

# Dr. Elizabeth Polgreen

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## Education

- 2020 **Ph.D. Computer Science**  
Advised by Alessandro Abate  
University of Oxford
- 2011 **Masters of Engineering**  
Electrical and Electronic Engineering,  
University of Cambridge
- 2010 **Bachelor of Arts**  
Electrical and Electronic Engineering,  
University of Cambridge

## Employment

- 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

- de Souza Magalhães, J. W., Brauckmann, A., Jaulmes, L., Polgreen, E., & O'Boyle, M. F. P. (2025). Guess, measure and edit: Using lowering to lift tensor code, In *34th international conference on parallel architectures and compilation techniques, PACT 2025*.
- Chen, P.-W., Lin, S., Godbole, A., Singh, R., Polgreen, E., Lee, E. A., & Seshia, S. A. (2025). Polyver: A compositional approach for polyglot system modeling and verification, In *2025 formal methods in computer aided design, FMCAD 2025*.
- Li, Y., Magalhães, J. W. d. S., Brauckmann, A., O'Boyle, M. F., & Polgreen, E. (2025). Guided tensor lifting. *Proceedings of the ACM on Programming Languages*, 9(PLDI), 1984–2006.
- Luque-Cerpa, A., Polgreen, E., Rajan, A., & Torfah, H. (2025). Metric-guided synthesis of class activation mapping. *XAI*.
- Li, Y., Frampton, L., Mora, F., & Polgreen, E. (2025). Online prompt selection for program synthesis (T. Walsh, J. Shah, & Z. Kolter, Eds.). In T. Walsh, J. Shah, & Z. Kolter (Eds.), *Aaai-25, sponsored by the association for the advancement of artificial intelligence, february 25 - march 4, 2025, philadelphia, pa, USA*, AAAI Press.
- Tang, W., Li, Y., Sypherd, C., Polgreen, E., & Belle, V. (2025). Hygenar: An llm-driven hybrid genetic algorithm for few-shot grammar generation (W. Che, J. Nabende, E. Shutova, & M. T. Pilehvar, Eds.). In W. Che, J. Nabende, E. Shutova, & M. T. Pilehvar (Eds.), *Findings of the association for computational linguistics, ACL 2025, vienna, austria, july 27 - august 1, 2025*, Association for Computational Linguistics.
- Brauckmann, A., Jaulmes, L., de Souza Magalhães, J. W., Polgreen, E., & O'Boyle, M. F. P. (2025). Tensorize: Fast synthesis of tensor programs from legacy code using symbolic tracing, sketching and solving (J. Doerfert, T. Grosser, H. Leather, & P. Sadayappan, Eds.). In J. Doerfert, T. Grosser, H. Leather, & P. Sadayappan (Eds.), *Proceedings of the 23rd ACM/IEEE international symposium on code generation and optimization, CGO 2025, las vegas, nv, usa, march 1-5, 2025*, ACM.
- Parsert, J., & Polgreen, E. (2024). Reinforcement learning and data-generation for syntax-guided synthesis (M. J. Wooldridge, J. G. Dy, & S. Natarajan, Eds.). In M. J. Wooldridge, J. G. Dy, & S. Natarajan (Eds.), *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*, AAAI Press.
- Li, Y., Parsert, J., & Polgreen, E. (2024a). Guiding enumerative program synthesis with large language models (A. Gurfinkel & V. Ganesh, Eds.). In A. Gurfinkel & V. Ganesh (Eds.), *Computer aided verification - 36th international conference, CAV 2024, montreal, qc, canada, july 24-27, 2024, proceedings, part II*, Springer.

