

# Dr. Elizabeth Polgreen

polgreen.github.io  
elizabeth.polgreen@ed.ac.uk

## Education

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- 2016- **Ph.D. Computer Science**  
2020 Advised by Alessandro Abate  
[University of Oxford](#)
- 2010- **Masters of Engineering**  
2021 Electrical and Electronic Engineering,  
[University of Cambridge](#)
- 2007- **Bachelor of Arts**  
2010 Electrical and Electronic Engineering,  
[University of Cambridge](#)

## Employment

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- 2025- **Associate Professor**  
current School of Informatics,  
University of Edinburgh
- 2020- **Assistant Professor**  
2025 School of Informatics,  
University of Edinburgh
- 2019- **Visiting Research Scholar**  
2020 University of California, Berkeley  
Advised by Sanjit A. Seshia
- 2017, **Software Development Intern**  
2018 Amazon Web Services
- 2015- **Research Assistant in Verification**  
2016 University of Oxford
- 2013- **Research Support**  
2015 University of Oxford
- 2011- **Electronics and Software Engineer**  
2013 Eg Technology, Cambridge.  
Peach Innovations, Cambridge.

## Refereed Conference and Journal Papers

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- [1] José Wesley de Souza Magalhães, Shideh Hashemian, Alexander Brauckmann, Jackson Woodruff, Elizabeth Polgreen, and Michael FP O’Boyle. “Accelerating Sparse Algebra with Program Synthesis”. *Proceedings of the 35th ACM SIGPLAN International Conference on Compiler Construction*. 2026, pp. 106–118.
- [2] José Wesley de Souza Magalhães, Alexander Brauckmann, Luc Jaulmes, Elizabeth Polgreen, and Michael F. P. O’Boyle. “Guess, Measure and Edit: Using Lowering to Lift Tensor Code”. *34th International Conference on Parallel Architectures and Compilation Techniques, PACT 2025*. 2025.
- [3] Alexander Brauckmann, José Wesley de Souza Magalhães Aarsh Chaube, Elizabeth Polgreen, and Michael F. P. O’Boyle. “Tensor Program Superoptimization through Cost-Guided Symbolic Program Synthesis”. *Proceedings of the 24th ACM/IEEE International Symposium on Code Generation and Optimization, CGO 2025*. 2026.
- [4] Pei-Wei Chen, Shaokai Lin, Adwait Godbole, Ramneet Singh, Elizabeth Polgreen, Edward A. Lee, and Sanjit A. Seshia. “PolyVer: A Compositional Approach for Polyglot System Modeling and Verification”. *2025 Formal Methods in Computer Aided Design, FMCAD 2025*. 2025.
- [5] Alejandro Luque-Cerpa, Elizabeth Polgreen, Ajitha Rajan, and Hazem Torfah. “Metric-Guided Synthesis of Class Activation Mapping”. 2025.
- [6] Yixuan Li, Lewis Frampton, Federico Mora, and Elizabeth Polgreen. “Online Prompt Selection for Program Synthesis”. *AAAI-25, Sponsored by the Association for the Advancement of Artificial Intelligence, February 25 - March 4, 2025, Philadelphia, PA, USA*. Ed. by Toby Walsh, Julie Shah, and Zico Kolter. AAAI Press, 2025, pp. 11282–11289.
- [7] Weizhi Tang, Yixuan Li, Chris Sypherd, Elizabeth Polgreen, and Vaishak Belle. “HyGenar: An LLM-Driven Hybrid Genetic Algorithm for Few-Shot Grammar Generation”. *Findings of the Association for Computational Linguistics, ACL 2025, Vienna, Austria, July 27 - August 1, 2025*. Ed. by Wanxiang Che, Joyce Nabende, Ekaterina Shutova, and Mohammad Taher Pilehvar. Association for Computational Linguistics, 2025, pp. 13640–13665.

