Siddharth Nair

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Summary

MSc Computer Science graduate focused on formal methods, mathematical software, and modern C++ computational projects. Completed a distinction-level thesis implementing a standalone, constructive Agda formalization of the integers as a commutative ring from first principles. Strongest in C++ and machine-verified proof development, with additional foundations in computational optimization, dependent type theory, logic, and mathematical modelling. Seeking an early-career role in formal methods, R&D engineering, scientific/technical computing, or C++ computational software.

Skills

Languages & Tools: C++23, Agda, Python, Git, NumPy, SymPy, Matplotlib

Formal Methods & Logic: Dependent Type Theory, Constructive Logic, Propositional and First-Order Logic

C++ Software Development: Object-Oriented Design, Templates/Concepts, Multithreading Fundamentals

Computational Optimization: Linear Programming (LP), Integer/Binary Integer Programming (IP/BIP), Mixed-Integer Linear Programming (MILP), Algebraic & Spreadsheet Modelling , LP-Solve

Mathematical & Scientific Foundations: Abstract Algebra (Rings and Groups), Vector Calculus, Classical Mechanics, Introductory Computational Physics

Projects

$\mathbb{Z}$ as a Commutative Ring: A Type-Theoretic Formalization in Agda siddharths.space/projects/agda-thesis
MSc thesis awarded Distinction — Supervisor: Prof. T. Altenkirch

- Built a standalone approx. 1 k LOC Agda development formalizing $\mathbb{N}$, $\mathbb{Z}$, arithmetic operations, equality reasoning, and algebraic properties from first principles
- Verified approx. 100 constructive proofs and instantiated reusable algebraic records certifying $\mathbb{Z}$ as a commutative ring without relying on standard-library algebra proofs

Indus siddharths.space/projects/project-indus
Multithreaded PBRT-inspired CPU path tracer in modern C++23 and SFML — (ongoing development)

- Built a modular C++23 CPU path tracer using named modules, concepts-constrained geometry/math types, and polymorphic renderer subsystems
- Implemented numerical robustness and acceleration systems: FMA utilities, interval arithmetic, ULP-offset secondary rays, and a flattened 32-bucket SAH BVH
- Implemented an environment-lit multi-bounce BSDF path integrator with PCG32/stratified sampling, Lambertian/dielectric transport, Fresnel evaluation, and Russian roulette
- Added thin-lens depth of field, object motion blur, RGB film accumulation, Gaussian filtering, PNG output, and `std::jthread` tile scheduling with progressive SFML preview/HUD

Experience

Audio Engineer, GTPL Hathway — IN Feb 2018 – June 2018

- Managed live broadcast audio/media continuity for 24-hour news programming, resolving emergent technical issues with on-air teams

Audio-Video Editor, Chrysalis Communications — IN 2015 – 2018

- Managed end-to-end post-production for infomercials commissioned by state agencies

Education

MSc Computer Science with Merit — **University of Nottingham** March 2024
Coursework: Computer Graphics, Program Proofs & Types, Research Methods, Linear & Discrete Optimization

BCA Games & Mobile Software Development — **CMR University** August 2021