Chandrakana Nandi

Employment

Director of US R&D, Certora Inc., December 2023 - present
Affiliate Assistant Professor, UW, Seattle, January 2023 - present

Principal Researcher at Certora Inc., April 2023 - November 2023
Formal Verification Team Lead at Certora Inc., June 2022 - March 2023
Senior Researcher at Certora Inc., September 2021 - May 2022
Website: `https://cnandi.com/`

Publications

Drafts and under submission papers

1. Yihong Zhang, Anjali Pal, Adriana Schulz, Zachary Tatlock, **Chandrakana Nandi**. Using Anti-Unification to Scale Parametric CAD Decompilation.

Peer reviewed conference papers

1. Shelly Grossman, Alexander Bakst, Sameer Arora, John Toman, Mooly Sagiv, **Chandrakana Nandi**.
   Practical Verification Of Smart Contracts Using Memory Splitting, OOPSLA 2024.

2. Enzo Nicourt, Ben Kushigian, **Chandrakana Nandi**, Ylies Falcone.
   Towards Mutation-guided Test Suites for Smart Contracts (Industry), ICST 2024.
3. Anjali Pal, Brett Saiki, Cynthia Richey, Amy Zhu, Ryan Tjoa, Oliver Flatt, Max Willsey, Zachary Tatlock, **Chandrakana Nandi**.
   Equality Saturation Theory Exploration à la Carte, OOPSLA 2023.
4. David Cao, Rose Kunkel, **Chandrakana Nandi**, Max Willsey, Zachary Tatlock, Nadia Polikarpova.
   babble: Learning Better Abstractions with E-Graphs and Anti-Unification, POPL 2023.
5. Haisen Zhao, Max Willsey, Amy Zhu, **Chandrakana Nandi**, Zachary Tatlock, Justin Solomon, Adriana Schulz.
   Co-Optimization of Design and Fabrication Plans for Carpentry, SIGGRAPH 2022 (ACM TOG).
6. **Chandrakana Nandi**, Max Willsey, Amy zhu, Brett Saiki, Yisu Wang, Adam Anderson, Adriana Schulz, Dan Grossman, Zachary Tatlock. Rewrite Rule Inference Using Equality Saturation. OOPSLA 2021.
   Distinguished Paper Award
7. Jasper Tran O'Leary, **Chandrakana Nandi**, Khang Lee, Nadya Peek.
   Taxon: a Language for Formal Reasoning with Digital Fabrication Machines. UIST 2021.

8. Brett Saiki, Oliver Flatt, **Chandrakana Nandi**, Zachary Tatlock, Pavel Panchekha. Combining Precision Tuning and Rewriting. ARITH 2021.
9. Molly Carton, **Chandrakana Nandi**, Adam Anderson, Haisen Zhao, Eva Darulova, Dan Grossman, Jeff Lipton, Adriana Schulz, Zachary Tatlock. A Roadmap Towards Parallel Printing for Desktop 3D Printers. SFF 2021.
10. Max Willsey, **Chandrakana Nandi**, Remy Wang, Oliver Flatt, Pavel Panchekha, Zachary Tatlock.
Fast and Extensible Equality Saturation. POPL 2021
Distinguished Paper Award
11. **Chandrakana Nandi**, Max Willsey, Adam Anderson, James R. Wilcox, Eva Darulova, Dan Grossman, Zachary Tatlock.
Synthesizing Structured CAD Models with Equality Saturation and Inverse Transformations. PLDI 2020.
12. Chenming Wu, Haisen Zhao, **Chandrakana Nandi**, Jeff Lipton, Zachary Tatlock, Adriana Schulz.
Carpentry Compiler. SIGGRAPH ASIA 2019
13. **Chandrakana Nandi**, James R. Wilcox, Pavel Panchekha, Taylor Blau, Dan Grossman, Zachary Tatlock.
Functional Programming for Compiling and Decompiling Computer-aided Design. ICFP 2018.
14. **Chandrakana Nandi**, Anat Caspi, Dan Grossman, Zachary Tatlock.
Programming Language Tools and Techniques for 3D Printing. SNAPL 2017.
15. **Chandrakana Nandi**, Aurelien Monot, Manuel Oriol: Stochastic Contracts for Runtime Checking of Component-based Real-time Systems. CBSE'15: 18th International ACM SIGSOFT Symposium on Component-Based Software Engineering.

