Markus de Medeiros

(213)-248-6245 | mjd9606@nyu.edu | markusde.ca | github.com/markusdemedeiros

Education

New York University, Courant Institute — New York, NY
PhD Computer Science, in progress. — *September 2023 – Present*

University of British Columbia — Vancouver, BC
BSc Combined Honours in Computer Science and Mathematics. — *September 2018 – April 2023*

- Stanley M. Grant Scholarship in Mathematics: 2022. By recommendation of the department.
- Dean's Honour List: 2018-2023.
- NSERC USRA award: 2021, 2023; SURE award: 2022.

Experience

Applications of Higher-Order Separation Logic in Probabilistic Verification — September 2023 – Present
with Joseph Tassarotti (NYU)

- Verifying security and privacy properties of distributed systems in Coq.
- Expanding the functionality of the Clutch verification framework.
- **Published** Error Credits: Resourceful Reasoning about Error Bounds for Higher-Order Probabilistic Programs. ICFP (2023). DOI. **ICFP Distinguished Paper Award.**
- **Published** Tachis: Higher-Order Separation Logic with Credits for Expected Costs. OOPSLA (2024). DOI.

SampCert: Verified Differential Privacy — May 2024 – August 2024
Amazon Web Services

- Develop and deploy a discrete differential privacy library, verified using the Lean 4 theorem prover.
- Verify high-level privacy results, low-level optimizations, and develop a unifying privacy framework.
- *Publication in progress* .

Coupled Borrows: Automated, Extensible Memory Safety Proofs for Prusti — May 2022 – August 2023
with Alex Summers (UBC), Aurel Bílý (ETH Zurich)

- Design a robust semantics for the internal state of the Rust type checker as an external API for verification tools.
- Enable reasoning about lifetimes with complex dataflow and type constraints in Prusti.
- Collaborate with Prusti and Rust developers to balance their evolving design requirements.
- **BSc. Thesis** and presentation link.

Fractional Differential Equations — May 2021 – August 2021
with Jun-cheng Wei (UBC)

- Develop numerical simulations of nonlocal differential equations to corroborate our asymptotic theory.
- **Published** Existence and stability of symmetric and asymmetric patterns for the half-laplacian gierer–meinhardt system in one-dimensional domain. *Mathematical Models and Methods in Applied Sciences (2022)*. DOI.
- **Published** Spike Solutions to the Supercritical Fractional Gierer-Meinhardt System. *Journal of Nonlinear Science* (2024). DOI.

Teaching Assistantships
University of British Columbia and New York Univeristy

- UBC: CPSC 312 *Functional and Logic Programming*, CPSC 421 *Theory of Computation*, CPSC 310 *Software Engineering*, Math 184 *Differential Calculus*
- NYU: CSCI-GA 2110 *Programming Languages*

Technical Skills

Languages: Rust, OCaml, Haskell, Python, C/C++, Prolog, Java, Typescript
Verification Tools: Lean, Coq, Iris, Prusti, Viper, Z3
Research Interests: Automated reasoning, separation logic, distributed and concurrent verification, functional programming, type systems, verified compilers, systems, differential privacy, security.