

# CAITLYN CLABAUGH

*Curriculum Vitæ*

Ph.D. Candidate  
Computer Science  
University of Southern California

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My research applies Machine Learning and Artificial Intelligence to automate long-term adaptation and interactive personalization of real-world Human-Machine Interaction and Human-Computer Interaction.

## EDUCATION

2013-Present	<b>University of Southern California</b>	Ph.D. Candidate in <i>Computer Science</i>	Los Angeles, CA
2013-2016	<b>University of Southern California</b>	Masters of Science in <i>Computer Science</i>	Los Angeles, CA
2009-2013	<b>Bryn Mawr College</b>	B.A. in <i>Computer Science, Magna Cum Laude</i>	Bryn Mawr, PA

## EXPERIENCE

May 2013-Present	<b>Graduate Research Assistant – University of Southern California</b>	Los Angeles, CA
<ul style="list-style-type: none"><li>– Developing Machine Learning (ML) methods to enable long-term adaptation and interactive personalization of autonomous Human-Robot Interaction (HRI).</li><li>– Designed and developed a fully autonomous Socially Assistive Robotic (SAR) system for personalized tutoring of concepts in early childhood mathematics, collaborating with an interdisciplinary research team of experts in ML, SAR and HRI, and STEM education and early childhood development.</li><li>– Deployed the SAR tutor in a real-world general education classroom with over 50 children aged 3-6.</li><li>– Deploying the SAR in the homes of children with Autism Spectrum Disorder (ASD) for 30 days.</li><li>– Applied Reinforcement Learning (RL) and Interactive Machine Learning (IML) to adapt the difficulty of the interaction to the aptitudes of individual children over multiple, repeated interactions.</li><li>– Leveraged domain knowledge, specifically educational and developmental standards, as well as human user input, such as parent feedback, to alleviate the computational complexities of personalization.</li></ul>		
Oct 2016-Present	<b>Human-Robot Learning Scientist – Embodied, Inc.</b>	Los Angeles, CA
<ul style="list-style-type: none"><li>– Responsible for Human-Robot Interaction and Machine Learning R &amp; D for a novel Socially Assistive Robot (SAR), directly under Chief Science Officer and Chief Technology Officer.</li><li>– Designed and implemented socially assistive interactions of the SAR with users of diverse needs.</li><li>– Designed a personalizable, multimodal model for detecting and responding to users' emotional states.</li></ul>		
Jun-Aug 2013	<b>Summer Web Developer – NetApp, Inc.</b>	Sunnyvale, CA
<ul style="list-style-type: none"><li>– Created an automated code generation engine and metaprogramming schema to support and simplify the develop of a Representational State Transfer (REST) web API for the Mars all-flash array.</li><li>– Designed a sparse and functional YAML schema for developers to design high-level web APIs.</li><li>– Given developer's high-level API design in YAML, the Java code auto-generator implements the RESTful API using internal logic and Velocity Template Language, exposing Mars API to the web.</li></ul>		
Jun-Aug 2012	<b>Summer Technology Analyst – Barclays Investment Bank</b>	New York, NY
<ul style="list-style-type: none"><li>– Supported the business by developing real-world, financial tools in a face-paced environment.</li><li>– Gained a working knowledge of investment banking, specifically in equities and risk management.</li><li>– Independently restructured, expanded, and integrated Apache Camel with TIBCO Rendezvous into the system flow testing suite for Barclays's trader-facing profit and loss risk viewer.</li><li>– Implemented in Java with focus on scalability using Aspect-Oriented Programming practices.</li></ul>		
Jun-Aug 2011	<b>Summer Research Scientist – MIT Lincoln Laboratory</b>	Lexington, MA
<ul style="list-style-type: none"><li>– Tasked to create solutions for spatiotemporal classification and anomaly detection for the DoD.</li><li>– Developed and implemented an emergent curvilinear clustering algorithm in MATLAB to detect road-like networks in geotagged data acquired from social networks (e.g. Flickr).</li><li>– The algorithm performed the best in cases with highly variable densities and tight waffle-like patterns.</li><li>– Gave technical presentations about research throughout the summer to experts and non-experts.</li></ul>		

