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

Experience

NASA, Langley Formal Methods *Hampton, VA (R)*

Research Assistant, Program Verification, Advised by Dr. Alwyn Goodloe June 2024 - Present

- Mechanized proofs that model correct behaviors behind a Software Defined Delay-Tolerant Network's Match-Action pipeline algorithm for NASA's Interplanetary Overlay Network framework.
- Developed a Network Calculus IR formally verified in Coq (*RocqNet*). Wrote an interpreter for a subset of P4 that targets RocqNet.

Carnegie Mellon University, S3D *Pittsburgh, PA*

Research Assistant, PL/Program Verification, Advised by Dr. Jonathan Aldrich & Dr. Jenna DiVincenzo May 2022 - May 2024

- Core contributor on the early development of the Gradual Verification framework [1]. Empirically evaluated the soundness of Gradual C_0 [4] and provided formal proofs of completeness between the dynamic and static verifiers [3].
- Explored the application of Gradual Verification to smart contracts on the *Algorand* and *Ethereum* blockchain platforms and developed a prototype for Gradually Verified Teal [2].

Cornell University, CIS *Ithaca, NY*

Teaching Assistant, CS 4114 Systems Programming, Taught by Dr. Ken Birman January 2024 - May 2024

- Graded students' assignments, held weekly office hours, and ran coding workshops each week with hands-on demos building and debugging C++/Linux applications.

Teaching Assistant, CS 4/5110 Programming Languages and Logics, Taught by Dr. Adrian Sampson August 2024 - December 2024

- Examination czar in charge of the infrastructure of midterms, graded students' assignments, and held weekly office hours.

Research Assistant, Programming Languages, 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] **Ramos-Dávila, J.**, Goodloe, A., *Type Preserving Compilation for Formally Verified Software Defined Delay-Tolerant Networks*, In IEEE Workshop on Optimizing Interplanetary Communication Through Network Autonomy, ACM SIGPLAN/SIGLOG Certified Programs and Proofs (CPP '25, co-located with POPL '25) (***In Submission***)

[2] DiVincenzo, J., McCormack, I., Gouni, H, Gorenburg, J., **Ramos-Dávila, J.**, Zhang, M., Zimmerman, C., Sunshine, J., Tanter, É., Aldrich, J., *Gradual C0: Symbolic Execution for Gradual Verification*, In ACM Transactions on Programming Languages and Systems (***To Appear***)

[3] Singh, K., Sun, H., **Ramos-Dávila, J.**, Aldrich, J., DiVincenzo, J. *Gradual Verification of Smart Contracts*, In ACM SIGPLAN Workshop on Principles of Secure Compilation (PRiSC, POPL '24 Workshop) [Preprint] [Presentation]

[4] **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) [Poster] [Abstract]

[5] **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 [Paper] [Presentation] [Poster]

Projects next page

- **A Verified IR for Calyx.** (*Cornell CS 6861 Kleene Algebra*) Verifying the correctness of parallelism in Calyx with KATs. [Paper]
- **Optimization of a Concurrent PL Model Checker.** (*Cornell CS 6120 Advanced Compilers*) Reduction of state explosion for the Harmony Concurrent Programming Language's model checker. [Repo]
- **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]
- **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]

Awards & Grants

Travel Scholarship: Verification Mentoring Workshop @ CAV	*'24*
Fellow: Amazon Summer Undergraduate Research Experience (CMU)	*'23*
Winner, Third Place: ACM SIGPLAN POPL SRC [4]	*'23*
Travel Scholarship: Programming Languages Mentoring Workshop @ ACM SIGPLAN PLDI	*'22*
Finalist, Mathematics: Regeneron International Science and Engineering Fair	*'20 & '21*

Academic Service

Seoul, KR	**Video Co-Chair**: ACM SIGPLAN PLDI 2025	*Jun. '25*
Denver, CO	**Video Co-Chair**: ACM SIGPLAN POPL 2025	*Jan. '25*
Milan, IT	**Virtualization Chair**: ACM SIGPLAN ICFP 2024	*Sep. '24*
Copenhagen, DK	**Virtualization Chair**: ACM SIGPLAN PLDI 2024	*Jun. '24*
London, UK	**AV Committee**: ACM SIGPLAN POPL 2024	*Jan. '24*
Cascais, PT	**Video Co-Chair**: ACM SIGPLAN SPLASH 2023	*Oct. '23*
Seattle, WA	**Student Volunteer**: ACM SIGPLAN ICFP 2023	*Sept. '23*

Skills

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
PL Education	Oregon Programming Languages Summer School 2024 (*Boston University*) Advanced Functional Programming Summer School 2023 (*Utrecht University*)