

## ZHEN BAI

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

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Zhen Bai is an Assistant Professor in the Department of Computer Science of University of Rochester, after serving as a postdoctoral fellow at the Human-Computer Interaction Institute and Language Technology Institute at Carnegie Mellon University. Zhen's research focuses on designing interactive and intelligent interfaces that improve learning, communication, and well-being. Zhen's research spans across Human-Computer Interaction (HCI), Augmented and Virtual Reality, Embodied Conversational Agent, Computer-Supported Collaborative Learning, Assistive technologies, Human-AI collaboration, and embraces interdisciplinary fields relating to Artificial Intelligence, cognitive, social, and learning science. Zhen has developed several playful and collaborative interfaces that cultivate the development of imaginative, curious and scientific minds for people with diverse abilities (e.g. autism, deaf) and backgrounds (e.g. underrepresented students in STEM). Zhen's work is published in leading HCI, Technology-Enhanced Learning, Augmented and Virtual Reality, and Human-Agent Interaction conferences and journals such as CHI, ISMAR, TVCG, IDC, AIED, IVA and ACII.

### Education

- 2010 – 2015    **Ph. D., Computer Science, University of Cambridge, UK**
- 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**  
Co-lead the ROCHCI group with research focus on interactive and intelligent technologies that augment learning and quality of life for people with diverse abilities and backgrounds. Current research focuses include novel learning technologies to support AI literacy for K-12 students and teachers, assistive technology for deaf child communication, and Human-AI collaboration in social reasoning.
- October 2015 – August 2018    **Post-doctoral Fellow, HCI/LTI, Carnegie Mellon University**  
**PI Collaborators:** Dr. Justine Cassell, Dr. Jessica Hammer, Dr. Louis-Philippe Morency  
Lead 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 the theoretical and computation framework of curiosity in social context based on a combination of theory-driven and data-driven approaches, and 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 and 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

## Publications

### Book Chapter

[In review] Daley, M., Bai, Z., Borasi, R., Miller, D. Machine Learning - a new lens for integrating computational thinking and science in the high school classroom. *Cultivating a Scientific Mindset in the Age of Inference*.

### Journal

**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.

**Bai, Z.**, Blackwell, A.F. (2012). *Analytic Review of Usability Evaluation in ISMAR*. *Interacting with Computers*, 24(6), pages 450-460.

### Conference

[In review] Zhou, X., Tang, J., Bai, Z. "Now, I Want to Teach it for Real!": Introducing Machine Learning as a Scientific Discovery Tool for K-12 Teachers. 2021 CHI Conference on Human Factors in Computing Systems.

Wan, X., Zhou, X., Ye, Z., Mortensen, C. K., & Bai, Z. (2020, June). SmileyCluster: supporting accessible machine learning in K-12 scientific discovery. In *Proceedings of the Interaction Design and Children Conference* (pp. 23-35).

Tenesaca, A., Oh, J. Y., Hu, W., Lee, C., **Bai, Z.** *Augmenting Communication Between Hearing Parents and Deaf Children*. In 2019 IEEE International Symposium on Mixed and Augmented Reality Adjunct (ISMAR-Adjunct).

Samrose, S., Chu, W., He, C., Gao, Y., Shahrin, S. S., **Bai, Z.**, Hoque, M. *Visual Cues for Disrespectful Conversation Analysis*. Eighth International Conference on Affective Computing and Intelligent Interaction, ACII 2019, Cambridge, UK. Sept. 3-5, 2019

Holmes, J. R., To, A., Zhang, F., Park, S. E., Ali, S., Bai, Z., Kaufman, G. & Hammer, J. (2019, April). *A Good Score: Leveraging Game Theming and Narrative to Impact Player Experience*. In *Extended Abstracts of the 2019 CHI Conference on Human Factors in Computing Systems* (p. LBW0178). ACM.

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*. In *Proc. 18th ACM International Conference on Intelligent Virtual Agents* (pp. 71-78). ACM.

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*. In *Proc. International Academic Conference on Meaningful Play 2018*

Paranjape, B., **Bai, Z.**, and Cassell, J. (2018) *Predicting the Temporal and Social Dynamics of Curiosity in Small Group Learning*. 19<sup>th</sup> International Conference on Artificial Intelligence in Education (pp. 420-435). Springer, Cham.

[**Best paper award nominee**] 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. In *European Conference on Technology Enhanced Learning* (pp. 254-269). Springer, Cham. [Accept rate: 25.3%]

Sinha, T., **Bai, Z.**, Cassell, J. (2017) *Curious Minds Wonder Alike: Studying Multimodal Behavioral Dynamics to Design Social Scaffolding of Curiosity*. In *European conference on technology enhanced learning* (pp. 270-285). Springer, Cham. [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%]

[**Best paper award nominee**] **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%]

**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%]

## Selected Talks and Demonstrations

*Augmenting Communication Between Hearing Parents and Deaf Children*. In 2019 IEEE International Symposium on Mixed and Augmented Reality Workshop Mixed Reality and Accessibility. Beijing, China, Oct 14<sup>th</sup>, 2019.

*Augmenting Social Reality for Lifelong Learning*. Tsinghua University Pervasive Human-Computer Interaction Group. Beijing, China, Aug 7<sup>th</sup>, 2019.

*Augmenting Reality in the Social Realm*. Light and Sound Interactive. Augmented and Virtual Reality Track Speaker. Rochester, USA, Jun 27<sup>th</sup>, 2019.

