

# Calvin Smith

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Software enables new ways to interact with and understand the world; as a tool for empowerment, it should be as widely-available as possible. My mission is to make code trustworthy, interpretable, and accessible through a neuro-symbolic combination of machine learning and formal methods.

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## Education

- 2014 - 2020 *PhD in Computer Sciences*, University of Wisconsin - Madison  
Thesis: *Program Synthesis for Data Analysis: Scalability and Privacy*
- 2014 - 2019 *Masters in Computer Sciences*, University of Wisconsin - Madison
- 2010 - 2014 *BS in Applied Mathematics*, Texas A&M University  
National Merit scholar, Summa Cum Laude, University Honors

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## Publications

- ICFP19 *Synthesizing Differentially Private Programs*  
Calvin Smith, Aws Albarghouthi  
International Conference of Functional Programming, 2019
- POPL19 *Trace Abstraction Modulo Probability*  
Calvin Smith, Justin Hsu, Aws Albarghouthi  
Principles of Programming Languages, 2019
- VMCAI19 *Program Synthesis with Equivalence Reduction*  
Calvin Smith, Aws Albarghouthi  
Verification, Model Checking, and Abstract Interpretation, 2019
- FSE17 *Discovering Relational Specifications*  
Calvin Smith, Gabriel Ferns, Aws Albarghouthi  
Foundations of Software Engineering, 2017
- CP17 *Constraint-Based Synthesis of Datalog Programs*  
Aws Albarghouthi, Paris Koutris, Mayur Naik, Calvin Smith  
Principles and Practices of Constraint Programming, 2017
- PLDI16 *Mapreduce Program Synthesis*  
Calvin Smith, Aws Albarghouthi  
Programming Language Design and Implementation, 2016

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## Workshops and Invited Talks

- SYNT19 *On Synthesis for Differential Privacy*, Workshop on Synthesis

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## Professional Experience

- 2022 - 2024 **Applied Scientist**, Durable (*Louisville, CO*)  
*Durable builds neurosymbolic techniques for custom code generation from natural-language specifications.*
- Implemented custom type inference, compilation, and deployment infrastructure for executing reactive programs synthesized from natural language specifications

- Built infrastructure to orchestrate, display, and reason about interactions between symbolic reasoners and transformer-based code prediction models
  - Developed novel static analyses to ensure correctness of synthesized programs
- 2020 - 2022    **Post-Doctoral Research Associate**, University of Texas - Austin (*Austin, TX*)
  - Designed core semantics and inference algorithms for a generative probabilistic logic programming language to explain structural and quantitative scientific data
- 2017            **Research Intern**, Microsoft Research (*Cambridge, UK*)
  - Explored the use of counterfactual reasoning in understanding the relationship between the training data and outputs of large-scale machine learning models
- 2014            **Director’s Summer Program**, National Security Agency (*Ft. Meade, MD*)
  - Designed sophisticated natural-language processing tools, including machine learning algorithms, to automate language classification of non-standard text
  - Briefed Richard H. Ledgett, Deputy Director of the National Security Agency, and researchers at IDA-CCR Princeton
- Summer 2013    **Director’s Summer Program**, National Security Agency (*Ft. Meade, MD*)
  - Researched and combined classified and academic literature on cryptanalytic techniques to develop a method leading to success on a specific cryptographic problem
  - Delivered a briefing detailing our team’s success to General Keith B. Alexander, Director of the National Security Agency
- Summer 2011    **Security Solutions Intern**, Unisys (*Blue Bell, PA*)
  - Documented and tested a proprietary mobile computing device for secure remote access to private networks

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## Teaching

- 2014 - 2015    *Teaching Assistant* at University of Wisconsin - Madison  
Cryptography, Intro to programming, Intro to principles of computers
- 2012 - 2013    *Student Mentor* at Texas A&M University  
Abstract algebra, linear algebra
- 2011, 2012    *Councilor, SMaRT Camp* at Texas A&M University

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## Community and Service

- 2022            PLDI Program Committee
- 2022            OOPSLA Artifact Evaluation Committee
- 2020            POPL Artifact Evaluation Committee
- 2019            CAV Artifact Evaluation Committee

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## Awards and Honors

- 2017            Best Paper Award, FSE  
*Discovering Relational Specifications*
- 2016            2nd Place, Student Research Competition, POPL  
*Equational Pruning for Enumerative Synthesis*