

Emma Tosch

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Research Interests

The research questions that motivate me relate to supporting sound experimental methodologies within complex software systems. I use methods from domain-specific programming language design to build languages and tools for data scientists and social scientists.

Education

- Sep. 2020 **PhD, Computer Science**, University of Massachusetts Amherst.
Thesis: System Design for Digital Experiments
Advisors: Profs. David Jensen and J. Eliot B. Moss
- May 2011 **MA, Computer Science**, Brandeis University.
Note: Part of a combined post-baccalaureate and MA program in computer science.
- Jun. 2008 **BA, English Literature**, Wellesley College.

Academic Appointments

- Jul. 2020 – present **Research Affiliate**, *College of Engineering and Mathematical Sciences, University of Vermont*, Temporary research affiliation until January 2021.
- Jan. 2021 **Assistant Professor**, *College of Engineering and Mathematical Sciences, University of Vermont*, Programming Languages, Information security and Data privacy (PLAID) Lab.
- May 2018 – Aug. 2020 **Research Assistant**, *University of Massachusetts Amherst*, Knowledge Discovery Lab, Supervisor: David Jensen.
Developed tools and methods to evaluate autonomous black-box agents for the DARPA Explainable AI (XAI) program.
- May 2013 – Dec. 2016 **Research Assistant**, *University of Massachusetts Amherst*, PLASMA Lab, Supervisor: Emery Berger.
Developed a domain specific programming language and runtime system to design, debug, and deploy scientific surveys on the web, at scale.
- Sep. 2011 – Jan. 2013 **Research Assistant**, *University of Massachusetts Amherst*, Computational Intelligence Lab, Supervisor: Lee Spector.
Devised a new measure for evaluating parameters of evolutionary search based on techniques from nonparametric statistics.

Publications

- OOPSLA 2019 **PlanAlyzer: Assessing Threats to the Validity of Online Experiments**, *Proceedings of the 2019 ACM International Conference on Object Oriented Programming Systems Languages and Applications (OOPSLA)*, Emma Tosch, Eytan Bakshy, Emery Berger, David D. Jensen, J. Eliot B. Moss.
Selected as a **SIGPLAN research highlight** and a **CACM research highlight**.
- NeurIPS Workshop 2018 **ToyBox: Better Atari Environments for Testing Reinforcement Learning Agents**, John Foley, * Emma Tosch, * Kaleigh Clary, David D. Jensen, Systems for Machine Learning Workshop at the 32nd Conference on Neural Information Processing Systems (NeurIPS).

- NeurIPS Workshop 2018 **Measuring and Characterizing Generalization in Deep Reinforcement Learning**, *Sam Witty, Jun Ki Lee, Emma Tosch, Akanksha Atrey, Michael Littman, David D. Jensen*, Critiquing and Correcting Trends in Reinforcement Learning Workshop at the 32nd Conference on Neural Information Processing Systems (NeurIPS).
- NeurIPS Workshop 2018 **Let's Play Again: Variability of Deep Reinforcement Learning Agents in Atari Environments**, *Kaleigh Clary, Emma Tosch, John Foley, David D. Jensen*, Critiquing and Correcting Trends in Reinforcement Learning Workshop at the 32nd Conference on Neural Information Processing Systems (NeurIPS).
- CODE 2015 **Formal Verification and Automated Causal Inference for Internet-Scale Experiments**, *Emma Tosch, E. Bakshy*, Conference on Digital Experimentation (CODE@MIT).
- OOPSLA 2014 **SurveyMan: Programming and Debugging Surveys at Scale**, *Emma Tosch, E. Berger*, Proceedings of the 2014 ACM International Conference on Object Oriented Programming Systems Languages and Applications (OOPSLA).
Best Paper Award
- GECCO Workshop 2012 **Achieving COSMOS: A metric for determining when to give up and when to reach for the stars**, *Emma Tosch, L. Spector*, Proceedings of the 14th International Conference on Genetic and Evolutionary Computation Conference Companion (GECCO).
- ICCS 2011 **Compositional Autoconstructive Dynamics**, *Kyle I. Harrington, Emma Tosch, Lee Spector, Jordan Pollack*, Proceedings of the 8th International Conference on Complex Systems.
- FLAIRS 2011 **Evaluating Conversational Characters Created through Question Generation**, *Grace Chen, Emma Tosch, Ron Artstein, Anton Leuski, David Traum*, Proceedings of the 24th International Florida Artificial Intelligence Research Society Conference (FLAIRS).

