

# Ariel Kellison, PhD

Senior Research Engineer, Code Metal, Inc.

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## CURRENT POSITION

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

Advancing formal methods for verifying and validating large language model-assisted code translation of complex software stacks.

## EDUCATION

### Cornell University

PhD in Computer Science

Fall 2020 – Fall 2024

*Thesis:* Type-Based Approaches to Rounding Error Analysis

Advisors: David Bindel (Cornell) & Andrew W. Appel (Princeton)

### University of California, Santa Cruz

BSc in Astrophysics, Honors in the Major

## WORK EXPERIENCE

**Senior Research Engineer**, Code Metal, Inc.

Jul. 2025 – Present

**Research Engineer**, Galois, Inc.

Apr. 2025 – Jul. 2025

**Postdoctoral Research Associate**, Sandia National Laboratories

Dec. 2024 – Apr. 2025

**Research Support Specialist I**, NuPRL Research Group, Cornell University

Jul. 2018 – Jan. 2020

**Research Aide IV**, NuPRL Research Group, Cornell University

Jul. 2016 – Jul. 2018

## PUBLICATIONS

### CONFERENCE PAPERS

1. *Bean: A Language for Backward Error Analysis*.  
46th ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI), 2025.  
**Ariel E. Kellison**, Laura Zielinski, David Bindel, Justin Hsu.
2. *Numerical Fuzz: A Type System for Rounding Error Analysis*.  
45th ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI), 2024.  
**Ariel E. Kellison**, Justin Hsu.
3. *VCFloat2: Floating-point Error Analysis in Coq*.  
13th ACM SIGPLAN International Conference on Certified Programs and Proofs (CPP), 2024.  
Andrew W. Appel, **Ariel E. Kellison**.
4. *LAProof: A Library of Formal Proofs of Accuracy and Correctness for Linear Algebra Programs*.  
30th IEEE International Symposium on Computer Arithmetic (ARITH), 2023.  
**Ariel E. Kellison**, Andrew W. Appel, Mohit Tekriwal, David Bindel.
5. *Verified Correctness, Accuracy, and Convergence of a Stationary Iterative Linear Solver: Jacobi Method*.  
16th International Conference on Intelligent Computer Mathematics (CICM), 2023.  
Mohit Tekriwal, Andrew W. Appel, **Ariel E. Kellison**, Jean-Baptiste Jeannin, David Bindel.
6. *A Machine-Checked Direct Proof of the Steiner-Lehmus Theorem*.  
11th ACM SIGPLAN International Conference on Certified Programs and Proofs (CPP), 2022.  
**Ariel E. Kellison**.

### JOURNAL ARTICLES

1. *Global Stochastic Optimization of Stellarator Coil Configurations*.  
*Journal of Plasma Physics*, 88(2), 2022.  
Silke Glas, Misha Padidar, **Ariel E. Kellison**, David Bindel.
2. *Implementing Euclid's Straightedge and Compass Constructions in Type Theory*.  
*Annals of Mathematics and Artificial Intelligence*, 85:175-192, 2019.  
**Ariel E. Kellison**, Mark Bickford, Robert Constable.

### REFEREED WORKSHOP PAPERS

1. *Mechanizing Olver's Error Arithmetic*.  
1st International Workshop on Verification of Scientific Software (VSS), 2025.  
Max Fan, **Ariel E. Kellison**, Samuel D. Pollard.
2. *Verified Numerical Methods for Ordinary Differential Equations*.  
15th International Workshop on Numerical Software Verification (NSV), 2022.  
**Ariel E. Kellison**, Andrew W. Appel.
3. *Towards Verified Rounding Error Analysis for Stationary Iterative Methods*.  
6th IEEE/ACM International Workshop on Software Correctness for HPC Applications (Correctness), 2022.  
**Ariel E. Kellison**, Mohit Tekriwal, Jean-Baptiste Jeannin, Geoffrey Hulette.

### TECHNICAL REPORTS

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

## WHITE PAPERS

1. *Real(istic) Specifications of Software* (SAND2021-14778C).  
U.S. DOE ASCR Workshop on the Science of Scientific-Software Development and Use, 2021.  
Samuel D. Pollard, **Ariel E. Kellison**, John Bender, Geoffrey C. Hulette.
2. *Formal Methods Based Certification Frameworks for Scientific Computing Applications* (SAND2021-13614C).  
U.S. DOE ASCR Workshop on Cybersecurity and Privacy for Scientific Computing Ecosystems, 2021.  
**Ariel E. Kellison**, Geoff C. Hulette, John Bender, Samuel D. Pollard, Heidi K. Thornquist.

