

Talia Lily Ringer (they/them)

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ACADEMIA

University of Illinois Urbana-Champaign 2021 – Present
Assistant Professor (3 YOE)

University of Washington 2015 – 2021
Ph.D. in Computer Science (advised by Dan Grossman).
Ph.D. Thesis: [Proof Repair](#). [Defense video](#).

University of Maryland, College Park 2008 – 2012
B.S. in Mathematics and Computer Science. (advised by Larry Washington).
Honors Thesis: [An Elliptic Curve Threshold Key Establishment Scheme](#)

INDUSTRY

Industrial Research (1 YOE)
Visiting Researcher, Google (N2Formal) Summer 2022 – Winter 2022
Research Scientist Intern, Amazon (Automated Reasoning Group) Summer 2016

- Worked on machine learning tools for proof assistants at Google.
- Developed a solver-aided language for automated test input generation at Amazon.

Software Engineering (4 YOE)
Software Development Engineer II, Amazon 2015
Software Development Engineer I, Amazon 2012 – 2014
Software Development Engineer Intern, Amazon Summer 2011
Software Intern, Carr Astronautics 2010 – 2011

- Helped launch [Amazon Business](#).
- Wrote customer-facing code used company-wide at Amazon.
- Deleted more lines of code during my time as an engineer at Amazon than I added. :)

INTERNATIONAL PROGRAMS FOUNDED

I am the **founder and president** of the [Computing Connections Fellowship](#), which provides institution-independent transitional funding and research visits for computer science Ph.D. students seeking healthier environments. Our two year pilot is in programming languages.

I am also the **founder and previous chair** of [SIGPLAN-M](#), a cross-institutional long-term mentoring program for the programming languages research community. It currently reaches more than **200 mentors** and **300 mentees** across more than **44 countries**, and has been described by mentees as “**life changing**” and “**a career saver.**”

My work founding these two programs (along with my other service work) led me to receive the **2023 ACM SIGPLAN [Distinguished Service Award](#)**.

RESEARCH IMPACT

My work introduced [proof repair](#), which has since been implemented and adapted at [Amazon](#) and [NASA](#), and was the subject of a [DARPA AI Exploration](#).

RESEARCH VISION

How can we build a world in which programmers of **all skill levels** across **all domains** can prove the absence of costly or dangerous bugs in software systems – that is, **formally verify** them? I lead a group that builds **proof engineering** technologies to make that world a reality. My group loves to use the whole toolbox – everything from **dependent type theory** to **program transformations** to **neural proof synthesis** – all in service of **real humans**.

CURRENT ADVISING

Postdoctoral Researchers

- [Kiran Gopinathan](#), 2024 – Present

Ph.D. Students:

- [Chris Lam](#), 2021 – Present
- [Cosmo Viola](#), 2021 – Present
- [Dylan Zhang](#), 2022 – Present
- [Hannah Leung](#), 2022 – Present

Visiting Ph.D. Students:

- [Jilin Hu](#), 2024 – Present

Researchers:

- [Evan Marzion](#), 2024 – Present

Masters Students:

- [Priyam Sahoo](#), 2024 – Present

Undergraduates:

- [Eyad Loutfi](#), 2024 – Present
- [Sankar Gopalkrishna](#), 2022 – Present

PREVIOUS ADVISING

Research Programmers:

- [Arpan Agrawal](#), 2022 – 2024

Masters Students:

- [Thomas Reichel](#), 2022 – 2024
 - Thesis: Neural Approaches to Theorem Search and Proof Repair

Undergraduates:

- [Eeshan Zele](#), 2022 – 2024
- [Jasper Hugunin](#), 2018 – 2019 (coadvised with Dan Grossman)

- Thesis: [Constructing Inductive-Inductive Types in Cubical Type Theory](#)
- **Max Fan**, 2022 – 2024
 - Now at Cornell for Ph.D.
- **Taylor Blau**, 2019 – 2020 (coadvised with Dan Grossman)
 - Thesis: [Verifying Strong Eventual Consistency in \$\delta\$ -CRDTs](#)
- **Timothy Zhou**, 2021 – 2024
 - Now at UCSD for Ph.D.
- **Zory Zhang**, 2023

DISSERTATION COMMITTEES

Bolton Bailey, UIUC, 2024. Formalizing Soundness Proofs of SNARKs.
 Emily First, UMass Amherst, 2023. [Automating the Formal Verification of Software](#).