Industrial Research Experience

- Summer 2015 **Research Intern**, *Facebook, Inc. Menlo Park, CA*, Core Data Science – Economic Research Team, Statistics and Decision Science Team, Supervisor: Eytan Bakshy.
Static Analysis for the PlanOut DSL
- Summer 2010 **Research Intern**, *Institute for Creative Technologies. Playa Vista, CA*, Supervisor: Ron Artstein.
Natural language generation and question-answering system for virtual humans

Honors, Scholarships, and Awards

- 2021 CACM Research Highlight
- 2020 SIGPLAN Research Highlight
- 2015 WPI STEM Faculty Launch participant and travel grant
- 2015 NCWIT Symantec Student Seed Funding (for UMass CS Women)
- 2015 UMass Amherst School of Computer Science Outstanding Synthesis Award
- 2014 OOPSLA Best Paper Award
- 2014 PLDI ACM Student Research Competition (1st Place)
- 2013 Future of Software Engineering Symposium Scholarship at Microsoft Research
- 2013 Programming Languages Mentoring Workshop Scholarship
- 2012 ACM-W conference scholarship (attended SIG-EVO)
- 2010 Grace Hopper Celebration of Women in Computing Scholarship
- 2005 Humanities Foundation Award in English Literature

Teaching Experience

- Spring 2021 **Instructor**, *Reinforcement Learning*, University of Vermont, Upper Undergraduate/Graduate.
- Spring 2018 **Instructor**, *Reasoning Under Uncertainty*, University of Massachusetts Amherst, Undergraduate.
Co-taught with Luis Pineda
- Fall 2017 **Teaching Assistant**, *Advanced Logic*, University of Massachusetts Amherst, Upper Undergraduate/Graduate.
Taught by Prof. Neil Immerman
- Spring 2017 **Teaching Assistant, Guest Lecturer**, *Reasoning Under Uncertainty*, University of Massachusetts Amherst, Undergraduate.
Spring 2013 Taught by Prof. Andrew McGregor
- Spring 2011 **Teaching Assistant, Guest Lecturer**, *Introduction to Theory of Computation*, Brandeis University, Undergraduate.
Taught by Dr. Antonella DiLillo
- Fall 2010 **Teaching Assistant**, *Structure and Interpretation of Computer Programs*, Brandeis University, Undergraduate.
Taught by Prof. Harry Mairson
- Spring 2010 **Teaching Assistant**, *Data Structures*, Brandeis University, Undergraduate.
Taught by Dr. Antonella DiLillo

Advising and Mentoring Experience

- Fall 2020 **Co-Advisor**, *Participatory Data Surveys*, Krystal Maughan, University of Vermont, PhD –present 2024 (expected), PLAID Lab.
- Summer 2016 **Mentor**, *Project on detecting adversarial behavior amongst online survey-takers*, Rosario Huamani Carpio, Pomona College, B.A. 2018.
REU Program, PLASMA Lab, University of Massachusetts Amherst
- Summer 2015 **Mentor**, *Project for developing a SurveyMan graphical interface in React*, Prakhar Srivastav, Columbia University, M.S. 2016.
Google Summer of Code, PLASMA Lab, University of Massachusetts Amherst
- Summer 2013 **Mentor**, *Early-stage research project on developing tools for writing sound online surveys*, Molly McMahon, University of Massachusetts Amherst, B.A. 2015.
Spring 2014 REU Program & Independent Study, PLASMA Lab, University of Massachusetts Amherst

