# Ariel Kellison, PhD

Senior Research Engineer, Code Metal, Inc.
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## Current Position

**Senior Research Engineer, Code Metal, Inc.** Developing scalable verification and validation techniques for large language model (LLM)-based code translation of entire projects.

## Education

**Cornell University**
PhD in Computer Science, Fall 2020 – Fall 2024
*Thesis: Type-Based Approaches to Rounding Error Analysis*
*Advisement: co-advised by David Bindel (Cornell) & Andrew Appel (Princeton)*

**University of California Santa Cruz**
BSc in Astrophysics with Honors in the Major

## Work Experience

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| **Senior Research Engineer, Code Metal, Inc.** | July 2025 – current |
| **Research Engineer, Galois, Inc.** | April 2025 – July 2025 |
| **Sandia National Labs** \| Digital Foundations & Mathematics Department | June 2021 – April 2025 |

- **Postdoctoral Research Associate** (Dec. 2024 – April 2025)
- **Formal Methods Intern** (June 2021 – Dec. 2024)
  *Supervisor*: Heidi Thornquist

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| **Cornell University** \| Department of Computer Science | Jan. 2020 – Aug. 2020 |

- **Lecturer**, Intro. to Computing Using Python (June 2020 – Aug. 2020)
- **Head Graduate Teaching Assistant**, Intro. to Computing Using Python (Jan. 2020 – May 2020)

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| **Cornell University** \| NuPRL Research Group | July 2016 – Jan. 2020 |

- **Research Support Specialist I** (July 2018 – Jan. 2020)
- **Research Aide IV** (July 2016 – July 2018)
  *Principal Investigator*: Robert Constable

## Refereed Publications

**(1)** *Bean: A Language for Backward Error Analysis*
**Ariel E. Kellison**, Laura Zielinski, David Bindel, and Justin Hsu
46th ACM SIGPLAN Conference on Programming Language Design and Implementation **(PLDI 2025)**

**(2)** *Mechanizing Olver's Error Arithmetic*
Max Fan, **Ariel E. Kellison**, Samuel D. Pollard
1st International Workshop on Verification of Scientific Software **(VSS 2025)**

**(3)** *Numerical Fuzz: A Type System for Rounding Error Analysis*
**Ariel E. Kellison**, Justin Hsu
45th ACM SIGPLAN Conference on Programming Language Design and Implementation **(PLDI 2024)**

**(4)** *VCFloat2: Floating-point Error Analysis in Coq*
Andrew W. Appel, **Ariel E. Kellison**
13th ACM SIGPLAN International Conference on Certified Programs and Proofs **(CPP 2024)**

**(5)** *LAProof: A Library of Formal Proofs of Accuracy and Correctness for Linear Algebra Programs*
**Ariel E. Kellison**, Andrew W. Appel, Mohit Tekriwal, David Bindel
30th IEEE International Symposium on Computer Arithmetic **(ARITH 2023)**

**(6)** *Verified Correctness, Accuracy, and Convergence of a Stationary Iterative Linear Solver: Jacobi Method*
Mohit Tekriwal, Andrew W. Appel, **Ariel E. Kellison**, Jean-Baptiste Jeannin, David Bindel
16th International Conference on Intelligent Computer Mathematics **(CICM 2023)**

**(7)** *Global Stochastic Optimization of Stellarator Coil Configurations*
Silke Glas, Misha Padidar, **Ariel E. Kellison**, David Bindel
Journal of Plasma Physics, Volume 88 (2), 2022

**(8)** *Verified Numerical Methods for Ordinary Differential Equations*
**Ariel E. Kellison**, Andrew Appel
15th International Workshop on Numerical Software Verification **(NSV 2022)**

**(9)** *A Machine-Checked Direct Proof of the Steiner-Lehmus Theorem*
**Ariel E. Kellison**
11th ACM SIGPLAN International Conference on Certified Programs and Proofs **(CPP 2022)**

**(10)** *Towards Verified Rounding Error Analysis for Stationary Iterative Methods*
**Ariel E. Kellison**, Mohit Tekriwal, Jean-Baptiste Jeannin, Geoffrey Hulette
6th IEEE/ACM International Workshop on Software Correctness for HPC Applications **(Correctness 2022)**

**(11)** *Implementing Euclid's Straightedge and Compass Constructions in Type Theory*
**Ariel E. Kellison**, Mark Bickford, Robert Constable
Annals of Mathematics and Artificial Intelligence, Volume 85, Pages 175-192, 2019