Workshop and other peer-reviewed papers

1. Gus Henry Smith, Colin Knizek, Daniel Petrisko, Zachary Tatlock, Jonathan Balkind, Gilbert Louis Bernstein, Haobin Ni, **Chandrakana Nandi**.
Scaling Program Synthesis Based Technology Mapping with Equality Saturation, WOSET 2024.
2. Gus Henry Smith, Zachary D. Sisco, Thanawat Techaumnuaiwit, Jingtao Xia, Vishal Canumalla, Andrew Cheung, Zachary Tatlock, **Chandrakana Nandi**, Jonathan Balkind.
There and Back Again: A Netlist's Tale with Much Egraphin', LATTE 2024.
3. Valkyrie Savage, Nóra Püsök, Harrison Goldstein, **Chandrakana Nandi**, Jia Yi Ren, Lora Oehlberg.
Demonstrating FEDT: Supporting Characterization Experiments in Fabrication Research. SCF Demo 2024.
4. **Chandrakana Nandi**, Dan Grossman, Adrian Sampson, Todd Mytkowicz, Kathryn S. McKinley.
Debugging Probabilistic Programs. MAPL 2017.
5. **Chandrakana Nandi**, Dan Grossman, Adrian Sampson, Todd Mytkowicz, Kathryn S. McKinley.
Debugging Probabilistic Programs. PPS 2017.

6. **Chandrakana Nandi**, Michael D. Ernst.
   Automatic Trigger Generation for Rule-based Smart Homes. ACM SIGPLAN PLAS 2016.
7. **Chandrakana Nandi**. Automatic Trigger Generation for End User Written Rules for Home Automation. ACM FSE SRC 2016.
8. **Chandrakana Nandi**. Correctness and Security for Home Automation. POPL SRC 2016.

Theses

1. C. Nandi: Programming Language Tools and Techniques for Computational Fabrication. PhD Thesis, UW, August 2021
2. C. Nandi: Functional Programming for Compiling and Decompiling Computer-aided Design, MS Thesis, UW, March 2018
3. C. Nandi: Contracts for Real-Time, Safety Critical Systems, Masters Thesis, EPFL, August 2014
4. C. Nandi: Social Network based Analysis of Behavior, Bachelors Thesis, BHU, April 2012

Professional services

Review committees

1. PLDI 2025 program committee (PC)
2. WITS 2025 program committee (PC)
3. PLDI 2024 program committee (PC)
4. ASPLOS 2024 program committee (PC)
5. TFP 2024 program committee (PC)
6. DSS 2024 review committee
7. ISSTA 2023 program committee (PC)
8. APLAS 2023 program committee (PC)
9. ACM-SRC 2023 Grand Finale judge
10. OOPSLA 2023 external review committee (ERC)
11. SCF 2023 subreviewer
12. TrustX 2023 program committee (PC)
13. EGRAPHS 2023 review committee (PC)
14. PLDI 2022 review committee (PC)
15. OOPSLA 2022 external review committee (ERC)
16. EGRAPHS 2022 review committee (PC)
17. PLDI-SRC 2022 review committee (PC)
18. SFF 2021 review committee
19. Subreviewer, ACM Symposium on Computational Fabrication (SCF), 2020
20. Artifact Evaluation Committee, ASPLOS 2020
21. External Reviewer, ICFP SRC 2019
22. External Reviewer, UBICOMP 2018
23. Reviewer for Elsevier journal, Future Generation Computer Systems 2016

Organizing

1. ICFP 2025 workshop co-chair
2. ICFP 2024 workshop co-chair
3. PLDI-SRC 2024 co-chair
4. ISSTA-SRC 2023 inaugural co-chair
5. PLDI-SRC 2023 co-chair
6. DeFi Security Summit (DSS) Steering committee (current)
7. National Conference on HPCA, BHU, 2010

Other service

1. EGRAPHS Advisory Committee, 2023-
2. Board member, Secure Staking Alliance, 2023-
3. PLMW Career Panel, OOPSLA 2023
4. Panelist, Formal Verification and Security panel, ETH Denver 2023
5. SIGPLAN-M mentor, 2022 - current
6. Session Chair at PLDI 2022 and SIGPLAN tracks
7. Session Chair at EGRAPHS 2022
8. Session Chair at OOPSLA 2021
9. PLMW Panelist, PLDI 2020
10. PSC Chair, Visit Days 2017, UW CSE
11. Student volunteer at POPL 2016
12. ACM-W mentorship program 2015, UW CSE
13. Session Chair at ACM CBSE 2015, session: Component and Composition