## HONORS & AWARDS

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May 2018	<b>Viterbi Undergraduate Research Mentoring Award</b> – Awarded to an outstanding Viterbi School of Engineering Ph.D. student who has been actively engaged in mentoring undergraduate student researchers. – Mentored over 40 undergraduate students, 95% of whom were underrepresented minorities or women, and 40% of graduates are pursuing graduate-level degrees in computer science.	Los Angeles, CA
May 2018	<b>The Order of Areté – University of Southern California</b> – All-university award for outstanding graduate students who have demonstrated significant depth and scope of responsibility in leadership roles benefiting peers and the broader communities.	Los Angeles, CA
Aug 2016	<b>Best Empirical Paper – RO-MAN</b> – Awarded “Best Empirical Paper” at the Twenty-Fifth IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN).	New York, NY
May 2016	<b>Third Place Startup at MEPC – University of Southern California</b> – Co-founder and Chief Technology Officer (CTO) of small companion robot startup, Botkins Robotics, that placed third at USC’s Fifth Annual Maseeh Entrepreneurship Prize Competition (MEPC).	New York, NY
Mar 2015	<b>Honorable Mention – NSF Graduate Research Fellowship Program</b> – Accorded an Honorable Mention, a significant national academic achievement.	Los Angeles, CA
Mar 2013	<b>Merit Top-off Fellowship – University of Southern California</b> – Awarded Viterbi School of Engineering Ph.D. Merit Top-off Fellowship.	Los Angeles, CA
Aug 2011-2013	<b>Fellowship – Center of Science of Information (CSOI)</b> – Awarded fellowship for senior research and thesis with focus on computational creativity. – Created automated A vs B music mashup system.	Bryn Mawr, PA
Aug 2011-2012	<b>Fellowship – Partnership for International Research and Education (PIRE)</b> – Awarded fellowship for research in humanoid robotics and development of RoboCup team. – Invited to SIGCSE conference as a student ambassador to Nao robot and Bryn Mawr College.	Bryn Mawr, PA
May 2011 & 2013	<b>MIT Lincoln Laboratories Research Award in Computer Science</b> – Awarded for work and research in gesture recognition for the American Sign Language-to-Text project (2011), and senior thesis (2013).	Bryn Mawr, PA

## PUBLICATIONS

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### UNDER REVIEW

- Caitlyn Clabaugh**, “Robot Learning,” Chapter in *The Robotics Primer (2nd Edition)*, Maja Matarić, MIT Press, 2019.
- Caitlyn Clabaugh** and Maja Matarić, “Robots for the People, by the People: Machine Learning Paradigms for Personalized Human-Robot and Human-Machine Interaction,” in *Science Robotics*, Focus Article, 2018.
- Caitlyn Clabaugh** and Maja Matarić, “Can Technology Save Children from Itself?,” in *Topical Issue on Roboethics*, Paladyn. Journal of Behavioral Robotics, 2018.

### PEER-REVIEWED CONFERENCE PAPERS

- Caitlyn Clabaugh**, David Becerra, Eric Deng, Gisele Ragusa, and Maja Matarić, “Month-long, In-home Case Study of a Socially Assistive Robot for Children with Autism Spectrum Disorder,” in *Companion of the Twenty-Second ACM/IEEE International Conference on Human-Robot Interaction (HRI)*, Chicago, IL, March 5-8, 2018.
- Caitlyn Clabaugh** and Maja Matarić, “Exploring Elicitation Frequency of Learning-Sensitive Information by a Robotic Tutor for Interactive Personalization,” in *Twenty-Fifth ACM/IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN)*, New York, NY, August 26-31, 2016. **Awarded Best Empirical Paper**
- Caitlyn Clabaugh**, Gisele Ragusa, Fei Sha, and Maja Matarić, “Designing a Socially Assistive Robot for Personalized Number Concepts Learning in Preschool Children,” in *Fifth International Conference on Development and Learning and on Epigenetic Robotics (ICDL-EPIROB)*, Providence, RI, August 13-16, 2015.

### PEER-REVIEWED WORKSHOP PAPERS

- Caitlyn Clabaugh**, Konstantinos Tsiakas, and Maja Matarić, “Predicting Preschool Mathematics Performance of Children with a Socially Assistive Robot Tutor,” in *Workshop on Synergies Between Learning and Interaction at the 2017 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2017)*, Vancouver, Canada, September 28, 2017.

**Caitlyn Clabaugh**, "Interactive Personalization for Socially Assistive Robotics," in *HRI-Pioneers Workshop at the Twenty-First ACM/IEEE International Conference on Human-Robot Interaction (HRI)*, Vienna, Austria, March 6-9, 2017.

Braden McDorman, **Caitlyn Clabaugh**, and Maja Matarić, "Attachment Theory in Long-Term Human-Robot Interaction," in *Workshop on Long-Term Child-Robot Interaction held at the Twenty-Fifth ACM/IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN)*, New York, NY, August 31, 2016.

