

Emma Tosch

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Research Interests

I work in *applied programming languages (PL) research*, where I treat PL processes, such as building domain-specific languages, as a broader method for scientific inquiry, with applications in computational social science. I am particularly interested in the intersection of formal methods and empirical methods.

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.

Grants, Awards, and other Funding

- 2022-2026 **Formalizing the Experimentation-Analysis Pipeline**, *Formal Methods in the Field*, NSF, \$661,021.

Publications

Refereed Conferences and Journals

- ACM REP 2025 **Encoding Hypotheses and Experiments with Helical**, [Emma Tosch](#), [Gwen Lincroft](#), ACM Conference on Reproducibility and Replicability.
- PoPETS 2024 **Privacy Policies on the Fediverse: A Case Study of Mastodon Instances**, [Emma Tosch](#), [Luis Garcia](#), [Cynthia Li](#), [Chris Martens](#), Proceedings on Privacy Enhancing Technologies Symposium.
- Applied AI Letters 2022 **Measuring and Characterizing Generalization in Deep Reinforcement Learning**, [Sam Witty](#), [Jun Ki Lee](#), [Emma Tosch](#), [Akanksha Atrey](#), [Kaleigh Clary](#), [Michael L. Littman](#), [David D. Jensen](#), (Wiley).
- USENIX 2022 **Stick It to The Man: Correcting for Non-Cooperative Behavior of Subjects in Experiments on Social Networks**, [Kaleigh Clary](#), [Emma Tosch](#), [Jeremiah Onaolapo](#), [David D. Jensen](#), Proceedings of the 31th USENIX Security Symposium, Volume 2024, Issue 4.
- 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 in the Sept. 2021 issue.

- 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
- Dialogue & Discourse 2012 **Creating Conversational Characters using Question Generation Tools**, *Xuchen Yao*, [Emma Tosch](#), *Grace Chen*, *Elnaz Nouri*, *Ron Artstein*, *Anton Leuski*, *Kenji Sagae*, *David Traum*, Volume 3, Number 2, pp. 125–146.
- 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).
- Refereed Workshops
- PLATEAU 2025 **Exploring Support for Lightweight DSLs in Jupyter Notebooks**, *Kevin G. Yang*, , 15th Annual Workshop on the Intersection of HCI and PL.
- ProLaLa 2023 **Exploring Consequences of Privacy Policies with Narrative Generation via Answer Set Programming**, *Chinmaya Dabral*, [Emma Tosch](#), *Chris Martens*, 2nd Workshop on Programming Languages and the Law.
- 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).
- 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).
- Non-Refereed Conferences, Workshops, Journals, and other Documents
- Invited Response (forthcoming) **Uncanny to Whom?: Usability in light of purpose and provenance of domain-specific languages for law**, [Emma Tosch](#), Journal of Cross-Disciplinary Research in Computational Law.

CACM, Sept. 2021 **PlanAlyzer: Assessing Threats to the Validity of Online Experiments**, *Communications of the ACM*, Vol. 64, Issue 9, [Emma Tosch](#), Eytan Bakshy, Emery Berger, David D. Jensen, J. Eliot B. Moss.

Living Document **HOWTO for AEC Submitters**, <https://tinyurl.com/4h5h65ba>, Dan Barowy, Charlie Curtsinger, [Emma Tosch](#), John Vilks.

Academic Appointments

Jan. 2021 – Aug. 2022 **Assistant Professor**, *College of Engineering and Mathematical Sciences, University of Vermont*, UVM Center for Security and Privacy.

Research Experience

August 2024 – present **Research Scientist**, *Northeastern University*, Principles of Expressible Machines (POEM) Lab, Supervisor: Dr. Chris Martens.

Oct 2022 – July 2024 **Postdoctoral Researcher**, *Northeastern University*, Principles of Expressible Machines (POEM) Lab, Supervisor: Dr. Chris Martens.

May 2018 – Aug. 2020 **Research Assistant**, *University of Massachusetts Amherst*, Knowledge Discovery Lab (KDL), Supervisor: Dr. David Jensen.

Summer 2015 **Research Intern**, *Facebook, Inc. Menlo Park, CA*, Core Data Science – Economic Research Team, Statistics and Decision Science Team, Supervisor: Dr. Eytan Bakshy.

May 2013 – Dec. 2016 **Research Assistant**, *University of Massachusetts Amherst*, PLASMA Lab, Supervisor: Dr. Emery Berger.

Sep. 2011 – Jan. 2013 **Research Assistant**, *University of Massachusetts Amherst*, Computational Intelligence Lab, Supervisor: Lee Spector.