- [8] Alexander Brauckmann, Luc Jaulmes, José Wesley de Souza Magalhães, Elizabeth Polgreen, and Michael F. P. O'Boyle. "Tensorize: Fast Synthesis of Tensor Programs from Legacy Code using Symbolic Tracing, Sketching and Solving". *Proceedings of the 23rd ACM/IEEE International Symposium on Code Generation and Optimization, CGO 2025, Las Vegas, NV, USA, March 1-5, 2025*. Ed. by Johannes Doerfert, Tobias Grosser, Hugh Leather, and P. Sadayappan. ACM, 2025, pp. 15–30.
- [9] Julian Parsert and Elizabeth Polgreen. "Reinforcement Learning and Data-Generation for Syntax-Guided Synthesis". *Thirty-Eighth AAAI Conference on Artificial Intelligence, AAAI 2024, Thirty-Sixth Conference on Innovative Applications of Artificial Intelligence, IAAI 2024, February 20-27, 2024, Vancouver, Canada*. Ed. by Michael J. Wooldridge, Jennifer G. Dy, and Sriraam Natarajan. AAAI Press, 2024, pp. 10670–10678.
- [10] Yixuan Li, Julian Parsert, and Elizabeth Polgreen. "Guiding Enumerative Program Synthesis with Large Language Models". *Computer Aided Verification - 36th International Conference, CAV 2024, Montreal, QC, Canada, July 24-27, 2024, Proceedings, Part II*. Ed. by Arie Gurfinkel and Vijay Ganesh. Vol. 14682. Lecture Notes in Computer Science. Springer, 2024, pp. 280–301.
- [11] Martin Brain and Elizabeth Polgreen. "A Pyramid Of (Formal) Software Verification". *Formal Methods - 26th International Symposium, FM 2024, Milan, Italy, September 9-13, 2024, Proceedings, Part II*. Ed. by André Platzer, Kristin Yvonne Rozier, Matteo Pradella, and Matteo Rossi. Vol. 14934. Lecture Notes in Computer Science. Springer, 2024, pp. 393–419.
- [12] Federico Mora, Justin Wong, Haley Lepe, Sahil Bhatia, Karim Elmaaroufi, George Varghese, Joseph E. Gonzalez, Elizabeth Polgreen, and Sanjit Seshia. "Synthetic Programming Elicitation for Text-to-Code in Very Low-Resource Programming and Formal Languages". *Advances in Neural Information Processing Systems 38: Annual Conference on Neural Information Processing Systems 2024, NeurIPS 2024, Vancouver, BC, Canada, December 10 - 15, 2024*. Ed. by Amir Globersons, Lester Mackey, Danielle Belgrave, Angela Fan, Ulrich Paquet, Jakub M. Tomczak, and Cheng Zhang, 2024.
- [13] Alessandro Abate, Haniel Barbosa, Clark W. Barrett, Cristina David, Pascal Kesseli, Daniel Kroening, Elizabeth Polgreen, Andrew Reynolds, and Cesare Tinelli. "Synthesising Programs with Non-trivial Constants". *J. Autom. Reason.* 67.2 (2023), p. 19.
- [14] Federico Mora, Ankush Desai, Elizabeth Polgreen, and Sanjit A. Seshia. "Message Chains for Distributed System Verification". *Proc. ACM Program. Lang.* 7.OOPSLA2 (2023), pp. 2224–2250.
- [15] Shaokai Lin, Yatin A. Manerkar, Marten Lohstroh, Elizabeth Polgreen, Sheng-Jung Yu, Chadlia Jerad, Edward A. Lee, and Sanjit A. Seshia. "Towards Building Verifiable CPS using Lingua Franca". *ACM Trans. Embed. Comput. Syst.* 22.5s (2023), 155:1–155:24.
- [16] Alexander Brauckmann, Elizabeth Polgreen, Tobias Grosser, and Michael F. P. O'Boyle. "mlirSynth: Automatic, Retargetable Program Raising in Multi-Level IR Using Program Synthesis". *32nd International Conference on Parallel Architectures and Compilation Techniques, PACT 2023, Vienna, Austria, October 21-25, 2023*. IEEE, 2023, pp. 39–50.
- [17] José Wesley de Souza Magalhães, Jackson Woodruff, Elizabeth Polgreen, and Michael F. P. O'Boyle. "C2TACO: Lifting Tensor Code to TACO". *Proceedings of the 22nd ACM SIGPLAN International Conference on Generative Programming: Concepts and Experiences, GPCE 2023, Cascais, Portugal, October 22-23, 2023*. Ed. by Coen De Roover, Bernhard Rumpe, and Amir Shaikhha. ACM, 2023, pp. 42–56.
- [18] Elizabeth Polgreen, Kevin Cheang, Pranav Gaddamadugu, Adwait Godbole, Kevin Laeuffer, Shaokai Lin, Yatin A. Manerkar, Federico Mora, and Sanjit A. Seshia. "UCLID5: Multi-modal Formal Modeling, Verification, and Synthesis". *Computer Aided Verification - 34th International Conference, CAV 2022, Haifa, Israel, August 7-10, 2022, Proceedings, Part I*. Ed. by Sharon Shoham and Yakir Vizel. Vol. 13371. Lecture Notes in Computer Science. Springer, 2022, pp. 538–551.
- [19] Elizabeth Polgreen, Andrew Reynolds, and Sanjit A. Seshia. "Satisfiability and Synthesis Modulo Oracles". *Verification, Model Checking, and Abstract Interpretation - 23rd International Conference, VMCAI 2022, Philadelphia, PA, USA, January 16-18, 2022, Proceedings*. Ed. by Bernd Finkbeiner and Thomas Wies. Vol. 13182. Lecture Notes in Computer Science. Springer, 2022, pp. 263–284.
- [20] Nikhil Pimpalkhare, Federico Mora, Elizabeth Polgreen, and Sanjit A. Seshia. "MedleySolver: Online SMT Algorithm Selection". *Theory and Applications of Satisfiability Testing - SAT 2021 - 24th International Conference, Barcelona, Spain, July 5-9, 2021, Proceedings*. Ed. by Chu-Min Li and Filip Manyà. Vol. 12831. Lecture Notes in Computer Science. Springer, 2021, pp. 453–470.
- [21] Alessandro Abate, Iury Bessa, Lucas C. Cordeiro, Cristina David, Pascal Kesseli, Daniel Kroening, and Elizabeth Polgreen. "Automated formal synthesis of provably safe digital controllers for continuous plants". *Acta Informatica* 57.1-2 (2020), pp. 223–244.
- [22] Byron Cook, Björn Döbel, Daniel Kroening, Norbert Manthey, Martin Pohlack, Elizabeth Polgreen, Michael Tautschnig, and Pawel Wieczorkiewicz. "Using model checking tools to triage the severity of security bugs in the Xen hypervisor". *2020 Formal Methods in Computer Aided Design, FMCAD 2020, Haifa, Israel, September 21-24, 2020*. IEEE, 2020, pp. 185–193.