HONORS & AWARDS

ESEC/FSE Distinguished Paper Award	2023
DARPA Young Faculty Award	2023
ACM SIGPLAN Distinguished Service Award	2023
Amazon Research Award	2022
PEO Scholar Award	2020
NSF GRFP	2016

GRANTS AWARDED

EPSULLM: Enabling Formal Methods Proof Synthesis Using Large Language Models. DARPA Seedling, 2024. PI: Yuriy Brun (UMass Amherst). Co-PI: **Talia Ringer** (UIUC).

Relation Learning for Proof Automation – PRICELESS. DARPA Young Faculty Award 2023. PI: **Talia Ringer** (UIUC).

PLATO: Enriched Tactic Prediction Models for Proof Synthesis & Repair. DARPA [PEARLS](#) AI Exploration. PI: **Talia Ringer** (UIUC). Co-PIs: Yuriy Brun (UMass Amherst) and Alex Sanchez-Stern (UMass Amherst).

POLYMORPH: Promotion to Optimal Languages Yielding Modular Operator-driven Replacements and Programmatic Hooks. DARPA [V-SPELLS](#). Primary PIs: Galois. Co-PIs: Northeastern, UW, UIUC, Alabama, and Syracuse.

Neurosymbolic Proof Synthesis and Repair. [Amazon Research Awards](#) 2022. PI: **Talia Ringer** (UIUC).

INVITED TALKS

Bridging Neural and Symbolic Proof Automation TYPES	2024
Language Models for Formal Proof Symposium on the Science of Security (HotSoS) Keynote	2024

Proofs and Conversations UIUC Math Colloquium	2024
<u>Concrete Problems in Proof Automation</u> <u>AI for Theorem Proving (AITP), EuroProofNet Large Libraries of Proofs</u>	2022
You and Your Environment Programming Languages Mentoring Workshop (PLMW) at POPL	2022
Proof Engineering Tools for a New Era Caltech, UCLA, UMass Amherst, Aarhus, Vermont, Illinois, Virginia, Tufts	2021
Proof Repair Across Type Equivalences Cornell, CMU, NUS	2020 – 2021
<u>Proof Transformation</u> <u>Logic Supergroup</u> Seminar Series	2020
Proof Engineering Tools for a New Era Rising Stars in CS Lecture Series at UMass Amherst	2019

INVITED SEMINARS AND WORKSHOPS

Shonan Seminar Foundation Models and Software Engineering: Challenges and Opportunities	<i>Spring 2024</i>
Dagstuhl Seminar Automated Mathematics: Integrating Proofs, Algorithms, and Data	<i>Fall 2023</i>
Career Path Panel Programming Languages Mentoring Workshop (PLMW) at PLDI	<i>Summer 2023</i>
NeurIPS Queer in AI Workshop: Queerness and Faculty Panel Invited Panel	<i>Winter 2022</i>
NeurIPS Workshop on MATH-AI Invited Panel	<i>Winter 2022, 2023</i>
ICML Workshop on Human-Machine Collaboration and Teaming Invited Panel: Human-Machine Teams for Mathematicians	<i>Summer 2022</i>
Dagstuhl Seminar Static Methods for Correctness of Model and Program Transformations	<i>Canceled (COVID-19)</i>
Coq Users and Developers Workshop An Event for Understanding, Improving, and Extending Coq	<i>Summer 2018, 2019</i>

REFEREED CONFERENCE & JOURNAL PUBLICATIONS

Audrey Seo*, Chris Lam*, Dan Grossman, Talia Ringer.
[Correctly Compiling Proofs About Programs Without Proving Compilers Correct.](#)
To appear in ITP 2024.

Talia Ringer.
[Proofs and Conversations.](#)
To appear in the AMS Early Career Notices in 2024.

Dylan Zhang, Curt Tigges, Zory Zhang, Stella Biderman, Maxim Raginsky, Talia Ringer.
[Transformer-Based Models Are Not Yet Perfect At Learning to Emulate Structural Recursion.](#)
TMLR 2024. [Short version.](#)

Emily First, Markus Rabe, Talia Ringer, Yuriy Brun.
[Baldur: Whole-Proof Generation and Repair with Large Language Models.](#)
ESEC/FSE 2023. **Distinguished Paper Award.**

Tom Reichel, R. Wesley Henderson, Andrew Touchet, Andrew Gardner*, Talia Ringer*.
[Proof Repair Infrastructure for Supervised Models: Building a Large Proof Repair Dataset.](#)
ITP 2023.