*FaceOverlay: Supporting Learning of Cluster Analysis for Scientific Discovery*. “AIED4K12” workshop at the 20th International Conference on Artificial Intelligence in Education. Chicago, USA, Jun 25<sup>th</sup> - 29<sup>th</sup>, 2019.

*Augmenting Social Reality for Lifelong Learning*. Goergen Institute Summer Colloquium. Rochester, USA, Jun 19, 2019

*Developing a K-12 Research Collaboration across Computer Science, Data Science, and Warner*. Learning in Digital Age Center. Warner School of Education. Rochester, USA, April 17<sup>th</sup>, 2019.

*Tangible Data: Towards Hands-on AI Education for K-12 Students*. The 9th Symposium on Educational Advances in Artificial Intelligence. Honolulu, USA, Jan 28, 2019

*Augmenting Human Cognition and Communication*. University of Rochester-RIT AR/VR Initiative Meeting. Rochester, USA, Oct 1, 2018

*Predicting the Temporal and Social Dynamics of Curiosity in Small Group Learning*. 19<sup>th</sup> 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.

## Grants and Awards

2020	(Co-PI) Google exploreCSR award to support undergraduate students from underrepresented groups to pursue graduate studies and research careers in computing
2019 – 2024	(Co-PI) NRT-HDR: Interdisciplinary Graduate Training in the Science, Technology, and Applications of Augmented and Virtual Reality (#1922591, 2019), \$1.5M, PI: Mujdat, Cetin, Co-PI: Jannick P Rolland, Michele Rucci
2018 – 2019	Sykes Engineering Faculty Award
2018 – 2019	(Co-PI) CMU ProSEED Crosswalk Seed Grant (2018) "Holographic Archive of Research Projects (HARP), \$2500, PI: Yoichi Matsuyama
2018 2014	Semifinalist of 2018 National Academy of Education/Spencer Postdoctoral Fellowship Lundgren Research Award
2013 – 2014	Cambridge Philosophical Society Research Studentship
2012	Finalist of 2012 Qualcomm Innovation Fellowship
2010 – 2013	Raymond and Helen Kwok Scholarship
2010 – 2013	Cambridge Overseas Trust Scholarship

## Committee Service

The Nineteenth IEEE International Symposium on Mixed and Augmented Reality (ISMAR-20) Doctoral Consortium Mentor Panel  
 The Twentieth International Conference on Artificial Intelligence in Education (AIED-20) program committee  
 The Tenth Symposium on Educational Advances in Artificial Intelligence (EAAI-20) program committee  
 PhD Admission Committee, URCS Colloquium committee, Department of Computer Science, University of Rochester [2018-present]  
 Diversity Committee, Department of Computer Science, University of Rochester [2018-present]  
 URCS Colloquium committee, Department of Computer Science, University of Rochester [2019-present]  
 Center for Learning in the Digital Age (LiDA): core center member [2019-present]

## 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'11,14,15,17-21; TEI'14,18,19; DIS'14; IDC'14,17,19; RO-MAN'16, CHI Play'17; HRI'18,19; ECTEL'18, ACII'19, Connected Learning'19, ICMI'19, Connected Learning'19, Research in Developmental Disabilities; IEEE's Transactions on Learning Technologies; Research in Developmental Disabilities

**Academic Membership** Academic membership: AAI, SIGCHI, IAIED Society

**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)

**Professional Development** Grace Hopper Celebration (2018 Sept), CRA-W Career Mentoring Workshop (2018 Nov)

## Teaching

- 2020 Fall CSC 211: Introduction to Human-Computer Interaction – This course aims to provide an introductory overview of the concepts, principles, methods and special topics of Human-Computer Interaction (HCI). The lectures will cover origins of HCI and interaction design, user-centered design methods, usability evaluation and a broad range of special topics such as AR/VR, Intelligent Virtual Agent, learning technologies and collaborative technologies.
- 2020 Spring CSC 531: Practicum In Data-Enabled Research Into Human Behavior And Its Cognitive and Neural Mechanisms- In this interdisciplinary project course, students will work in mixed teams of Computer Science, Data Science and Brain and Cognitive Science graduate students to develop an artifact that addresses a research question and/or infrastructure need. The team will also learn principles of design by participating in the stages of brainstorming, specification, initial design, prototyping, refinement, and evaluation.
- 2019 Fall CSC 294: AR/VR Interaction Design – This course aims to provide an introductory overview of the concepts, principles, methods and special topics of AR, VR and related technologies. The course helps students to build a frame of reference of the above technologies, apply them in design practices that address real-world problems in domains such as education, healthcare, art/entertainment, and socio-cultural inclusion, and actively reflect on social implications such as acceptance, privacy and fairness.
- 2018 Fall CSC 494/CSC 574: Future User Interfaces – A seminar course that provides an introductory overview of embodied technologies including key theoretical frameworks, interaction technologies, and design methods, across application domains such as education, healthcare and computer-supported collaboration  
Research assistant supervisor (2 master students, 4 undergraduate students)
- 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

## Student Supervision

- 2019 Summer Research assistant supervisor (2 PhD students, 2 master students, and 5 undergraduate students (2 REU students))
- 2019 Spring Research assistant supervisor (3 master students, 4 undergraduate students)
- 2016 – 2017 Research assistant supervisor, Carnegie Mellon University (26 undergrad, 4 master and 1 PhD students) – supervised augmented tabletop and hand gesture project (2 students), embodied conversational agent (9 students), observational study (2 students), game reasoner and decision-making (2 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