Awards

1. Rising Stars in EECS Award, 2021
2. OOPSLA 2021 **Distinguished Paper Award**
3. POPL 2021 **Distinguished Paper Award**
4. Adobe Research Fellowship 2019
5. Swiss Government Fellow 2012-2014
6. M.Sc Research Scholars Program with Prof. Joseph Sifakis, 2012
7. University Gold Medal, Institute of Science, BHU, 2012
8. Department Gold Medal, Department of Statistics, BHU, 2012
9. Gargi Devi Deodhar Silver Medal, Institute of Science, BHU, 2012
10. Manorama Gold Medal, Institute of Science, BHU, 2012
11. Dr. Basudeo Sahni Medal, Institute of Science, BHU, 2012
12. University scholarship, Institute of Science, BHU
13. All India Rank 14 in the IIT-JAM (Statistics) in 2012

Talks

- *From Theory to Practice: Enhancing Formal Verification for Real-World Smart Contracts*, Invited Speaker, UCLA PL Day, October 2024.
- *Practical Verification of Smart Contracts Using Memory Splitting*, Conference Talk, OOPSLA, October 2024
- *From Theory to Practice: Enhancing Formal Verification for Real-World Smart Contracts*, Invited Speaker, University of Utah, CS Colloquium, August 2024.
- *Mutation Testing for Formal Verification*, Invited Speaker, Adobe PL Seminar, December 2023
- *Mutation Testing for Formal Specifications*, Solidity Summit, Devconnect 2023

- *Proactive Security*, TrustX, Devconnect 2023
- *Beyond Testing: The Power of Proof*, TrustX, Devconnect 2023
- *Formally Verifying Vyper Programs*, Cyfrin Audits Live on Youtube, September 2023
- *Formal Verification Using the Certora Prover*, Invited Speaker, CMU Secure Blockchain summit, May 2023
- *Using Mutation Testing to Write Better Formal Specs*, ETH Denver, March 2023
- *Formally verifying what you execute* DeFi FV in Practice, Denver, March 2023
- *Formal Verification Using the Certora Prover*, Invited Lecture, UPenn, Nov 2022
- *Future of Smart Contract Security*, Panelist, Devcon, Bogota, Oct 2022
- *Formal Verification Using the Certora Prover*, Invited Lecture, (link) Stanford, Aug 2022
- *Formal Verification Using the Certora Prover*, Invited Lecture, (link) Secureum Bootcamp, Feb 2022
- *Rewrite Rule Inference Using Equality Saturation*, Invited Talk, NVIDIA Research, Feb 2022
- *Rewrite Rule Inference Using Equality Saturation*, Invited Talk, NUS, Singapore, Nov 2021
- *Rewrite Rule Inference Using Equality Saturation*, Conference Talk, OOPSLA, October 2021
- *Programming Languages Tools and Techniques for 3D Printing*, Invited Talk, MIT, October 2021
- *Efficient Term Rewriting and Rewrite Rule Inference with Equality Saturation*, Invited Talk, Intel, May 2021
- *Synthesizing Structured CAD Models with Equality Saturation and Inverse Transformations*, Invited Talk, UCSD PL Seminar, Nov 2020
- *Synthesizing Structured CAD Models with Equality Saturation and Inverse Transformations*, Conference Talk, PLDI, June 2020
- *Programming Languages for Computational Geometry and Fabrication*, Expert Speaker, IEEE RAS, UP Section Chapter, Allahabad, India, January 2020
- *Programming Languages for Computational Fabrication*, Adobe Headquarters, San Jose, August 2019
- *Functional Programming for Compiling and Decompiling CAD*, Invited Talk, MPI-SWS, Germany, October 2018
- *Functional Programming for Compiling and Decompiling CAD*, Invited Talk, SUNY Buffalo, October 2018
- *Functional Programming for Compiling and Decompiling CAD*, Conference Talk, ICFP, September 2018
- *Automatic Trigger Generation for Rule-based Smart Homes*, Conference Talk, PLAS, October 2016
- *Debugging Probabilistic Programs*, Internship Talk, Microsoft Research, Redmond, September 2016
- *Use of Contracts for Run-time Verification of Real-time Software*, Invited talk, IEEE RAS, UP Section Chapter, Allahabad, India, August 2015
- *Stochastic Contracts for Runtime Checking of Component-based Real-time Systems*, Conference talk, ACM Sigsoft Symposium on CBSE, Montreal, May 2015