Alex Sanchez-Stern*, Emily First*, Timothy Zhou, Zhanna Kaufman, Yuriy Brun, Talia Ringer.
[Passport: Improving Automated Formal Verification Using Identifiers.](#)
TOPLAS Volume 45, Issue 2: No. 12, pp 1-30.
[Presented at PLDI 2023.](#) [Tool repository.](#)

Arpan Agrawal, Emily First, Zhanna Kaufman, Tom Reichel, Shizhuo Zhang, Timothy Zhou,
Alex Sanchez-Stern, Talia Ringer, Yuriy Brun.
[Proofster: Automated Formal Verification.](#)
ICSE Demo 2023. [Demo video](#), [tool website](#).

Emily Ruppel*, Sihang Liu*, Elba Garza, Sukyoung Ryu, Alexandra Silva, Talia Ringer.
[Long-Term Mentoring for Computer Science Researchers.](#)
Communications of the ACM (CACM): Volume 66: No. 5, pp 33-35. May 2023.

Talia Ringer, RanDair Porter, Nathaniel Yazdani, John Leo, Dan Grossman.
[Proof Repair Across Type Equivalences.](#)
PLDI 2021. [Talk video](#), PUMPKIN Pi [tool repository](#).

Talia Ringer, Alex Sanchez-Stern, Dan Grossman, Sorin Lerner.
[REPLICA: REPL Instrumentation for Coq Analysis.](#)
CPP 2020. [Talk video](#).

Talia Ringer, Karl Palmskog, Ilya Sergey, Milos Gligoric, Zachary Tatlock.
[QED at Large: A Survey of Engineering of Formally Verified Software.](#)
Foundations and Trends® in Programming Languages: Vol. 5: No. 2-3, pp 102-281. 2019.
[Project website.](#)

Talia Ringer, Nathaniel Yazdani, John Leo, Dan Grossman.
[Ornaments for Proof Reuse in Coq.](#)
ITP 2019. [Talk video](#), DEVOID [tool repository](#).

Talia Ringer, Nathaniel Yazdani, John Leo, Dan Grossman.
[Adapting Proof Automation to Adapt Proofs.](#)
CPP 2018. [Talk video](#), PUMPKIN PATCH [tool repository](#).

Talia Ringer, Dan Grossman, Daniel Schwartz-Narbonne, Serdar Tasiran.
[A Solver-Aided Language for Test Input Generation.](#)
OOPSLA 2017. [Talk video](#).

Talia Ringer, Dan Grossman, Franziska Roesner.
[AUDACIOUS: User-Driven Access Control with Unmodified Operating Systems.](#)
CCS 2016. [Talk video](#).

WORKSHOP PUBLICATIONS

Dylan Zhang, Emily First, Talia Ringer.
[Getting More out of Large Language Models for Proofs.](#)
AITP 2023.

Hannah Leung, Talia Ringer, Christopher Fletcher.
[Towards Formally Verified Path ORAM in Coq.](#)
CoqPL 2023.

Seth Poulsen, Matthew West, Talia Ringer.
[Autogenerating Natural Language Proofs for Proof Education.](#)
The Coq Workshop 2022.

PUBLICATION DRAFTS

Cosmo Viola, Max Fan, Talia Ringer.
[Proof Repair across Quotient Type Equivalences](#)
Under Submission.

LEADERSHIP, DIVERSITY, & SERVICE

Service is a core important part of my career since it is **so much bigger than my own research**. My service work was formally recognized when I received the **2023 ACM SIGPLAN [Distinguished Service Award](#)**.