- [23] Alessandro Abate, Cristina David, Pascal Kesseli, Daniel Kroening, and Elizabeth Polgreen. “Counterexample Guided Inductive Synthesis Modulo Theories”. *Computer Aided Verification - 30th International Conference, CAV 2018, Held as Part of the Federated Logic Conference, FloC 2018, Oxford, UK, July 14-17, 2018, Proceedings, Part I*. Ed. by Hana Chockler and Georg Weissenbacher. Vol. 10981. Lecture Notes in Computer Science. Springer, 2018, pp. 270–288.
- [24] Alessandro Abate, Iury Bessa, Dario Cattaruzza, Lucas C. Cordeiro, Cristina David, Pascal Kesseli, Daniel Kroening, and Elizabeth Polgreen. “Automated Formal Synthesis of Digital Controllers for State-Space Physical Plants”. *Computer Aided Verification - 29th International Conference, CAV 2017, Heidelberg, Germany, July 24-28, 2017, Proceedings, Part I*. Ed. by Rupak Majumdar and Viktor Kuncak. Vol. 10426. Lecture Notes in Computer Science. Springer, 2017, pp. 462–482.
- [25] Alessandro Abate, Iury Bessa, Dario Cattaruzza, Lennon C. Chaves, Lucas C. Cordeiro, Cristina David, Pascal Kesseli, Daniel Kroening, and Elizabeth Polgreen. “DSSynth: an automated digital controller synthesis tool for physical plants”. *Proceedings of the 32nd IEEE/ACM International Conference on Automated Software Engineering, ASE 2017, Urbana, IL, USA, October 30 - November 03, 2017*. Ed. by Grigore Rosu, Massimiliano Di Penta, and Tien N. Nguyen. IEEE Computer Society, 2017, pp. 919–924.
- [26] Elizabeth Polgreen, Viraj B. Wijesuriya, Sofie Haesaert, and Alessandro Abate. “Automated Experiment Design for Data-Efficient Verification of Parametric Markov Decision Processes”. *Quantitative Evaluation of Systems - 14th International Conference, QEST 2017, Berlin, Germany, September 5-7, 2017, Proceedings*. Ed. by Nathalie Bertrand and Luca Bortolussi. Vol. 10503. Lecture Notes in Computer Science. Springer, 2017, pp. 259–274.
- [27] Elizabeth Polgreen, Viraj B. Wijesuriya, Sofie Haesaert, and Alessandro Abate. “Data-Efficient Bayesian Verification of Parametric Markov Chains”. *Quantitative Evaluation of Systems - 13th International Conference, QEST 2016, Quebec City, QC, Canada, August 23-25, 2016, Proceedings*. Ed. by Gul Agha and Benny Van Houdt. Vol. 9826. Lecture Notes in Computer Science. Springer, 2016, pp. 35–51.

