Stanford



Leni Aniva

Ph.D. Student in Computer Science, admitted Autumn 2022

Bio

BIO

I am a CS PhD student in Stanford University's Centaur Lab. My main research focus is on machine-assisted theorem proving, which refers to using machine learning to find proofs of mathematical theorems and conduct reasoning. Prior to entering Stanford, I was a Computer Science student at the University of Waterloo.

EDUCATION AND CERTIFICATIONS

- Bachelor of Computer Science, University of Waterloo , Data Science (2022)

PERSONAL INTERESTS

DevOps, Cosplay, Violin, Video FX, CAD

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

My main research interest is Machine-Assisted Theorem Proving, which refers to using machine-learning agents to find proofs of mathematical theorems and conduct reasoning. We are pursuing a hybrid algorithm between neural networks and SMT solvers to solve some of the long standing problems facing machine learning models today such as opaqueness, hallucinations, and information leakage. For this goal, I built the Pantograph library for Lean 4, which provides an uncompromising interface for machine-learning agents to conduct MCTS-like proof search on theorems. This library provides a flexible solution to the metavariable coupling problem, which happens when a theorem requires two conditions which are interdependent on each other. For example, if you want to provide there exists an odd perfect number, you would have to exhibit a number and prove that the particular number is odd and perfect. I built Trillium, a tool for evaluating theorem proving algorithms, and designed it to be compatible with all previous theorem proving algorithms to provide a fair benchmark for all of them.

I also do research on SMT solvers and automatic verifications of programs.

PROJECTS

- Pantograph - Centaur Lab (March 1, 2023 - present)

LAB AFFILIATIONS

- Clark Barrett, Center for Automated Reasoning (9/26/2022)

Publications

PUBLICATIONS

- **Prismriver: Formalization of Music Theory and Algorithmic Composition in Lean 4**
  Aniva, L., Wang, C.
  edited by Milano, M., Park, T. H.
  ASSOC COMPUTING MACHINERY.2026: 47-58

- **Nazrin: An Atomic Neural Proof Automation Tactic in Lean 4** *Formal Methods in Computer-Aided Design*
  Aniva, L., Oikawa, I., Dill, D., Barrett, C.
  2026

- **Pantograph: A Machine-to-Machine Interaction Interface for Advanced Theorem Proving, High Level Reasoning, and Data Extraction in Lean 4** *Tools and Algorithms for the Construction and Analysis of Systems*
  Aniva, L., Sun, C., Miranda, B., Barrett, C., Koyejo, S.
  2025

- **IsaRARE: Automatic Verification of SMT Rewrites in Isabelle/HOL**
  Lachnitt, H., Fleury, M., Aniva, L., Reynolds, A., Barbosa, H., Notzli, A., Barrett, C., Tinelli, C.
  edited by Finkbeiner, B., Kovacs, L.
  SPRINGER INTERNATIONAL PUBLISHING AG.2024: 311-330