graphics & Interaction Group, University of Cambridge**
Supervisor: Dr. Alan Blackwell and Dr. George Coulouris
Collaborated with neuroscientists, caregivers and therapists of children with autism to explore the dual representation characteristic of augmented reality technologies in supporting theory of mind development at individual and dyad levels. Designed and developed two robust augmented and tangible systems that promote cognitive and social development for young children with autism during make-believe play, and articulated primary design and evaluation considerations for augmented reality interfaces for young children with diverse developmental abilities
- October 2005 – June 2006 **RA, Artificial Intelligence & Knowledge Engineering Lab, Beijing University of Technology**
Constructed an emotion knowledge database based on selected children’s stories and developed machine learning approaches to extract character-centered emotion attributes

Multi-disciplinary Collaboration

Machine learning and NLP	Conduct multimodal behavioral data collection, machine labeling using NLP and computer vision; conduct statistical analysis and data mining to identify structural and temporal models in developing the curiosity estimator and reasoner; develop an end-to-end embodied conversational agent with technologies in AI, dialogue management and multimodal behavior generation
Design	Design the appearance and animation of an age-appropriate and gender ambiguous virtual peer; model and evaluate virtual peer behavior in multi-party collaborative game play and game appropriate social scaffolding for curiosity
Psychology and education	Discuss with researchers in psychology, education and learning science to inform the development and evaluation of the theoretical framework and interface design guidelines

Research Methods

Quantitative	Experimental design, usability evaluation, statistical analysis (e.g. t-test, ANOVA, linear regression, causality and mediation, structural equation model), data mining (e.g. USpan sequential pattern mining), and multimodal behavioral data collection and measures (crowdsourcing annotation, machine annotation and manual annotation)
Qualitative	Interview, survey, questionnaire, analytical evaluation, behavioral observation in different contexts (e.g. usability lab, classroom, summer camp, special support group), and grounded theory (e.g. thematic chart)

Publications

- [In review] Sinha, T., **Bai, Z.**, Cassell, J. *A Novel Multimodal Approach for Studying the Dynamics of Curiosity in Group Learning*. IEEE Transactions on Learning Technologies.
- Paranjape, B., Bin, Y., **Bai, Z.**, Hammer, J., and Cassell, J. (2018). *Towards Automatic Generation of Peer-Targeted Science Talk in a Curiosity-Evoking Virtual Agent*. [to appear] In Proc. 18th ACM International Conference on Intelligent Virtual Agents.
- Ali, S., To, A., **Bai, Z.**, Holmes, J., Fath, E., Kaufman, G., Hammer, J. (2018). *Transition from Goal Driven Game Design to Game Driven Goal Delineation in Tandem Transformational Game Design*. [to appear] In Proc. Meaningful Play 2018
- Paranjape, B., **Bai, Z.**, and Cassell, J. (2018) *Predicting the Temporal and Social Dynamics of Curiosity in Small Group Learning*. 19th International Conference on Artificial Intelligence in Education.
- Sinha, T., **Bai, Z.**, Cassell, J. (2017) *A New Theoretical Framework for Curiosity for Learning in Social Contexts*. 12th European Conference on Technology Enhanced Learning. [Accept rate: 25.3%] (**Best paper award nominee**)
- Sinha, T., **Bai, Z.**, Cassell, J. (2017) *Curious Minds Wonder Alike: Studying Multimodal Behavioral Dynamics to Design Social Scaffolding of Curiosity*. 12th European Conference on Technology Enhanced Learning. [Accept rate: 25.3%]
- Bai, Z.**, Blackwell, A.F., Coulouris, G. (2015). *Exploring Expressive Augmented Reality: The FingAR Puppet System for Social Pretend Play*. In Proc. ACM CHI Conference on Human Factors in Computing Systems, Seoul, Republic of Korea, April 18-23, 2015, pages 1035-1044. [Accept rate: ~23%]
- Bai, Z.**, Blackwell, A.F., Coulouris, G. (2015). Using Augmented Reality to Elicit Pretend Play for Children with Autism. (2015) IEEE Transactions on Visualization and Computer Graphics, vol.21, no.5, pages 598-610. (**By invitation**)
- Bai, Z.**, Blackwell, A.F., Coulouris, G. (2013). *Through the Looking Glass: Pretend Play for Children with Autism*. In Proc. 12th International Symposium on Mixed and Augmented Reality (ISMAR), 1-4 October 2013, Adelaide, Australia, pages 49-58. [Accept rate: ~3%](**Best paper award nominee**)
- Bai, Z.**, Blackwell, A.F. (2013). *See-through Window vs. Magic Mirror: A Comparison in Supporting Visual-Motor Tasks*. In Proc. 12th International Symposium on Mixed and Augmented Reality (ISMAR), pages 239-240.

- Bai, Z.**, Blackwell, A.F., Coulouris, G. (2013). *Can We Augment Reality with “Mental Images” to Elicit Pretend Play? A Usability Study*. In Proc. ACM CHI Extended Abstract 2013, 27 April -2 May 2013, Paris, France, pages 1-6.
- Bai, Z.**, Blackwell, A.F., Coulouris, G. (2012). *Making Pretense Visible and Graspable: An Augmented Reality Approach to Promote Pretend Play*. In Proc. 11th IEEE International Symposium on Mixed and Augmented Reality (ISMAR), 5-8 November 2012, Atlanta, Georgia, USA, pages 267-268. [Accept rate: ~28%]
- Bai, Z.** (2012). *Augmenting Imagination for Children with Autism*. In Proc. 11th International Conference on Interaction Design and Children (IDC), 12-15 June 2012, Bremen, Germany, pages 327-330. [Accept rate: ~31%]
- Bai, Z.**, Blackwell, A.F. (2012). *Analytic Review of Usability Evaluation in ISMAR*. *Interacting with Computers*, 24(6), pages 450-460.