Summer 2010 **Research Intern**, *Institute for Creative Technologies. Playa Vista, CA*, Supervisor: Dr. Ron Artstein.

Teaching Experience

Spring 2022 **Instructor**, *Artificial Intelligence*, University of Vermont, Upper Undergraduate/Graduate.

Fall 2021 **Instructor**, *Systems for Knowledge Discovery*, University of Vermont, Upper Undergraduate/Graduate.

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 2013, Spring 2017 **Teaching Assistant, Guest Lecturer**, *Reasoning Under Uncertainty*, University of Massachusetts Amherst, Undergraduate.
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

- July 2025 – December 2025 **Undergraduate research co-op supervisor**, *Zixuan (Jason) Yu*, Northeastern University Undergraduate, BS 2027 (expected).
Identifying opportunities for intervention and privacy annotation in the Mastodon code stack
- January 2025 – present **Independent research project supervisor**, *Gwen Lincroft*, Northeastern University, PhD 2027 (expected).
DSL support for Data Linting
- July 2024 – December 2024 **Undergraduate research co-op supervisor**, *Kevin Yang*, Northeastern University Undergraduate, BS 2026 (expected).
Building a Jupyter extension as an interface to the Helical languages, with the goal of making replication in digital experimentation more usable.
- 2022-2023 **NSF CSGrads4US Mentor**, *Advised three then-employed prospective graduate students through the PhD application process.*
- Spring 2022 **PhD Advisor**, *Ratang Sedimo*, University of Vermont, PhD 2027 (expected).
Safe and Auditable Digital Experimentation Pipelines
- Summer 2022 **Independent research project supervisor**, *Mako Bates*, University of Vermont, PhD 2025 (expected).
Formal verification of programmatically-defined experiments
- Summer 2022 **Independent research project supervisor**, *Erin McBride*, University of Vermont, MS 2022 (now at University of Wisconsin School of Law, JD 2025 (expected)).
Encoding consent models for experimentation via modal logic and probabilistic programming
- Summer 2016 **REU Mentor**, *Rosario Huamani Carpio*, Pomona College, BA 2018.
Project on detecting adversarial behavior amongst online survey-takers
- Summer 2015 **Google Summer of Code Mentor**, *Prakhar Srivastav*, Columbia University, MS 2016.
Project for developing a SurveyMan graphical interface in React
- Summer 2013, Spring 2014 **REU Mentor, Independent research project supervisor**, *Molly McMahon*, University of Massachusetts Amherst, BA 2015, MS 2017.
Early-stage research project on developing tools for writing sound online surveys

Honors, Scholarships, and other Awards

- 2025 Dagstuhl Seminar 25021 Grand Challenges for Research on Privacy Documents invited participant
- 2022 Keynote speaker at the LASER Workshop at ACSAC
- 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

Other Work Experience

Summer 2017 **Project Assistant**, *University of Massachusetts Amherst*, Prof. Charles Weems, Amherst, MA.
Fall 2014 **Software Engineering Intern**, *Google, Inc.*, Mountain View, CA.
2008 – 2009 **Data Warehouse Analyst**, *Recombinant Data Corp.*, Newton, MA.
September 2006 – May 2008 **Usher**, *American Repertory Theater*, Cambridge, MA.
June 2005 – October 2006 **Assistant Loan Processor**, *Hoffman Companies*, Brookline, MA.
May 2006 – August 2006 **Clerk**, *Lulu's Bakery*, Boston, MA.
January 2006 – May 2006 **Laborer**, *Natick Community Organic Farm*, Natick, MA.
June 2004 – August 2004 **Intern**, *New Jersey Division of Law and Public Service*, Trenton, NJ.
June 2002 – April 2003 **Clerk**, *Wawa*, Hamilton, NJ.

Talks and Presentations

Policy, Governance, and Administration in the Fediverse

15 Oct. 2024 **Invited Talk**, *Platform Economy Interest Group*, Oxford Internet Institute Seminar Series, Virtual.
16 Jul. 2024 **Oral Presentation (full)**, *PETS 2024*, Bristol, England, UK.
27 Oct. 2023 **Community Talk**, *Human-centered computing community meeting*, Northeastern University, Boston, MA.

Programming Languages and Experimentation

9 May 2025 **Oral Presentation/Tutorial**, *NEPLS Spring 2025*, University of Massachusetts Lowell, Lowell, MA.
8 Dec. 2022 **Panelist**, *On the Curation of Artifacts in the Era of AI/ML for Cybersecurity*, ACSAC, Austin, TX.
6 Dec. 2022 **Keynote Talk**, *ACSAC LASER Workshop*, Austin, TX.
18 Nov. 2022 **Invited Talk**, *University of New Hampshire*, Durham, NH, Robotics Seminar Series.
15 Nov. 2022 **Invited Talk**, *George Mason University*, Fairfax, VA, Software Engineering Seminar Series.

