Austin J. Garrett

✉ ajg@purdue.edu
austingarrett.dev
github.com/agarret7

Education

PhD in Computer Science
Jul 2025 – present *Purdue University*

Master of Engineering in Electrical Engineering and Computer Science
Sep 2019 – Feb 2021 *Massachusetts Institute of Technology*

Bachelor of Science in Computer Science and Engineering and in Physics
Sep 2015 – Jun 2019 *Massachusetts Institute of Technology*

Publications

Under review **Sampling-based Model Predictive Control as Sequential Monte Carlo Inference**
Submitted to IEEE RA-L. Code.
2nd-place Best Poster, 2026 Midwest Robotics Workshop

2022 **Barrier Functions Enable Safety-Conscious Force-Feedback Control**
*arXiv preprint. C. Dawson, **A. Garrett**, F. Pollok, Y. Zhang, C. Fan*

2021 **3DP3: 3D Scene Perception via Probabilistic Programming**
*NeurIPS 2021. N. Gothoskar, M. Cusumano-Towner, B. Zinberg, M. Ghavamizadeh, F. Pollok, **A. Garrett**, J. B. Tenenbaum, D. Gutfreund, V. K. Mansinghka*

Experience

W. Lafayette, IN **Purdue University, Computational Motion, Manipulation, and Autonomy Lab**
Jul 2025 – present *PhD Researcher. Advisor: Zachary Kingston*

• Lead author: training-free Sequential Monte Carlo for MPC in JAX on GPU, with 90% success on real-robot Push-T vs. 10–15% for MPPI, CEM, and DIAL-MPC.
• Learning friction and impact parameters from a few non-prehensile pushes, with orders of magnitude less data than an Attentive Neural Process model (preliminary).

Phoenix, AZ **Tandem Wealth Advisors**
Oct 2023 – Apr 2024 *Software Consultant*

• Deployed a full-stack Monte Carlo retirement planner for a firm with 100+ clients.

Cambridge, MA **IBM (Business Innovation Team & MIT-IBM Lab)**
Oct 2021 – May 2023 *AI Software Engineer. Managers: Mark Weber & Dan Gutfreund*

• Contributed to DARPA's Machine Common Sense evaluation; deployed an LLM + symbolic visual QA system on a TIAGo, shown to clients at IBM Think.
• Coauthored the barrier-functions force-feedback preprint, with live TIAGo demos.

Cambridge, MA **MIT Probabilistic Computing Project**
Jun 2019 – Feb 2021 *Master's Student. Advisor: Vikash Mansinghka*

• 3DP3 (NeurIPS 2021): beat deep learning baselines at 6DoF pose estimation from real images; built scene-graph inverse-rendering models and MCMC inference.
• M.Eng. thesis: inference infrastructure for 3D generative scene graphs in Gen.

Cambridge, MA **ISEE**
Jan 2018 – Sep 2018 *Research Intern. Mentor: Wongun Choi*

• Prepared real-world LIDAR datasets in ROS and implemented multi-modal detection and regression networks in GPU-accelerated PyTorch for autonomous vehicles.

Projects

Mar 2026 – present **Open-Source Contributor: Enzyme & Melior (MLIR)**
Compiler infrastructure for automatic differentiation in Rust

• Working toward compiler-based automatic differentiation in Rust MLIR toolchains by bringing Enzyme's AD ops to Melior.

• Enzyme: added initial C bindings for its MLIR dialect, covering dialect registration and AD op constructors, for Rust, Python, and other languages (merged PR).

• Melior (Rust bindings for MLIR): fixed ODS builder codegen for type inference and operand segment sizes, enabling all upstream `linalg` ops (2 merged PRs).

May 2023 – Jul 2024 **ModPPL: Probabilistic Programming Language in Rust**
Independent project. Talk at Scientific Computing in Rust 2026

• Built a modular library for probabilistic programming in Rust, integrating effect handlers, particle filtering, importance sampling, and MCMC.

• Designed a generic trait interface for probabilistic generative functions and a dynamic modeling language using procedural macros.

Teaching Experiences

West Lafayette, IN **Graduate Teaching Assistant, Purdue University**
2025 – present *CS 250: Computer Architecture; CS 536: Software Engineering for Robotics; CS 177*

Copenhagen, DK **Probabilistic AI School**
Summer 2024 *Teaching Assistant*

Cambridge, MA **Teaching Assistant, MIT**
2017 – 2018 *6.031: Software Construction; 6.01: Introduction to EECS I*

Skills

Languages: Python, Rust, C/C++, Julia
Compilers & AD: MLIR, LLVM, Enzyme, Melior
ML & Robotics: JAX, PyTorch, MuJoCo, ROS, Gen.jl