

Talia Lily Ringer

<https://dependtyp.es>

ACADEMIA

University of Illinois Urbana-Champaign
Assistant Professor

2021 – Present

University of Washington

Ph.D. in Computer Science

Advisor: Dan Grossman

Ph.D. Thesis: [Proof Repair](#). [Defense video](#).

2015 – 2021

University of Maryland, College Park

B.S. in Mathematics and Computer Science

Advisor: Lawrence Washington

Honors Thesis: [An Elliptic Curve Threshold Key Establishment Scheme](#)

2008 – 2012

INDUSTRY

Visiting Researcher at Google Research (N2Formal)

Working on machine learning tools for proof assistants.

Summer 2022

Research Scientist Intern at Amazon (Automated Reasoning Group)

Developed a solver-aided domain-specific language to generate test inputs.

Summer 2016

Software Development Engineer II at Amazon (Amazon Business)

Helped launch Amazon Business. Wrote customer-facing code used company-wide.

2012 – 2015

INTERNATIONAL PROGRAMS FOUNDED

I am the **founder and president** of the [Computing Connections Fellowship](#), a fellowship that provides institution-independent transitional funding for computer science PhD students who need help escaping unhealthy environments. We are in the process of a two year pilot in the programming languages research community.

I am also the **founder and chair** of the [SIGPLAN Long-Term Mentoring Committee \(SIGPLAN-M\)](#). SIGPLAN-M pairs mentors and mentees in the programming languages research community for cross-institutional mentoring relationships lasting a year by default. It currently reaches more than **200 mentors** and more than **300 mentees** across more than **41 countries**, and has been described by mentees as “**life changing**” and “**a career saver.**”

RESEARCH IMPACT

Proof repair, the subject of my PhD thesis, has since been reimplemented by researchers and engineers at [Amazon](#) and [NASA](#), and adapted to the languages they use. It is also the subject of a **DARPA** AI Exploration called [PEARLS](#), a grant for which I am a primary PI.

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 build **proof engineering** technologies to make that world a reality. In doing so, I love 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

Cosmo Viola (Ph.D.)

Extending proof repair to handle relations more general than type equivalences.

[Chris Lam](#) (Ph.D.)

Compiling proofs alongside programs.

Hannah Leung (Ph.D., coadvised with Christopher Fletcher)

Formally verifying security properties of Path ORAM.

Shizhuo Zhang (Ph.D., coadvised with Maxim Raginsky)

Developing neurosymbolic proof models to infer deep semantic relations between types.

Thomas Reichel (masters student)

Developing a neural proof repair model.

[Timothy Zhou](#) (undergraduate)

Improving neural tactic prediction models for proof synthesis and repair.

STUDENTS ADVISED

Taylor Blau (undergraduate, coadvised with Dan Grossman)

[Verifying Strong Eventual Consistency in \$\delta\$ -CRDTs](#) (senior thesis)

Jasper Hugunin (undergraduate, coadvised with Dan Grossman)

[Constructing Inductive-Inductive Types in Cubical Type Theory](#) (FOSSACS 2019)

GRANTS AWARDED

PLATO: Enriched Tactic Prediction Models for Proof Synthesis & Repair. UIUC and UMass Amherst. DARPA [PEARLS](#) AI Exploration. \$1,000,000. Primary PI.

POLYMORPH: Promotion to Optimal Languages Yielding Modular Operator-driven Replacements and Programmatic Hooks. Galois, Northeastern, University of Washington, UIUC, University of Alabama, and Syracuse University. DARPA [V-SPILLS](#). \$11,342,650.

Neurosymbolic Proof Synthesis & Repair. Amazon Research Awards. \$40,000. Sole PI.

INVITED TALKS

Concrete Problems in Proof Automation AI for Theorem Proving (AITP)	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

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>
Rising Stars An Academic Career Workshop for Women in EECS	<i>Fall 2019</i>

PUBLICATIONS

Alex Sanchez-Stern, Emily First, Timothy Zhou, Zhanna Kaufman, Yuriy Brun, Talia Ringer.
[Passport: Improving Automated Formal Verification Using Identifiers](#).
Under Submission.

Seth Poulsen, Matthew West, and Talia Ringer.
Autogenerating Natural Language Proofs for Proof Education.
The Coq Workshop 2022.

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](#).

LEADERSHIP & SERVICE

Computing Connections Fellowship Founder & President	2022
Beyond Bayes Workshop Co-Chair	2022
Coq Workshop Co-Chair	2022
Illinois Mental Health Ambassador	2021 – Present
Illinois CS CARES Committee	2021 – Present
SIGPLAN-M Founder & Chair	2021 – Present
SPLASH Hybridization Committee	2021
ICFP Mentoring Chair	2020
ICFP Programming Languages Mentoring Workshop (PLMW) Co-Chair	2020
POPLmark 15 Year Retrospective Panel Lead Organizer	2020
University of Washington Graduate Admissions Committee	2018
DeepSpec Summer School Student Talks Organizer	2017

PROGRAM COMMITTEES

TYPES (2022), ITP (2022), PLDI (2022), AIPLANS (2021), CAV (2021), HATRA (2020),
 MSCS (2020), CoqPL (2019), CAV AEC (2019), POPL AEC (2018, 2019)

MENTORSHIP, DIVERSITY, & OUTREACH

SIGPLAN-M	2021 – Present
Mentor for the mentorship program listed under leadership & service above.	
Shut Down PL	2020
Coorganizer of an anti-racist workshop for programming languages researchers.	

Neighbors Feeding Neighbors Seattle & Ballard Food Bank Packer & delivery driver of food & masks for the hungry during the pandemic.	<i>2020 – 2021</i>
UW CSE Care Committee Founder & organizer of a support network for graduate students in times of need.	<i>2019 – 2021</i>
Jewish Family Services ESL tutor and friendly visitor for an elderly refugee.	<i>2017 – 2021</i>
UW CSE & TUNE House Mentor for undergraduate women and graduate students in computer science.	<i>2015 – 2020</i>
UW Queer Mentoring Program Mentor for LGBT students from any major.	<i>2016 – 2019</i>
The Identity Function Author of a blog interview series about LGBT computer science researchers.	<i>2016 – 2018</i>
Amazon Technical and career mentor for software engineers.	<i>2012 – 2015</i>

MEDIA

[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.

HONORS & AWARDS

College of Engineering Quarterly Fellow
P.E.O. Scholar
NSF GRFP Fellow

University of Washington
University of Washington
University of Washington

TEACHING

[CS 598 TLR: Proof Automation](#)

Spring 2022

JUST FOR FUN

I enjoy **distance running**. 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.

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