#### Refereed Workshop Papers or Presentations

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- [28] Guy Frankel, Rudi Schneider, Michel Steuwer, and Elizabeth Polgreen. “Syntax-Guided Synthesis with CounterExample Guided E-graphs: A Work-In-Progress Report”. *23rd International Workshop on Satisfiability Modulo Theories, August 10–11, 2025, Glasgow, UK, 2025*.
- [29] Yixuan Li, Federico Mora, Elizabeth Polgreen, and Sanjit A. Seshia. “Genetic Algorithms for Searching a Matrix of Metagrammars for Synthesis”. *SYNT 2023 abs/2306.00521 (2023)*.
- [30] Julian Parsert and Elizabeth Polgreen. “Reinforcement Learning for Syntax-Guided Synthesis”. *SYNT 2023 abs/2307.09564 (2023)*.
- [31] Nicolas Chan, Elizabeth Polgreen, and Sanjit A. Seshia. “Gradient Descent over Metagrammars for Syntax-Guided Synthesis”. *SYNT 2020 abs/2007.06677 (2020)*.
- [32] Federico Mora, Kevin Cheang, Elizabeth Polgreen, and Sanjit A. Seshia. “Synthesis in Uclid5”. *SYNT 2020 abs/2007.06760 (2020)*.

#### Language Standards, Editorships, etc.

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- [33] Saswat Padhi, Elizabeth Polgreen, Mukund Raghothaman, Andrew Reynolds, and Abhishek Udupa. “The SyGuS Language Standard Version 2.1”. *CoRR abs/2312.06001 (2023)*.
- [34] Nathanaël Fijalkow, Bernd Finkbeiner, Guillermo A. Pérez, Elizabeth Polgreen, and Rémi Morvan. “The Futures of Reactive Synthesis (Dagstuhl Seminar 23391)”. *Dagstuhl Reports* 13.9 (2023), pp. 166–184.
- [35] Elizabeth Polgreen and Guillermo Alberto Pérez. “Preface for the formal methods in system design special issue on SYNT 2021”. *Formal Methods Syst. Des.* 61.2 (2022), pp. 137–138.