- *Contracts for Real-time and Safety Critical Systems*, LARA, EPFL, August 2014
- *Contracts for Real-time and Safety Critical Systems*, ABB Corporate Research, August 2014
- *A Bi-directional Model Transformation Tool between BIP and FASA*, ABB Corporate Research, November 2013

Media Coverage

- Smart Contract Security, Interviewed by Cyfrin Audits, November 2023
- Featured in the ICFP 2021 trailer
- Invited SIGPLAN Article on Fast and Extensible Equality Saturation, April 2021
- Co-author of a SIGPLAN blog on Conferences after COVID: An Early-Career Perspective, March 2021
- Media coverage for Carpentry Compiler published in 2019:
  1. UW News Article, 2019
  2. Tech Crunch Article, 2019
  3. The Daily of UW Article, 2020
- "I Am CSE" video for Reincarnate, UW CSE 2020

Research Mentorship

1. Anjali Pal, UW PhD Student
2. Amy Zhu, UW PhD Student
3. Thia Richey, UW BS/MS → UPenn PhD student
   - 1^{st} place, ACM-ICFP SRC (undergraduate category), 2023
4. Brett Saiki, UW BS/MS → UW PhD student
5. Ben Kushigian, intern at Certora (March - Sept 2023)
6. Thia Richey, intern at Certora (June - Sept 2023)
7. Oliver Flatt, intern at Certora (Jan - Aug 2022)
8. Vishal Canumalla, intern at Certora (March - June 2022)
9. Ben Phipathananunth, intern at Certora (June - Dec 2022) → Yale PhD student
   - 2^{nd} place, ACM-SPLASH SRC (undergraduate category), 2022
10. Anagha G, BIT Hyderabad BS, SIGPLAN-M, Jan 2023 - current
11. Alperen Keles, UMD PhD student, SIGPLAN-M, May 2022 - Jan 2023
12. Adam Anderson, UW BS (March 2018 - Nov 2020)
13. Grace Oh, High School → Princeton BS
14. Taylor Blau, UW BS → Github
15. Seth Pendergrass, UW BS → Microsoft
16. Melissa Hovik, UW BS/MS → Caltech, Teaching Faculty

TA Experience

1. Winter 2018. CSE 341: Programming Languages, UW, Seattle
2. Spring, Fall 2016. CSE 331: Software Design and Implementation, UW, Seattle
3. Spring 2015: Concepts of Concurrent Computation, graduate level, ETH Zurich
4. Fall 2014: Introduction to Programming, undergraduate level, ETH Zurich

Education

PhD in Computer Science, Fall 2015 - Summer 2021
Paul G. Allen School of Computer Science & Engineering, UW
Thesis topic: Programming Language Techniques for Computational Fabrication
Advisors: Zachary Tatlock, Dan Grossman
Adobe Research Fellow, 2019

Master of Science, Computer Science, June 2018
Paul G. Allen School of Computer Science & Engineering, UW
Advisors: Zachary Tatlock, Dan Grossman

Master of Science, Computer Science, August 2014
École Polytechnique Fédérale de Lausanne(EPFL), Switzerland
Thesis: Contracts for Real-Time, Safety Critical Systems
Supervisors: Prof.Viktor Kuncak, Dr.Manuel Oriol
M.Sc Research Scholars Program and Swiss Government Fellow

Bachelor of Science, Statistics, Mathematics and Computer Science, June 2012
Banaras Hindu University (BHU), Varanasi, India
Concentration: Statistics
Thesis: Social Network-based Analysis of Behavior
Supervisor: Prof. R.D Singh
University Gold Medalist for graduating with highest GPA

Prior Work Experience

Research Intern June 2016 - August 2016
RiSE group, Microsoft Research, Redmond

Research Assistant September 2014 - June 2015
Chair of Software Engineering, ETH Zurich

Research Intern August 2013 - August 2014
ABB Corporate Research Center, Switzerland

Research Intern June 2010 - July 2010
Bio-robotics Lab, EPFL, Switzerland

Language Proficiency

English: Fluent
French: Basic
German: Basic
Bengali: Mother Tongue
Hindi: Fluent