Other Work Experience

- May 2017 – **Project Assistant**, *University of Massachusetts Amherst*, Prof. Charles Weems, Amherst, MA.
Aug. 2017
- Sep. 2014 – **Software Engineering Intern**, *Google, Inc.*, Mountain View, CA.
Dec. 2014
- Mar. 2008 – **Data Warehouse Analyst**, *Recombinant Data Corp.*, Newton, MA.
May 2009

Selected Talks and Presentations

Programming Languages and Experimentation

- 23 Oct. 2019 **Oral Presentation (full)**, *OOPSLA 2019*, Athens, Greece.
- 9 Dec. 2016 **Invited talk**, *Wellesley College*, Wellesley, MA.
- 31 May 2016 **Oral presentation (full)**, *NEPLS Spring 2016*, Amherst, MA.
- 17 Oct. 2015 **Poster presentation**, *CODE@MIT*, Cambridge, MA.

Software Infrastructure for Machine Learning

- 7 Dec. 2018 **Poster presentation**, *NeurIPS Systems for ML Workshop*, Montreal, QC.
- 4 Oct. 2018 **Oral presentation (full)**, *IBM AI Systems Day*, Cambridge, MA.

Programming and Debugging Surveys

- 8 Nov. 2016 **Invited talk**, *SPLASH-I*, Amsterdam, Netherlands.
- 1 Oct. 2015 **Invited talk**, *Union College*, Schenectady, NY.
- 13 May 2015 **Invited talk**, *Google, Inc.*, Cambridge, MA.
- 22 Oct. 2014 **Oral presentation (full)**, *OOPSLA 2014*, Portland, OR.
- 11 Jun. 2014 **Oral presentation (short)**, *PLDI Student Research Competition*, Edinburgh, Scotland.
- 25 Jan. 2014 **Oral presentation (full)**, *POPL OBT Workshop*, San Diego, CA.

Professional Activities and Service

- 2020 **Organizer**, *Virtual PhD recruiting*, <https://phd-recruiting.com>.
- 2019 **Evaluator**, *SLE Artifact Evaluation Committee*.
- 2018 **Evaluator**, *ECOOP Artifact Evaluation Committee*.
- Jan. 2016 – **Graduate Representative**, *University of Massachusetts Amherst, College of Information and Computer Sciences Faculty*.
- 2016 **Student Volunteer**, *PLDI Conference*.
- Jun. 2016 – **Webmaster**, *CS Women*, University of Massachusetts Amherst, College of Information and Computer Sciences.
- Jan. 2016 – **Treasurer**, *UMass CS Women*, University of Massachusetts Amherst, College of Information and Computer Sciences.
- May 2016 **Treasurer**, *UMass CS Women*, University of Massachusetts Amherst, College of Information and Computer Sciences.
- Jan. 2015 – **Co-Chair**, *UMass CS Women*, University of Massachusetts Amherst, College of Information and Computer Sciences.
- Jan. 2016 **Co-Chair**, *UMass CS Women*, University of Massachusetts Amherst, College of Information and Computer Sciences.
- 2016 **Reviewer**, *PLDI External Review Committee*.
- 2016 **Reviewer**, *ECOOP External Review Committee*.
- 2016 **Reviewer**, *POPL OBT Workshop Program Committee*.
- 2016 **Reviewer**, *ECOOP DSLDI Workshop Program Committee*.
- 2016 **Evaluator**, *PLDI Artifact Evaluation Committee*.
- 2014 **Reviewer**, *NCWIT Aspirations Scholarship*.
- 2015 **Reviewer**, *POPL Artifact Evaluation Committee*.
- 2014 **Student Volunteer**, *SPLASH Conference*.
- Sep. 2011 – **Steward**, *Graduate Employee Organization, UAW 2322*, University of Massachusetts Amherst.
- May 2014 **Steward**, *Graduate Employee Organization, UAW 2322*, University of Massachusetts Amherst.