#### Funding

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- 2025 **DARPA**, \$450,000  
“Formally-Verified Compositional Lifting of C to Rust”
- 2023 **Amazon Research Award**, \$50,000  
“Program Synthesis for Code Modernization”
- 2023 **Royal Academy of Engineering Research Fellowship**, £589,657  
“Automated and Provably Correct Code Modernization”

#### Invited Talks

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- 2025     **Language Model Guided Synthesis for Lifting**  
The Simons Institute for the Theory of Computing
- 2025     **Making the Most of Large Language Models for Program Synthesis (when you want correct answers)**  
British Colloquium for Theoretical Computer Science
- 2024     **Making the Most of Large Language Models for Program Synthesis (when you want correct answers)**  
Keynote, 13th Workshop on Synthesis
- 2024     **Using Program Synthesis to Make Your Code Run Faster**  
Annual Meeting of the Research Institute on Verified Trustworthy Software Systems (VeTSS)
- 2023     **Sherlock Holmes and the Case of the Untrustworthy Software**  
TedX University of Edinburgh
- 2022     **Beyond Counterexamples: Synthesis Modulo Oracles**  
11th Workshop on Synthesis
- 2022     **UCLID5: multi-modal modeling, synthesis and verification**  
3rd Workshop on Democratizing Software Verification
- 2022     **Model checking Xen**  
Verified Software Workshop, Isaac Newton Institute for Mathematical Sciences
- 2021     **CounterExample Guided Inductive Synthesis Modulo Theories**  
The Simons Institute for the Theory of Computing

#### Teaching

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- 2025     **Introduction to Program Synthesis, VeTSS Summer School, Glasgow**
- 2024     **System Design Project, University of Edinburgh**
- 2023     **System Design Project, University of Edinburgh**
- 2022     **Formal Verification, University of Edinburgh**
- 2022     **Introduction to SAT/SMT, Scottish Programming Languages Summer School**

#### Professional Service

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##### Co-organizer

- [CAV Verification Mentoring Workshop \(2025\)](#)
- [Dagstuhl Seminar on the Futures of Reactive Synthesis \(2023\)](#)

##### Workshop Chair

- [International Workshop on Synthesis \(SYNT\) \(2021\)](#)

##### Program Committee Member

- Symposium on Principles of Programming Languages (POPL '27)
- International Workshop on Synthesis (SYNT '26)
- Object-oriented Programming, Systems, Languages, and Applications (OOPSLA '26)
- Annual AAI Conference on Artificial Intelligence (AAAI '26)
- International Workshop on Synthesis (SYNT '25)
- Computer Aided Verification (CAV '25)
- Tools and Algorithms for the Construction and Analysis of Systems (TACAS '25)
- Computer Aided Verification (CAV '24)
- International Conference on Verification, Model Checking, and Abstract Interpretation (VMCAI '24)
- International Conference on Systems, Programming, Languages and Applications: Software for Humanity, Student Research Competition (SPLASH '24)
- Computer Aided Verification (CAV '23)
- International Workshop on Synthesis (SYNT '23)

- Workshop on Principles of Secure Compilation (PRiSC '23)
- Workshop on the Democratization of Software Verification (DSV '23)
- International Workshop on Satisfiability Modulo Theories (SMT '22)
- The International Conference on Theory and Applications of Satisfiability Testing (SAT '22)
- Computer Aided Verification (CAV '22)
- Formal Methods in Computer Aided Design (FMCAD '22)
- International Conference on Quantitative Evaluation of SysTems (QEST '22)
- Formal Methods in Computer Aided Design (FMCAD '21)
- International Conference on Quantitative Evaluation of SysTems (QEST '21)
- International Workshop on Synthesis (SYNT '19)

**Artifact Evaluation Committee Member**

- Computer Aided Verification (CAV '21)
- Tools and Algorithms for the Construction and Analysis of Systems (TACAS '21)

**Non-program committee reviews**

- Acta Informatica, Transactions on Programming Languages and Systems, Robotics: Science and Systems 2017, CAV 2021, SOFSEM-FOCS2017, QEST 2017, QEST 2016, Information and Software Technology, 13th International Workshop on Discrete Event Systems