Alaia Solko-Breslin

Ph.D. Candidate, University of Pennsylvania

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Education

University of Pennsylvania Fall 2022 – Spring 2027 (expected)
Ph.D. in Computer and Information Science
Advisor: Rajeev Alur
Thesis: *Algorithmic Supervision and Enforcement of Symbolic Specifications in Deep Learning*

Cornell University Fall 2021 – Spring 2022
M.Eng. in Computer Science
GPA: 4.08

Cornell University Fall 2018 – Spring 2021
B.S. in Computer Science, Minor in Applied Mathematics
GPA: 3.81

Research Statement

I study how to make machine learning more trustworthy using formal methods. My work has developed formal guardrails for AI models through verification of agent trajectories against security policies, as well as constrained decoding of LLMs for reliable code generation. I have also developed scalable algorithms for neurosymbolic (i.e., weakly supervised) learning.

Publications (∗ denotes equal contribution)

Preprints

[1] **Tether: Verified Stateful Policy Engine for System-Level Monitoring of Agents** **arXiv 2026**
M. A. Sistla, **A. Solko-Breslin**, S. Jha, A. Kanade, K. Dvijotham

[2] **Constrained Decoding of LLMs for Behavioral Type Enforcement** **Under review**
A. Solko-Breslin, R. Alur

[3] **CAMEL: An ECG Language Model for Forecasting Cardiac Events** **arXiv 2026**
N. Velingker*, **A. Solko-Breslin***, M. Keoliya*, S. Choi*, J. Xin, A. Marathe, A. Oraii, R. Deo, S. Khatana, R. Alur, M. Naik, E. Wong

Refereed Publications

[4] **Efficient and Sound Probabilistic Verification for AI Agents** **S&P 2027**
A. Solko-Breslin, P. K. Mudrakarta, M. Christodorescu, S. Jha, K. Dvijotham

[5] **Forecasting Shockable In-Hospital Cardiac Arrest from Continuous Telemetry** **ML4H (Findings) 2026**
M. Keoliya*, S. Choi*, N. Velingker*, **A. Solko-Breslin**, A. Oraii, S. Khatana, M. Naik, G. E. Weissman, E. Wong, R. Alur, R. Deo

[6] **CTSketch: Compositional Tensor Sketching for Scalable Neurosymbolic Learning** **NeurIPS 2025**
S. Choi*, **A. Solko-Breslin***, R. Alur, E. Wong

[7] **Understanding the Effectiveness of Large Language Models in Detecting Security Vulnerabilities** **ICST 2025**
A. Khare*, S. Dutta*, Z. Li, **A. Solko-Breslin**, R. Alur, M. Naik

[8] **Data-Efficient Learning with Neural Programs** **NeurIPS 2024**
A. Solko-Breslin, S. Choi, Z. Li, N. Velingker, R. Alur, M. Naik, E. Wong

[9] **Automata Learning with an Incomplete Teacher** **ECOOP 2023**
M. Moeller, T. Wiener, **A. Solko-Breslin**, C. Koch, N. Foster, A. Silva

[10] **Petr4: Formal Foundations for P4 Data Planes** **POPL 2021**
R. Doenges, M. T. Arashloo, S. Bautista, A. Chang, N. Ni, S. Parkinson, R. Peterson, **A. Solko-Breslin**, A. Xu, N. Foster

Workshop Publications

[11] **Efficient and Sound Probabilistic Verification for AI Agents** **FLMSec@NeurIPS 2026**
A. Solko-Breslin, P. K. Mudrakarta, M. Christodorescu, S. Jha, K. Dvijotham
Distinguished Paper Award

Work Experience

Google DeepMind Feb. – Dec. 2026
Student Researcher Mountain View, CA

- Developed a probabilistic verification framework for enforcing security policies in AI agents.
- Built a deterministic verification framework and developed a corresponding dataset to evaluate Gemini's ability to reason about formal security policies over agent trajectories.
- Advised by Dj Dvijotham, Science and Strategic Initiatives unit.

Amazon Web Services Feb. – May 2025
Applied Scientist Intern New York, NY

- Implemented a framework for autoformalization of preconditions for AWS APIs, used to help guide trustworthy code generation for agents that use the AWS CLI.
- Advised by Serdar Tasiran, Agentic AI/Automated Reasoning Group.

Amazon Web Services Summer 2020, Summer 2021
Software Development Engineer Intern Herndon, VA

- Designed and implemented an API enabling test fleets to obtain the security posture required to access native AWS services; built an authentication-service health-check API and canaries to monitor our service and report metrics.

Teaching

University of Pennsylvania
Teaching Assistant

- CIS 7000: Special Topics: Trustworthy Machine Learning Spring 2024
- CIS 5000: Software Foundations Fall 2023

Cornell University
Teaching Assistant

- CS 4160/5160: Formal Verification Spring 2022
- CS 3110: Data Structures and Functional Programming Fall 2021
- CS 4820: Introduction to Analysis of Algorithms Spring 2021
- CS 4820: Introduction to Analysis of Algorithms Fall 2020
- CS 3110: Data Structures and Functional Programming Spring 2020
- CS 3110: Data Structures and Functional Programming Fall 2019

Awards

- **Distinguished Paper Award**, FLMSec@NeurIPS 2026
- **AWS-AI ASSET Fellow** 2024
  Funding to support research on safe, explainable, and trustworthy AI-enabled systems
- **John Grist Brainerd Doctoral Fellowship**, University of Pennsylvania 2022

Service

- Reviewer for ICML (Silver/Top 50%), NeurIPS, FLMSec@NeurIPS 2026
- Reviewer for NeurIPS 2025
- Student Volunteer at PLDI 2023

Leadership and Mentorship

- CISDA Co-Chair Fall 2024 – Fall 2026
- CIS Mentorship Program Volunteer and Mentor Fall 2023 – Present

Technical Skills

- **Programming Languages:** Python, Java, OCaml, Rust, Rocq, Ruby, Racket, Dafny, C
- **Tools:** PyTorch, Git, LaTeX, Z3