## Reports and Position Papers

**(1)** *Report on the First Tri-Lab Workshop on Formal Verification* **(SAND2024-02142)**
Samuel D. Pollard, Jon M. Aytac, **Ariel E. Kellison**, Ignacio Laguna, Srinivas Nedunuri, Sabrina Reis, Matthew J. Sottile, Heidi K. Thornquist. Feb. 2024

**(2)** *Real(istic) Specifications of Software* **(SAND2021-14778C)**
Samuel D. Pollard, **Ariel E. Kellison**, John Bender, Geoffrey C. Hulette. U.S. Department of Energy ASCR Workshop on the Science of Scientific-Software Development and Use. Dec. 2021

**(3)** *Formal Methods Based Certification Frameworks for Scientific Computing Applications* **(SAND2021-13614C)**
**Ariel E. Kellison**, Geoff C. Hulette, John Bender, Samuel D. Pollard, Heidi K. Thornquist. U.S. Department of Energy ASCR Workshop on Cybersecurity and Privacy for Scientific Computing Ecosystems. Nov. 2021


## Awards and Honors

**2025 Frederick A. Howes Scholar Award**
An award bestowed upon a recent graduate of the Department of Energy Computational Science Graduate Fellowship program who has shown outstanding leadership, character and technical achievement in the field of computational science.

**Department of Energy Computational Science Graduate Fellowship**
A highly-competitive graduate fellowship program providing, for four years, an annual $45,000 living stipend, an annual $1,000 professional development allowance, and full university tuition and fees. The program requires substantial (six courses total) graduate level coursework in science & engineering, mathematics & statistics, and computer science, as well as a minimum of one graduate level course in high-performance computing.

**UCSC Physics Department Honors**
Awarded to students with a grade point average above 3.5 in the major.

**California Space Grant Consortium**
A competitively awarded program supporting undergraduate students in aero/space-related research.

## Selected Talks

**Designing Type Systems for Rounding Error Analysis**
- FPBench Community Meeting (invited virtual talk)                     Sept. 2024

**Type-Based Approaches to Rounding Error Analysis**
- Department of Energy CSGF Annual Program Review                     July 2024
- FPTalks 2024 Annual Workshop (invited virtual talk)                 July 2024

**A Type System for Numerical Error Analysis**
- Cornell Programming Languages Discussion Group (invited seminar talk)   March 2024
- New Jersey Programming Languages and Systems Seminar                Nov. 2023

**LAProof: A Library of Formal Proofs of Accuracy and Correctness for Linear Algebra Programs**
- Midwest Programming Languages Summit, University of Michigan        Oct. 2023

**Verified Numerical Methods for Ordinary Differential Equations**
- Cornell Programming Languages Retreat, Cornell University           Dec. 2022
- FPBench Community Meeting (virtual contributed talk)                Jan. 2022

**A Machine-Checked Direct Proof of the Steiner-Lehmus Theorem**
- Cornell Programming Languages Retreat, Cornell University           Dec. 2021


## Service

**Review Committee**, PLDI                                             2025
46th ACM SIGPLAN Conference on Programming Language Design and Implementation

**External Reviewer**, CAV                                            2025
37th International Conference on Computer Aided Verification

**External Reviewer**, ICALP                                          2025
52nd EATCS International Colloquium on Automata, Languages, and Programming

**Journal Article Reviewer**, TACO                                    2025
ACM Transactions on Architecture and Code Optimization

**Artifact Evaluation Committee**, POPL                               2025
52nd ACM SIGPLAN Symposium on Principles of Programming Languages

**External Reviewer**, POPL                                           2025
52nd ACM SIGPLAN Symposium on Principles of Programming Languages

**External Reviewer**, CADE                                           2023
29th International Conference on Automated Deduction

**External Reviewer**, CSL                                            2022
30th EACSL Annual Conference on Computer Science Logic

## Student Project Advisement

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| Zack Cheslock (Cornell, UGrad in CS) | Summer 2024 – current |
| Laura Zielinski (Cornell, CS PhD student) | Fall 2025 – Summer 2025 |
| Max Fan (Cornell, CS PhD student) | Fall 2025 – Summer 2025 |
| Luis Hernandez (Cornell, UGrad in CS) | Summer 2024 – Spring 2025 |