- Brain, M., & Polgreen, E. (2024). A pyramid of (formal) software verification (A. Platzer, K. Y. Rozier, M. Pradella, & M. Rossi, Eds.). In A. Platzer, K. Y. Rozier, M. Pradella, & M. Rossi (Eds.), *Formal methods - 26th international symposium, FM 2024, milan, italy, september 9-13, 2024, proceedings, part II*, Springer.
- Mora, F., Wong, J., Lepe, H., Bhatia, S., Elmaaroufi, K., Varghese, G., Gonzalez, J. E., Polgreen, E., & Seshia, S. A. (2024). Synthetic programming elicitation and repair for text-to-code in very low-resource programming languages. *to appear at Neurips, abs/2406.03636*.
- Abate, A., Barbosa, H., Barrett, C. W., David, C., Kesseli, P., Kroening, D., Polgreen, E., Reynolds, A., & Tinelli, C. (2023). Synthesising programs with non-trivial constants. *J. Autom. Reason.*, 67(2), 19.
- Mora, F., Desai, A., Polgreen, E., & Seshia, S. A. (2023). Message chains for distributed system verification. *Proc. ACM Program. Lang.*, 7(OOPSLA2), 2224–2250.
- Lin, S., Manerkar, Y. A., Lohstroh, M., Polgreen, E., Yu, S.-J., Jerad, C., Lee, E. A., & Seshia, S. A. (2023). Towards building verifiable CPS using lingua franca. *ACM Trans. Embed. Comput. Syst.*, 22(5s), 155:1–155:24.
- Brauckmann, A., Polgreen, E., Grosser, T., & O’Boyle, M. F. P. (2023a). Mlirsynth: Automatic, retargetable program raising in multi-level IR using program synthesis. In *32nd international conference on parallel architectures and compilation techniques, PACT 2023, vienna, austria, october 21-25, 2023*, IEEE.
- de Souza Magalhães, J. W., Woodruff, J., Polgreen, E., & O’Boyle, M. F. P. (2023). C2TACO: lifting tensor code to TACO (C. D. Roover, B. Rumpe, & A. Shaikhha, Eds.). In C. D. Roover, B. Rumpe, & A. Shaikhha (Eds.), *Proceedings of the 22nd ACM SIGPLAN international conference on generative programming: Concepts and experiences, GPCE 2023, cascais, portugal, october 22-23, 2023*, ACM.
- Polgreen, E., Cheang, K., Gaddamadugu, P., Godbole, A., Laeufer, K., Lin, S., Manerkar, Y. A., Mora, F., & Seshia, S. A. (2022a). UCLID5: multi-modal formal modeling, verification, and synthesis (S. Shoham & Y. Vizel, Eds.). In S. Shoham & Y. Vizel (Eds.), *Computer aided verification - 34th international conference, CAV 2022, haifa, israel, august 7-10, 2022, proceedings, part I*, Springer.
- Polgreen, E., Reynolds, A., & Seshia, S. A. (2022). Satisfiability and synthesis modulo oracles (B. Finkbeiner & T. Wies, Eds.). In B. Finkbeiner & T. Wies (Eds.), *Verification, model checking, and abstract interpretation - 23rd international conference, VMCAI 2022, philadelphia, pa, usa, january 16-18, 2022, proceedings*, Springer.
- Pimpalkhare, N., Mora, F., Polgreen, E., & Seshia, S. A. (2021). Medleysolver: Online SMT algorithm selection (C.-M. Li & F. Manyà, Eds.). In C.-M. Li & F. Manyà (Eds.), *Theory and applications of satisfiability testing - SAT 2021 - 24th international conference, barcelona, spain, july 5-9, 2021, proceedings*, Springer.
- Abate, A., Bessa, I., Cordeiro, L. C., David, C., Kesseli, P., Kroening, D., & Polgreen, E. (2020). Automated formal synthesis of provably safe digital controllers for continuous plants. *Acta Informatica*, 57(1-2), 223–244.
- Cook, B., Döbel, B., Kroening, D., Manthey, N., Pohlack, M., Polgreen, E., Tautschnig, M., & Wieczorkiewicz, P. (2020). Using model checking tools to triage the severity of security bugs in the xen hypervisor. In *2020 formal methods in computer aided design, FMCAD 2020, haifa, israel, september 21-24, 2020*, IEEE.
- Abate, A., David, C., Kesseli, P., Kroening, D., & Polgreen, E. (2018). Counterexample guided inductive synthesis modulo theories (H. Chockler & G. Weissenbacher, Eds.). In H. Chockler & G. Weissenbacher (Eds.), *Computer aided verification - 30th international conference, CAV 2018, held as part of the federated logic conference, floo 2018, oxford, uk, july 14-17, 2018, proceedings, part I*, Springer.
- Abate, A., Bessa, I., Cattaruzza, D., Cordeiro, L. C., David, C., Kesseli, P., Kroening, D., & Polgreen, E. (2017a). Automated formal synthesis of digital controllers for state-space physical plants (R. Majumdar & V. Kuncak, Eds.). In R. Majumdar & V. Kuncak (Eds.), *Computer aided verification - 29th international conference, CAV 2017, heidelberg, germany, july 24-28, 2017, proceedings, part I*, Springer.
- Abate, A., Bessa, I., Cattaruzza, D., Chaves, L. C., Cordeiro, L. C., David, C., Kesseli, P., Kroening, D., & Polgreen, E. (2017). Dssynth: An automated digital controller synthesis tool for physical plants (G. Rosu, M. D. Penta, & T. N. Nguyen, Eds.). In G. Rosu, M. D. Penta, & T. N. Nguyen (Eds.), *Proceedings of the 32nd IEEE/ACM international conference on automated software engineering, ASE 2017, urbana, il, usa, october 30 - november 03, 2017*, IEEE Computer Society.
- Polgreen, E., Wijesuriya, V. B., Haesaert, S., & Abate, A. (2017a). Automated experiment design for data-efficient verification of parametric markov decision processes (N. Bertrand & L. Bortolussi, Eds.). In N. Bertrand & L. Bortolussi (Eds.), *Quantitative evaluation of systems - 14th international conference, QEST 2017, berlin, germany, september 5-7, 2017, proceedings*, Springer.
- Polgreen, E., Wijesuriya, V. B., Haesaert, S., & Abate, A. (2016). Data-efficient bayesian verification of parametric markov chains (G. Agha & B. V. Houdt, Eds.). In G. Agha & B. V. Houdt (Eds.), *Quantitative evaluation of systems - 13th international conference, QEST 2016, quebec city, qc, canada, august 23-25, 2016, proceedings*, Springer.