Selected Talks and Demonstrations

- Predicting the Temporal and Social Dynamics of Curiosity in Small Group Learning*. 19th International Conference on Artificial Intelligence in Education. London, UK, Jun 27-30, 2018.
- New Theoretical Framework for Curiosity for Learning in Social Contexts*. 12th European Conference on Technology Enhanced Learning. Tallinn, Estonia, Sept 12-15, 2017.
- A Theoretical Framework of Curiosity in Small Group Learning*. “Designing for Curiosity” workshop at ACM CHI Conference on Human Factors in Computing Systems, Denver, USA, May 6-11, 2017.
- Fostering Curiosity through Peer-support in Science Learning*. Human Computer Interaction Institute Seminar, Carnegie Mellon University. October 2016.
- Design Considerations of Augmented Reality Systems for Child Development through Play*, “Supporting Children to Engage in Play for Wellbeing” workshop at ACM CHI Conference on Human Factors in Computing Systems, Seoul, Republic of Korea, April 18-23, 2015
- Immersion through Augmented Reality: Encouraging Pretend Play for Children with Autism*. Presented at Children and Youth Research Centre Keyword Seminar Series, Queensland University of Technology, Brisbane, Australia. September 2013.
- An Augmented Reality Approach to Promote Pretend Play*, Human-Computer Interaction Group, Microsoft Research Asia, Beijing, China, June 2013
- Augmenting Imagination for Children with Autism*, Health Systems Institute, Georgia Institute of Technology, Atlanta, USA, November 2012
- Demonstrated the Augmented Reality system to promote children’s pretend play at the “AWARE: Autism Software – how to get it out there” event, September 2012, Informatics Forum, University of Edinburgh, UK.

Academic Activities and Additional Skills

- Public Media:** IEEE Institute: “*Augmented Reality Can Help Children With Autism Tap Into Their Imaginations*”. 2015; University of Cambridge: “*The land of make-believe*”. 2013
- Conference/Journal Reviewer:** ISMAR’13-15; CHI’11,14,15,17,18; TEI’14,18, DIS’14; IDC’14,17; RO-MAN’16, CHI Play’17; HRI’18; Research in Developmental Disabilities; IEEE’s Transactions on Learning Technologies; Research in Developmental Disabilities
- Conference Organizer and Volunteer:** Jesus College Annual Graduate Conference, Cambridge, 2012 (call for paper, logo design, souvenir supply), conference volunteer for ISMAR’11-12, IDC’12
- Technical Skills:** C#, Java, OpenCV, HTML, CSS, JSP, ASP, SQL, XNA Studio, SPSS
- Volunteer and local community activities:** women@cl committee member (2010-2014), consultant for the Cambridge University Disability Resource Centre (2015 March-April), Science and Engineering Experiments for Kids (2011-2012), National Autistic Society supporting group (2012-2014), Romsey Mill Playgroup (2014 November – 2015 April), Chain Reaction Contraption Contest, Carnegie Science Museum (2015)

Work Experience

- March 2009 – June 2010 **Program Manager, Microsoft Consultant, ISoftStone, China**
Led the design and implementation of the Input and Device Management features of Windows Embedded CE7 (later Windows Mobile). Main responsibilities included participating in product vision definition, specifying product features, managing progress, risk and resources, and closely working with software engineers, engineers in testing, and UX designers.
- December 2007 – November 2008 **Software Developer Intern, BlackBerry, UK**
Participated in developing an automation framework for the BlackBerry Smartphone Operating System and applications.
- September 2007 – November 2007 **Program Manager Intern, Microsoft, China**
Led the design and implementation of the Zoom feature of Windows Mobile IE7.
- March 2006 – July 2006 **Software Developer Intern, Microsoft, China**
Developed the UI of an online Ads User Behavior Analysis platform for MSN.

Teaching and Supervision Experience

- 2017 Developed a new HCI course for master students in the Entertainment Technology Center, Carnegie Mellon University for the spring term in 2018. The course aims to provide an introductory overview of HCI concepts, principles, methods and special topics through lecture, seminar and group project based on user-centered design approach
- 2016 – 2017 Research assistant supervisor, Carnegie Mellon University (26 undergrad, 2 master and 1 PhD students) – supervised augmented tabletop and hand gesture project (2 students), embodied conversational agent (8 students), observational study (2 students), game reasoner and decision-making (1 student) and human behavior transcription and annotation (16 students); created educational plans, managed intern meetings, and supervised research skills such as literature review, hypothesis generation, quantitative and qualitative analysis and research paper writing
- 2016 Capstone project supervisor, Human Computer Interaction Institute, Carnegie Mellon University – supervised 5 undergraduate students to prototype an augmented and tangible interface called “Marble Run” in supporting collaborative scientific inquiry, and conduct user studies with children 9-14 years old to compare collaborative game experience with an agent with different levels of interaction ability (pen, shadow and physical) with tangible objects
- 2013 – 2014 Teaching assistant, Design Workshop of Sustainable Design & Technology, Sustainability Leadership master’s program - demonstrated digital technology, and facilitated small group brainstorming, technology prototyping and reflection
- 2012 – 2014 Course supervisor, Human-Computer Interaction, Computer Science undergraduate part II – supervised 5-9 students in 2-3 small groups including assigning and grading homework, and weekly tutoring to discuss assignments and course-related projects covering topics in visual representation, novel user interfaces, usability evaluation and user-centred design
- 2012 – 2014 Course supervisor, Software Engineering, Computer Science undergraduate part IB – supervised small groups covering topics in software life cycle and project management