- 10 Mar. 2022 **Invited Talk**, *North Carolina State University*, Seminar/Colloquia Series.
- 7 Feb. 2020 **Invited Talk**, *George Mason University*, CS Seminar.
- 23 Oct. 2019 **Oral Presentation (full)**, *OOPSLA 2019*, Athens, Greece.
- 9 Dec. 2016 **Invited talk**, *Wellesley College*, Wellesley, MA, CS Colloquium Series.
- 31 May 2016 **Oral presentation (full)**, *NEPLS Spring 2016*, Amherst, MA.
- 17 Oct. 2015 **Poster presentation**, *CODE@MIT*, Cambridge, MA.
Programming Languages and Law or Policy
- 15 Jan. 2023 **Oral Presentation (long)**, *ProLaLa23*, Boston, MA.
Programming and Debugging Surveys
- 8 Nov. 2016 **Invited talk**, *SPLASH-I*, Amsterdam, Netherlands.
- 1 Oct. 2015 **Invited talk**, *Union College*, Schenectady, NY, CS Seminar Series.
- 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.
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.
Detecting Convergence in Population-based Genetic Programming Methods
- 7 Jul. 2012 **Oral presentation (full)**, *GECCO Understanding Problems Workshop*, Philadelphia, PA.
General Non-technical Topics in Computing
- 22 Oct. 2019 **Panelist**, *Programming Languages Mentoring Workshop*, Athens, Greece.
- 23 Jun. 2019 **Panelist**, *Programming Languages Mentoring Workshop*, Phoenix, AZ.
- 24 Apr. 2015 **Panelist**, *MassMutual Women in Technology Conference*, Springfield, MA.

Professional Activities and Service

- 2024 **Co-Chair**, *ProLaLa 2024*.
- 2024 **Associate Chair**, *OOPSLA 2024*.
- 2024 **Program Committee Member**, *OOPSLA 2024*.
- 2023 **Organizer**, *Usable Privacy Reading Group*.
- 2023 **Program Committee Member**, *ECOOP 2023*.
- 2022 **Mentor**, *NSF/CRA CSGrads4US Program*, (3 prospective PhD students).
- 2022 **Reviewer**, *NSF/CRA CSGrads4US Program*.
- 2022 **Participant**, *CRA Early Career Mentoring Workshop*.
- 2022 **Program Committee Member**, *ProLaLa 2023*.
- 2022 **Program Committee Member**, *ECOOP 2022*.
- 2021 **Organizer**, *Virtual PhD recruiting*, <https://phd-recruiting.com>.
- 2021 **Reviewer**, *NSF Software and Hardware Foundations Virtual Panel (NSF SMALL)*.

- 2021 **External Program Committee Member**, *OOPSLA 2021*.
- 2021 **Program Committee Member**, *Dynamic Languages Symposium 2021*.
- 2021 **Reviewer**, *The Programming Journal*, Volume 6.
- 2020 **Organizer**, *Virtual PhD recruiting*, <https://2020.phd-recruiting.com>.
- 2019 **Evaluator**, *SLE Artifact Evaluation Committee*.
- 2018 **Evaluator**, *ECOOP Artifact Evaluation Committee*.
- 2016 **Graduate Representative**, *University of Massachusetts Amherst, Robert and Donna Manning College of Information and Computer Sciences Faculty*.
- 2016 **Student Volunteer**, *PLDI Conference*.
- 2016 **Webmaster**, *CS Women*, University of Massachusetts Amherst, Robert and Donna Manning College of Information and Computer Sciences.
- 2016 **Treasurer**, *UMass CS Women*, University of Massachusetts Amherst, Robert and Donna Manning 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*.
- 2015 **Co-Chair**, *UMass CS Women*, University of Massachusetts Amherst, Robert and Donna Manning College of Information and Computer Sciences.
- 2015 **Participant**, *WPI STEM Faculty Launch*.
- 2015 **Participant**, *ACM-W Early Career Mentoring Workshop*.
- 2014 **Reviewer**, *PLDI Artifact Evaluation Committee 2015*.
- 2014 **Reviewer**, *NCWIT Aspirations Scholarship*.
- 2014 **Reviewer**, *POPL Artifact Evaluation Committee 2015*.
- 2014 **Student Volunteer**, *SPLASH Conference*.
- 2011 – 2014 **Steward**, *Graduate Employee Organization, UAW 2322*, University of Massachusetts Amherst.