#### Refereed Workshop Papers or Presentations

- Frankel, G., Schneider, R., Steuwer, M., & Polgreen, E. (2025). Syntax-guided synthesis with counterexample guided E-graphs: A work-in-progress report. In *23rd international workshop on satisfiability modulo theories, august 10–11, 2025, glasgow, uk*.

Li, Y., Mora, F., Polgreen, E., & Seshia, S. A. (2023). Genetic algorithms for searching a matrix of metagrammars for synthesis. *SYNT 2023*, *abs/2306.00521*.

Parsert, J., & Polgreen, E. (2023). Reinforcement learning for syntax-guided synthesis. *SYNT 2023*, *abs/2307.09564*.

Chan, N., Polgreen, E., & Seshia, S. A. (2020). Gradient descent over metagrammars for syntax-guided synthesis. *SYNT 2020*, *abs/2007.06677*.

Mora, F., Cheang, K., Polgreen, E., & Seshia, S. A. (2020). Synthesis in uclid5. *SYNT 2020*, *abs/2007.06760*.

#### Language Standards, Editorships, etc.

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Padhi, S., Polgreen, E., Raghothaman, M., Reynolds, A., & Udupa, A. (2023). The sygus language standard version 2.1. *CoRR*, *abs/2312.06001*.

Fijalkow, N., Finkbeiner, B., Pérez, G. A., Polgreen, E., & Morvan, R. (2023). The futures of reactive synthesis (dagstuhl seminar 23391). *Dagstuhl Reports*, 13(9), 166–184.

Polgreen, E., & Pérez, G. A. (2022). Preface for the formal methods in system design special issue on SYNT 2021. *Formal Methods Syst. Des.*, 61(2), 137–138.

#### Funding

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2025      **DARPA**, \$450,000

2023      **Amazon Research Award**, \$50,000

2023      **Royal Academy of Engineering Research Fellowship**, £589,657

#### Invited Talks

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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**

- Annual AAAI 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 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