Ritoban Roy-Chowdhury

✉ ritobanrc@gmail.com
rroychowdhury@ucsd.edu

Education

Sept 2022 – Jun 2026
B.S. in Computer Science, *University of California, San Diego*, (Total) GPA: 3.97
Signifcant courses: CSE100 (Advanced Data Structures), CSE101 (Analysis of Algorithms), CSE105 (Theory of Computation), CSE 130 (Programming Languages), CSE 107 (Cryptography), CSE 270 (Discrete Differential Geometry), CSE 140+L (Digital Logic), CSE 260 (Parallel Computation), CSE291E (Physics Simulation)

Sept 2022 – Jun 2026
B.S. in Mathematics, *University of California, San Diego*, GPA: 3.97
Significant courses: MATH 31ABC (Honors Linear Algebra & Multivariable Calculus), MATH 184 (Enumerative Combinatorics), MATH 140ABC (Foundations of Real Analysis), MATH 148 (Partial Differential Equations), MATH 180A (Probability), MATH 272 (Numerical PDEs), MATH 250 (Differential Geometry)

Publications

Mohammad Sina Nabizadeh, Ritoban Roy-Chowdhury, Hang Yin, Ravi Ramamoorthi, and Albert Chern. Fluid implicit particles on coadjoint orbits. *SIGGRAPH Asia*, 2024. Best Paper Honorable Mention.

Ritoban Roy-Chowdhury, Tamar Shinar, and Craig Schroeder. Higher order divergence-free and curl-free interpolation on mac grids. *Journal of Computational Physics*, page 112831, 2024.

Craig Schroeder, Ritoban Roy Chowdhury, and Tamar Shinar. Local divergence-free polynomial interpolation on mac grids. *Journal of Computational Physics*, 468:111500, 2022.

Research Experience

Sept 2023–Present
University of California, San Diego, Advisor: Albert Chern

- Learned about differential geometry, applied to Hamiltonian fluid mechanics: Lie groups of diffeomoprphisms, symplectic/Poisson manifolds, coadjoint orbits.
- Helped develop a structure preserving, high order accurate fluid simulation algorithm based on FLIP, leading to a SIGGRAPH Asia publication that won a Best Paper Honourable Mention.
- Used the National Research Platform Kubernetes cluster to Design and Run Numerical Experiments. I've continued to do research in structure preserving numerical methods for fluids, inspired by differential geometric ideas.

April 2021–Aug 2023
University of California, Riverside, Advisors: Prof. Tamar Shinar & Prof. Craig Schroeder at UCR

- Implemented Physics-Based Animation algorithms in Rust and C++: Smoothed Particle Hydrodynamics for Fluids, Material Point Method for Elastic Solids, Snow.
- Two Journal of Computational Physics papers developed interpolation algorithms for divergence and curl-free vector fields.
- Collaborated on a Geometric Deep Learning project on surface reconstruction from Particle Data, experimenting with PointNet++, KPConv, etc.

Leadership and Teaching

September – Present **Tutor for Digital Logic**, *University of California, San Diego*
Tutored for CSE 140, Digital Logic. Responsibilities included office hours, writing mathematically interesting and challenging exam questions, grading homework and exams, proctoring exams, and supporting the lab course.

Jan 2023 – Present **IEEE Supercomputing Chair**, *San Diego Supercomputing Center*
Worked on a mesh networking project, introduced students to distributed computing using a Raspberry Pi Cluster, organized the Single-Board Cluster Competition with over 5 teams from around the world, mentored the UCSD Student Cluster Competition team on computational physics and numerical analysis applications.

Sep 2022 – Present **Comfort Tone**
Participated in UCSD's all-inclusive a capella group Comfort Tone. Tenor section lead and board member starting Fall 2024.

Programmming Projects

- **TritonTrails** A React/TypeScript web application that that displays walking trails in the San Diego Area. Users can create accounts, post images, and reviews, filter trails by length, difficulty, weather, and more! Part of a CSE 110, Software Engineering project. [code]
- **Physics Simulator** A real-time physics simulator written in Rust, with implementations of Smoothed Particle Hydrodynamics for fluid simulation and the Material Point Method for elastic solids and snow. [code]
- **Firework** A path tracing 3d renderer written in Rust, featuring multithreading, BVH acceleration structures, diffuse, specular, glass, and emissive materials, several different kinds of analytic objects and meshes that can be rendered, particle systems, simple volumetics, and scene serialization using YAML. [code]
- **Chess Engine** A Chess GUI and engine I wrote as my first major project in the Rust programming language. The interface was written using the Piston OpenGL library, with custom UI code, and the chess AI used a parallelized minimax algorithm for finding moves, alpha-beta pruning, a hand-written transposition table data structure avoid redundant computations. [code]
- And several more available on my Github profile at `github.com/ritobanrc`, including a procedural dungeon generator using Unity, Conway's Game of Life, several fractal generators, a hexagonal version of Minesweeper written in Javascript, and a random 3d maze generator, as well as more recent code from the research projects above.

Skills

Programming Languages
Rust, Python, C++, JavaScript, C#, Java, Haskell

Tools
Blender, Unity, Houdini, SageMath, Python, LaTeX, Bash, Vim, Git, OpenMPI, Kubernetes

Topics I've Self-Studied Out of Curiosity
Electromagnetism, Lagrangian and Hamiltonian Mechanics, Quantum Mechanics, General Relativity, Global Illumination Rendering, Cryptography, Linguistics (particularly Phonetics)