**Caitlyn Clabaugh**, Teja Ram, and Maja Matarić, "Estimating Visual Focus of Attention in Dyadic Human-Robot Interaction for Planar Tasks," in *First International Workshop on Educational Robots (WONDER) at the Seventh International Conference on Social Robotics (ICSR)*, Paris, France, October 26, 2015.

**Caitlyn Clabaugh**, Fei Sha, Gisele Ragusa, and Maja Matarić, "Towards a Personalized Model of Number Concepts Learning in Preschool Children," in *Workshop on Machine Learning for Social Robotics at ICRA*, Seattle, WA, May 26, 2015.

Jillian Greczek, Elaine Short, **Caitlyn Clabaugh**, Katelyn Swift-Spong, and Maja Matarić, "Socially Assistive Robotics for Personalized Education for Children," in *AAAI Fall Symposium Series*, Washington, DC, November 13-15, 2014.

Ross Mead, Amin Atrash, Edward Kaszubski, Aaron St Clair, Jillian Greczel, **Caitlyn Clabaugh**, Brian Kohan, and Maja Matarić, "Building Blocks of Social Intelligence: Enabling Autonomy for Socially Intelligent and Assistive Robots," in *AAAI Fall Symposium Series*, Washington, DC, November 13-15, 2014.

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## WORKSHOP ORGANIZATION

<i>HRI 2018</i>	<b>Program Chair – 13th Human-Robot Interaction Pioneers Workshop</b> <i>2018 ACM/IEEE International Conference on Human-Robot Interaction (HRI), March 2018</i> An annual workshop held in conjunction with the larger HRI conference to bring together the world's top student researchers in HRI, early in their academic careers, to foster collaboration and facilitate discussion of their work with peers and senior scholars in the field. Co-organizers: Austin Whitesell (Oregon State University), Cristina Zaga (University of Twente), Brittany Noah (Georgia Institute of Technology), Felix Gervits (Tufts University), Nik Martelaro (Stanford University), Zhi Tan (Carnegie Mellon University), Ali Raza (University of Technology Sydney)	Chicago, IL
<i>RO-MAN 2016</i>	<b>Co-Organizer – First Workshop on Long-Term Child-Robot Interaction</b> <i>IEEE International Symposium on Robot and Human Interactive Communication, August 2016</i> Co-organizers: Jacqueline Kory Westlund (MIT Media Lab), Hae Won Park (MIT Media Lab), Iolanda Leite (Disney Research), Chien-Ming Huang (Yale University), James Kennedy (Plymouth University), Elaine Short (University of Southern California)	New York, NY

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## LEADERSHIP

<i>May 2014-2016</i>	<b>Co-Founder &amp; Chief Technology Officer of Botkins Robotics</b> – Co-founder and CTO of personalized companion robotics startup for young children. – Learned about many parts of the startup process through the USC Incubator, including hardware and software prototyping, market and UX research, business modeling, legal processes, and pitching. – Attended the annual New York Toy Fair and Maker Faire Bay Area as part of our market research and connected with many other companies and startups in the space. – Placed 3rd out of 18 teams at the Fifth Annual Maseeh Entrepreneurship Prize Competition (MEPC).	Los Angeles, CA
<i>Aug 2011-2013</i>	<b>RoboCup Robotic Soccer Team Founder &amp; Captain</b> – Founded and led Bryn Mawr and Haverford team for robot soccer platform on five Aldebaran NAOs. – Placed fifth at the 2012 U.S. Open national RoboCup Standard Platform League competition. – Qualified to compete in the international RoboCup competition. – Led weekly meetings and trained team with various levels of robotics and programming experience. – Developed semester-long goals and long-term team strategies, and fostered future team leadership.	Bryn Mawr, PA

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## K-12 STEM OUTREACH & MENTORING

