Koundinya Vajjha, CQF, Ph.D.

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Summary

A highly motivated individual with strong background in mathematics and nearly six years of experience in formal verification of software, hardware and mathematics across academia and industry.

Work experience

- **Formal Verification Engineer** — Intel Corp.
  San Francisco Bay Area, USA — *2024 - present*
  - Arithmetic formal verification in CPUs using theorem provers/model checkers.

- **R&D Engineer** — Imandra
  San Francisco Bay Area, USA — *2022 - 2024*
  - Formally verifying a trading venue's matching logic from the system specification in an **automated reasoning engine/theorem prover**.
  - Re-using the formally verified model to optimize order placement via Reinforcement Learning using OCaml.

- **Quantitative Analyst** — CRISIL, an S&P Global Company
  Chennai, India — *2016 - 2017*
  - Verification and validation of Anti-Money Laundering models deployed on **payments/transaction databases**.

Education

- **University of Pittsburgh** — Pittsburgh, Pennsylvania
  Ph.D. Mathematics — *2018-2022*
  - **Advisor** : Thomas Hales.
  - Received the **Andrew W. Mellon Predoctoral Fellowship** for 2021-22.
  - Research in Formal Verification of Optimal Control and Discrete Geometry.

- **University of Western Ontario** — London, Ontario
  MSc. Mathematics — *2017 - 2018*

- **Fitch Learning**
  Certificate in Quantitative Finance — *2017*

- **Indian Statistical Institute** — Kolkata, West Bengal
  Master of Mathematics — *2014 - 2016*

- **Indian Statistical Institute** — Bangalore, Karnataka
  Bachelor of Mathematics — *2011 - 2014*

Technical Skills

OCaml, Python, Coq, Lean, Haskell, Mathematica, R, Matlab, SAS, Octave.

Academic Publications and Preprints

1. *Formal Verification of a Stochastic Approximation Theorem* (with Barry Trager, Avi Shinnar and Vasily Pestun) accepted to **ITP 2022**.
2. *The Reinhardt Conjecture as an Optimal Control Problem* (with Thomas Hales), work-in-progress.
3. *CertRL: Formalizing Convergence Proofs for Value and Policy Iteration in Coq* (with Avi Shinnar, Barry Trager, Vasily Pestun and Nathan Fulton) presented at **CPP 2021**.
4. *A formal proof of PAC Learnability of Decision Stumps* (with Joseph Tassarotti and Jean-Baptiste Tristan) presented at **CPP 2021**.
5. *On a Definite Integral of the Fractional Part Function* in **Resonance**, May 2012, Volume 17, Number 05.
6. *On Pythagorean Triples of the Form* $(i, i+1, k)$ in **Resonance**, September 2009, Volume 15, Number 09.

Internships

1. Research Internship at the **MIT-IBM Watson AI Lab, IBM Research**, 2020.
    - Formal verification of Reinforcement Learning algorithms in the Coq theorem prover. **Mentors**: Barry Trager, Avi Shinnar.
2. Research Internship in **Oracle Labs**, 2019.
    - Formal verification of Statistical Learning Theory in the Lean theorem prover. **Mentor**: Jean-Baptiste Tristan
3. Summer internship in **Essex Lake Group LLC**, 2013
4. Summer internship at the **Indian Institute for Science Education and Research, Mohali**, 2013.
5. Summer internship as a JNCASR Fellow, at the **Indian Institute for Science Education and Research, Kolkata** in 2012.

Conferences

1. Participant at the **DeepSpec Summer School, 2018**, July 2018 at Princeton University.
2. Participant at the **Vladimir Voevodsky Memorial Conference** at the Institute for Advanced Study, Princeton, September 2018.
3. Participant at the **Homotopy Type Theory Summer School** at Carnegie Mellon University, August 2019.
4. Participant at **Homotopy Type Theory - 2019** at Carnegie Mellon University, August 2019.
5. Participant at the **Category Theory Octoberfest**, October 2019 at Johns Hopkins University.
6. Patricipant at **Optimal Control, Optimal Transport, and Data Science - Institute for Mathematics and Applications – University of Minnesota**, November 09 - 13, 2020.

7. Participant at the **Certified Programs and Proofs, 2021**, January 2021.

8. Selected to participate in the **2021 Galois Summer School for Trustworthy Machine Learning, Artificial Intelligence, and Data Science**, June 2021.

9. Participant at the **OCaml Hacking Day, 2023**, Oct 2023 at Tarides, India.