

Jan-Paul Vincent Ramos-Dávila

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Education

Cornell University

Ithaca, NY

B.A. in Computer Science, Conc. in Programming Languages & B.A. in Philosophy, Conc. in Logic

August 2021 - May 2025

Research Experience

Carnegie Mellon University

Pittsburgh, PA

Software Verification REU Participant, Advised by Dr. Jonathan Aldrich & Dr. Joshua Sunshine

May 2022 - Present

- Core contributor on the early development of the Gradual Verification framework.
 - *Verification*: Implemented a Property Based Testing tool for evaluating soundness of Gradual C_0 and developed formal proofs for establishing semantic correspondence between static and dynamic verification.
 - *Performance*: Significantly optimized benchmark results by using second-order logic equivalences for runtime assertions.
- Exploring the application of Gradual Verification to smart contracts on the *Algorand* and *Ethereum* blockchain platforms. Developed a prototype for Gradually Verified Teal and Gradually Verified Ethereum.

Cornell University

Ithaca, NY

Programming Languages Undergraduate Researcher, Advised by Dr. Adrian Sampson

October 2021 - December 2022

- Implemented *Graphicionado Graph Analytics* algorithm in Calyx as a case study of the language. Found/solved soundness bugs in the front-end in the Computer Architecture & Programming Abstractions group.
- Worked on a symbolic execution tool for verifying parallelism in Calyx.

Publications & Presentations

- [1] DiVincenzo, J., McCormack, I., Gouni, H., Gorenburg, J., **Ramos-Dávila, J.**, Zhang, M., Zimmerman, C., Sunshine, J., Tanter, É., Aldrich, J., *Gradual C_0 : Symbolic Execution for Gradual Verification*, In ACM Transactions on Programming Languages and Systems (*In Submission*)
- [2] Singh, K., Sun, H., **Ramos-Dávila, J.**, *Gradual Verification of Smart Contracts*, In 39th ACM/IEEE Symposium on Logic in Computer Science (*In Submission*)
- [3] **Ramos-Dávila, J.**, *Optimization of a Gradual Verifier: Lazy evaluation of Iso-recursive Predicates as Equi-recursive at Runtime*, In 51st ACM SIGPLAN Symposium on Principles of Programming Languages Student Research Competition (POPL '24 SRC), Midwest Programming Languages Summit 2023 (MWPLS '23)
- [4] **Ramos-Dávila, J.**, *Evaluating Soundness of a Gradual Verifier with Property Based Testing*, In 50th ACM SIGPLAN Symposium on Principles of Programming Languages Student Research Competition (POPL '23 SRC), Cornell Undergraduate Research Journal, 2(1), 17–27. <https://doi.org/10.37513/curj.v2i1.696> [Pub] [Presentation] [Poster]

Projects

- **Lightweight Verification of Compiler Optimizations** (*Cornell CS 6120 Advanced Compilers*) *In Progress*.
- **Incremental Specification Mining** (*Cornell CS 6156 Runtime Verification*) Instrumentation for Maven-based projects that *incrementally* mines specifications for runtime verification. Significantly decreases overhead for evolutionary-aware specification miners. Supports integration with Javert and BDDMiner. [Repo]
- **EtaC** (*Cornell CS 4120 Intro to Compilers*) Compiler for the Eta programming language in OCaml with ~ 7,200 lines of code. Made use of Jane Street's expect testing suite for ~ 90% code coverage.
- **RNAFoldml** (*Cornell CS 3110 Functional Programming*) OCaml package that enables users to input both RNA sequences in FASTA format and a set of constraints to predict RNA secondary structure. [Repo]
- **Diffeq-lang** (*Senior High School ISEF*) Domain-specific language for automatically solving and graphing differential equations via a web interface. [Repo] [Website]

Awards and Honors

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| 2023 | Fellow: Amazon Summer Undergraduate Research Experience (CMU) |
| 2023 | Winner, Third Place: ACM SIGPLAN POPL SRC |
| 2022 | Travel Scholarship: ACM SIGPLAN PLDI |
| 2021 | Sponsor Prize: Cornell BRH Hackathon [Course2Career] |
| 2020 & 2021 | Finalist, Mathematics: Regeneron International Science and Engineering Fair |

Academic Service

Cascais, PT
Seattle, WA

Video Co-Chair: ACM SIGPLAN SPLASH 2023
Student Volunteer: ACM SIGPLAN ICFP 2023 (Video & Audio Tech)

Skills & Other Experience

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| Education | Advanced Functional Programming Summer School 2023 (Utrecht University) |
| Languages | OCaml, Scala, Python, Haskell, JavaScript, Java, C, Racket, Rust, English, Español, Italiano |
| Tools | \LaTeX , Coq IDE, Agda-mode, Unix, Git, Shell, Neovim, Emacs, Docker, Heroku, HTML/CSS, Flask |