<i>2015-present</i>	<b>SHINE High School Research Mentor – University of Southern California</b> – Mentored and led a total of six high school students in Computer Science and Robotics research through USC's Summer High School Intensive in Next-Generation Engineering (SHINE) program. – Designed research project to introduce student to the field of Socially Assistive Robotics. – Every student now studies Computer Science or related STEM field at major research universities.	Los Angeles, CA
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<i>Aug 2015-2016</i>	<b>Robotics &amp; Coding Academy – University of Southern California</b> <ul style="list-style-type: none"> <li>– Pioneered the University of Southern California Robotics &amp; Coding Academy, an after-school program that reaches 70 students, annually, from three middle schools surrounding USC.</li> <li>– Developed open source robotics curriculum aligned to Common Core Standards for elementary school.</li> <li>– Hired and trained over 20 USC undergraduate and graduate mentors to lead after-school classes.</li> </ul>	Los Angeles, CA
<i>Jan 2016</i>	<b>“Design a Start Up in a Day” Workshop – All Star Code</b> <ul style="list-style-type: none"> <li>– Co-led workshop on tech and entrepreneurship for All Star Code, a non-profit founded in 2013 and dedicated to closing the opportunity gap between young men of color and the tech industry.</li> </ul>	Los Angeles, CA
<i>Jul 2014 &amp; 2015</i>	<b>Expressive Robotics Workshop at Global Conference on Educational Robotics</b> <ul style="list-style-type: none"> <li>– Presented core concepts in expressive robotics including: emotion theory, tweening, principles of animation, and character/story design.</li> <li>– Contributed new aesthetics component to workshop with professional puppeteer-led costume design.</li> <li>– Led small teams in creating expressive robots through keyframing in C and aesthetic character design.</li> </ul>	Los Angeles, CA
<i>2014-present</i>	<b>Annual USC Viterbi Robotics Open House</b> <ul style="list-style-type: none"> <li>– Conducted interactive demos of the Interaction Lab's Stewart Platform Robot for Interactive Tabletop Engagement (SPRITE) robot to thousands of visitors, especially K-12 students, annually.</li> </ul>	Los Angeles, CA
<i>Jun 2015</i>	<b>Volunteer at International Botball Tournament</b> <ul style="list-style-type: none"> <li>– Volunteer judge and mentor at international tournament for Botball Educational Robotics Program.</li> </ul>	Albuquerque, NM
<i>Apr 2015</i>	<b>Public Robotics Demonstration at Los Angeles Festival of Books</b> <ul style="list-style-type: none"> <li>– Publicly showcase some of the Interaction Labs research on Socially Assistive Robotics, specifically with applications in personalized education and children with autism spectrum disorder.</li> </ul>	Los Angeles, CA
<i>Jan 2015</i>	<b>First Annual Robotics Visit at the Marlborough School</b> <ul style="list-style-type: none"> <li>– Presented interactive demonstrations of the NAO robot and led discussion on robotics and women in STEM to robotics club at all girls' high school.</li> </ul>	Los Angeles, CA
<i>May 2014</i>	<b>Volunteer Judge at Regional Botball Tournament</b> <ul style="list-style-type: none"> <li>– Volunteer judge for regional tournament for Botball international educational robotics program.</li> </ul>	Los Angeles, CA
<i>May 2014</i>	<b>Assembly at Monterey Hills Elementary School</b> <ul style="list-style-type: none"> <li>– Presented interactive demonstrations of some robots to 100 fourth and fifth graders and teachers.</li> <li>– The NAO led students in a short exercise routine, Maki illustrated how robots communicate through facial affect, and DragonBot taught students about healthy food choices.</li> </ul>	Pasadena, CA
<i>May 2014</i>	<b>Invited Speaker on Robotics &amp; Machine Learning at Girls Who Code</b> <ul style="list-style-type: none"> <li>– Presented and led discussion on Robotics, Machine Learning, and women empowerment in Computer Science research to a diverse and all-female classroom of 40 high school students.</li> </ul>	San Jose, CA

## SKILLS

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<b>Computer Languages:</b>	C#, Python, JavaScript, C/C++, Java, Lua, Logo, Scheme, Processing, Scratch, Blockly
<b>Natural Languages:</b>	French (limited working proficiency), Spanish (elementary proficiency)
<b>Applications:</b>	Unity, Vim, Emacs, MATLAB, R, Visual Studios, .NET Framework, Eclipse, NetBeans, OpenGL, MS Office, LaTeX, Adobe Photoshop, Adobe Illustrator, Maya, Mudbox, Final Cut Pro
<b>Operating Systems:</b>	OSX, Linux, Unix, ROS, ArdOS, Windows 7, Vista, and XP
<b>Robotic Platforms:</b>	USC's SPRITE robot, Aldebaran NAO, MIT Media Lab's DragonBot, Wonder Workshop Dot & Dash, Sphero

## PERSONAL

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<b>Citizenship:</b>	United States of America
<b>Other:</b>	Assistant Pastry Chef at Butter Cake Shoppe (2015-2016), USC Boxing Team (2014-2016)