## AWARDS AND HONORS

<b>MIT Rising Star in EECS</b>	2025
Massachusetts Institute of Technology and Boston University	
<b>Frederick A. Howes Scholar Award</b>	2025
US Department of Energy Computational Science Graduate Fellowship Committee	
<b>Best Paper Finalist</b>	2023
IEEE International Symposium on Computer Arithmetic (ARITH)	
<b>US Department of Energy Computational Science Graduate Fellowship</b>	2020–2024
US Department of Energy Computational Science Graduate Fellowship Committee	

## TALKS AND PRESENTATIONS

<b>Formal Methods for the Age of Approximation</b>	
• <i>Poster Presentation.</i> MIT Rising Stars in EECS Workshop, Oct. 2025	
<b>Elevating Correctness in Scientific Computing: A Formal Methods Perspective</b>	
• <i>Frederick A. Howe's Scholar Award Talk.</i> DOE CSGF Annual Program Review, July 2025	
<b>Bean: A Language for Backward Error Analysis</b>	
• <i>Paper Presentation.</i> 46th ACM SIGPLAN Conference on Programming Language Design and Implementation, July 2024	
<b>Designing Type Systems for Rounding Error Analysis.</b>	
• <i>Invited Talk.</i> FPBench Community Meeting, Sept. 2024	
<b>Type-Based Approaches to Rounding Error Analysis.</b>	
• <i>Invited Talk.</i> Galois, Inc., Aug. 2024	
• <i>Final Year Fellow Talk.</i> DOE CSGF Annual Program Review, July 2024	
• <i>Invited Talk.</i> FPTalks 2024, July 2024	
<b>Numerical Fuzz: A Type System for Rounding Error Analysis.</b>	
• <i>Paper Presentation.</i> 45th ACM SIGPLAN Conference on Programming Language Design and Implementation, June 2024	
• <i>Invited Talk.</i> Cornell Programming Languages Discussion Group, Mar. 2024	
• <i>Invited Talk.</i> New Jersey Programming Languages and Systems Seminar, Nov. 2023	
• <i>Poster Presentation.</i> DOE CSGF Annual Program Review, July 2023	
<b>LAProof: A Library of Formal Proofs of Accuracy and Correctness for Linear Algebra Programs.</b>	
• <i>Invited Talk.</i> Midwest Programming Languages Summit hosted by the University of Michigan, Oct. 2023	
• <i>Paper Presentation.</i> 30th IEEE Conference on Computer Arithmetic, Sept. 2023	
<b>Verified Numerical Methods for Ordinary Differential Equations.</b>	
• <i>Invited Student Talk.</i> Cornell Programming Languages Retreat, Dec. 2022	
• <i>Invited Talk.</i> FPBench Community Meeting, Jan. 2022	
• <i>Paper Presentation.</i> 15th International Workshop on Numerical Software Verification, Aug. 2022	
<b>A Machine-Checked Direct Proof of the Steiner-Lehmus Theorem.</b>	
• <i>Invited Student Talk.</i> Cornell Programming Languages Retreat, Dec. 2021	
• <i>Paper Presentation.</i> 11th ACM SIGPLAN International Conference on Certified Programs and Proofs, Dec. 2021	

## SERVICE

<b>Review Committee</b> for PLDI	2025
<b>External Reviewer</b> for CAV, ICALP, and POPL	2025
<b>Journal Article Reviewer</b> for TACO	2025
<b>Artifact Evaluation Committee</b> for POPL	2024
<b>External Reviewer</b> for CADE	2023
<b>External Reviewer</b> for CSL	2022

## STUDENT ADVISING

### SIGPLAN-M Mentor

Zack Cheslock (Cornell, undergraduate in CS)

Laura Zielinski (Cornell, CS PhD)

Max Fan (Cornell, CS PhD)

Luis Hernandez (Cornell, undergraduate in CS)

2024 – Present

Summer 2024 – Summer 2025

Fall 2025 – Summer 2025

Fall 2025 – Summer 2025

Summer 2024 – Spring 2025