International Programs Founded:

- [Computing Connections Fellowship](#), Founder & President 2022 – Present
- [SIGPLAN-M](#) (long-term mentoring), Founder & Previous Chair 2021 – Present

Conferences & Workshops:

- Beyond Bayes Workshop Co-Chair 2022
- Coq Workshop Co-Chair 2022
- SPLASH Hybridization Committee ([first major hybrid conference in my field](#)) 2021
- ICFP Programming Languages Mentoring Workshop (PLMW) Co-Chair 2020
- ICFP Mentoring Chair 2020
- [POPLmark 15 Year Retrospective Panel](#) Lead Organizer 2020
- Shut Down PL Co-Organizer (anti-racist workshop) 2020
- DeepSpec Summer School Student Talks Organizer 2017

Departmental & University Service:

- Disability Justice Panel 2023
- Grainger [IDEA Institute](#) Core Faculty Member 2022 – 2024
- UW CSE Academic Jobs Panel 2022
- Illinois CS BPC Committee 2022 – 2023
- Illinois Mental Health Ambassador 2021 – Present
- Illinois [CS CARES](#) Committee 2021 – Present
- UW CSE Care Committee Founder & Organizer (support network) 2019 – 2021
- UW CSE Graduate Admissions Committee 2018

National & International Service:

- BIRS Scientific Advisory Committee 2023
- BIRS Equity, Diversity, and Inclusion Advisory Committee 2023
- NASEM [AI to Assist Mathematical Reasoning Workshop](#) Planning Committee 2023
 - [Resources Document](#)
- [C3E Workshop](#) Planning Committee 2023

Reviewing & Program Committees (PCs):

- **Panels:** NSF (2023).
- **Conference PCs:** POPL (2024), ICFP (2023), ITP (2022), PLDI (2022), CAV (2021).
- **Journal Reviewing:** Nature (2023), [JAR](#) (2022), Mathematical Structures in Computer Science (2020).
- **Workshop PCs:** TYPES (2022), AIPLANS (2021), HATRA (2020), CoqPL (2019).
- **Artifact Evaluation Committees:** CAV (2019), POPL (2018, 2019).

Mentoring:

- Mentor for [SIGPLAN-M](#), the program that I founded and chair. 2021 – Present
- Mentor for undergraduate and graduate women in CS at UW. 2015 – 2020
- Mentor for LGBT students through the UW Queer Mentoring Program. 2016 – 2019
- Technical and career mentor for software engineers at Amazon. 2012 – 2015

Community:

- Creator and administrator of the Neurodivergent at UIUC Slack (2022 – Present).
- Creator and administrator of the Neurodivergent in CS Slack (2021 – Present).
- Creator and administrator of the Midwest PL Slack (2021 – Present).

- Packer and food delivery driver for food banks in Seattle (2020 – 2021).
- ESL tutor & friendly visitor for an elderly refugee with JFS (2017 – 2021).
- Author of a [blog interview series](#) about LGBT CS researchers (2016 – 2018).

TEACHING

CS 576 TLR: Dependent Type Theory

Spring 2024

CS 421: Programming Languages and Compilers

Fall 2023

CS 598 TLR: Proof Automation

Spring 2022, Fall 2022

MEDIA

AI-Powered Proof Generator Helps Debug Software

IEEE Spectrum article about our award-winning work on Baldur.

Talia Ringer receives DARPA Young Faculty Award

Article about receiving the DARPA Young Faculty Award.

Ringer Awarded for Mentoring and Community Work

Article about receiving the SIGPLAN Distinguished Service Award.

Formal Verification and Deep Learning

Podcast interview for The Gradient about my work as it intersects with machine learning.

Ringer Seeks to Expand Upon the Impact of Being a Mentor

Article about my international service work.

Proof Repair

Thesis Review podcast about my thesis work and how it has informed my work since.

Tenure, Sexism, and ADHD

Type Theory Forall podcast about my work and my experiences.

How Will Proof Engineering Affect the Future of Software Development?

A podcast interview about my work and future vision. From DevDiscuss Season 6, Episode 4.

Proof Repair & Code Generation

A Galois blog post by Valentin Robert about using my tools for industrial applications.

Proof Engineering for the People

A podcast interview about my work and future vision. From Building Better Systems.

AMA on Mentoring

Invited Ask Me Anything (AMA) session at ICFP 2021 about SIGPLAN-M.

GAP Interview

Interview about the academic job search.

JUST FOR FUN

I love **judo**. I am fairly new to it, but I am hooked.

Before that, I used to compete for **Club Northwest**, a top **distance running** club in Seattle. I served on the board of Club Northwest from 2015 to 2016. I ran **NCAA Division I Cross-Country** in 2009. And before even that, I was a **competitive swimmer** for ten years.

I also enjoy **solving logic and number puzzles, writing poetry, singing, studying languages, making bagels, making chocolate truffles, windsurfing, playing Dance Dance Revolution, foraging edible mushrooms, and composing music for the piano.**