Navaneeth Mohan

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Education

Chennai Mathematical Institute, India *Aug 2011 – April 2014*
BSc. (Hons) Physics

- CGPA: 7.47/10.0
- **Coursework:** Mathematical Physics, Statistical Physics, Non-Linear Dynamics, General Relativity

Chennai Mathematical Institute, India *Aug 2014 – April 2016*
MSc. (Project) Physics

- CGPA: 8.30/10.0
- **Coursework:** Mathematical Physics, Statistical Physics, Nonlinear Dynamics, Monte-Carlo Simulations

University of Western Ontario, Canada *Sept 2016 – Aug 2018*
MSc. (Thesis) Applied Mathematics

- CGPA: 8.40/10.0
- **Coursework:** Finite Element Methods, Differential Equations
- **Thesis:** Investigation of chaos in biological systems.

University of Minnesota, USA *Sept 2025 – Present*
PhD Aerospace Engineering & Mechanics

- CGPA: 9.73/10.0
- **Coursework:** Continuum Mechanics, Iterative Methods for PDEs
- **Project:** Data-driven approaches to multiscale modeling of fracture mechanics in high entropy alloys.

Career/Education breaks

April - August 2014 : Vacation.
April - September 2016 : Vacation, preparation for Canadian immigration.
August - October 2018 : Actively seeking employment.
August - September 2025 : Vacation, preparation for USA immigration.

Summary of Skills

Numerical & Simulation: Ray-Tracing, Point-Cloud Processing, Surface Reconstruction, Visualization.
Machine Learning: Autoencoder, CNN, SVM, KNN, Clustering, PCA, SVD, t-SNE.
Time Series: Kahlman Filters, ARMA, Euclidean Distance, Fourier Transform.
Stochastic Systems: Monte-Carlo, Markov-Chain Monte-Carlo, Random Walks, Poisson Process.
Differential Equations: FEM, Runge-Kutta, Polynomial Expansion, Euler.
Analysis: Hessian, Quasi-Newton, Krylov Subspace, Gradient-Descent, Lyapunov Exponents.
Programming: OpenGL, CUDA, LibTorch, PyTorch, Boost, Pandas, ASE, GDB, Git.

Experience

Graduate Research Assistant *Aug 2025 – Present*
Department of Aerospace Engineering & Mechanics, University of Minnesota

- This project will be the foundation of my PhD thesis. The OpenKIM project is an NSF-funded cyber-infrastructure to provide a curated repository of conventional and machine learning interatomic potentials.
- Incorporated a base64-encoder-decoder into the core codebase of the KIM-API.
- Implemented a unified visualization framework for comparing potentials across various material properties.
- Contributed to the verification-framework of the OpenKIM pipeline
- Contributed to the CI/CD pipeline for automated testing of pull-requests.

Research Assistant *July 2024 – Dec 2024*
Department of Mechanical & Materials Engineering, University of Western Ontario

- Part of Public Health Ontario's $12M initiative to develop a non-invasive early warning system for COVID-19 by sequencing SARS-CoV-2 RNA from wastewater.
- Implement algorithms for sequence-alignment, variant-calling, and evolutionary-tree reconstruction.
- Create and maintain the software architecture to facilitate public access to data dashboards. Responsibilities include code/unit-tests contribution, code reviewing, and CI/CD pipeline development.
- Provide technical expertise to public-health researchers and mentorship for junior programmers.

C++ Scientific Software Developer
Quality Positioning Systems B.V *Aug 2023 – Aug 2025*

- QPS is a Dutch scientific software company specializing in hydrographic software solutions for studying the shape and characteristics of the sea floor .
- Develop high-performance asynchronous/parallel `C++` tools for point-cloud processing such as clustering, outlier-detection, regression, spline-interpolation, segmentation, downsampling, and denoising for geospatial data. Optimized algorithms in computational geometry, including triangulation, collision detection, and conic section intersections, as well as realtime ray-tracing. Libraries utilized include: `Boost.ASIO`, `OpenGL`, `CUDA`, `Boost.Geometry`, `CGAL`, `GDAL`.
- Test, debug, and profile code using `GDB`, `Perf`, and `Python` to examine bugs and bottlenecks.
- Collaborate with an international team of software developers. Ensure cross-platform compatibility and code passes unit-, integrated-, and manual-tests.

Research Assistant
Schulich School of Medicine & Dentistry, University of Western Ontario *Nov 2022 – Aug 2023*

- Worked on the GISAID-recognized CoVizu project. Optimized genome-sequencing algorithms for clustering, phylogenetic-tree simplification, and sequence-comparison to analyze global SARS-CoV-2 genome variation
- Scaled data pipelines for millions of sequences by minimizing memory overhead, reducing disk I/O, and accelerating data preprocessing and alignment steps.
- Implemented high-availability backend infrastructure with fault tolerance and failover mechanisms to support continuous global access to genomic visualizations.

C++ Software Developer
Radio Western *Oct 2018 – July 2023*

- Designed and implemented GPU-accelerated pipelines for real-time video rendering, image-processing, and frame-buffering using `OpenGL`, `CUDA`, and `OpenCV`.
- Developed asynchronous and parallel middleware for multimedia streaming, integrating RESTful `HTTP/TCP` APIs with low-latency algorithms for packet scheduling, buffering, and encoding.
- Applied signal processing and compression algorithms to optimize audio/video throughput, reduce latency, and support hardware-driven media input from USB cameras, microphones, and relay controls.

Graduate Teaching Assistant
Department of Applied Mathematics, University of Western Ontario *Sept 2016 – Apr 2018*

- Conducted weekly tutorial sessions and office hours for the 1st year Calculus course with 110+ students.
- Graded and proctored quizzes and exams.

Academic Projects

Spatio-Temporal Analysis of Population Dynamics *Sept 2016 – Aug 2018*
Advisor: Dr. Geoff Wild
Department of Applied Mathematics, University of Western Ontario

Developed an iterative model of predator-prey interactions. Performed simulations on compute clusters to generate synthetic time-series. The time-series was examined with analytical tools such as Poincaré maps, Lyapunov exponents, surrogate-data, PCA, SVD, recurrence-plots and correlation-integral plots. The objective was to identify chaotic signatures in population fluctuations.

Molecular Dynamics Simulation of Annealing of Glass *Aug 2015 – April 2016*
Advisor: Dr. Satyavani Vemparala
Department of Physics, Institute of Mathematical Sciences, Taramani

MD simulations of glass-crystallization was performed on compute-clusters using `LAMMPS`. Simulation results were analyzed with `Python` scripts. Results were corroborated with experimental collaborators at Indian Institute of Technology, Madras. Objective was to identify quantitative thresholds in the manufacturing process that led to formation of cracks when annealing glass.

Monte-Carlo Simulations in Statistical Physics
Instructor: Dr. Rajesh Ravindran *Aug 2015 – Dec 2015*
Department of Physics, Institute of Mathematical Sciences, Taramani

A credit-bearing reading course on MC simulation techniques for numerical integration and sampling, with an emphasis on systems in statistical mechanics and condensed-matter physics. Covered MCMC algorithms (Metropolis algorithm, Gibbs sampling, Hamiltonian MC). Implemented algorithms in `Python` to simulate lattice models and compute macroscopic properties such as energy, entropy, magnetization.

Ginzburg-Landau Theory of Superconductivity
Advisor: Dr. Gautam Menon *Aug 2013 – April 2014*
Department of Physics, Institute of Mathematical Sciences, Taramani

The GL model was applied towards modeling the Normal-Superconducting Interface in the microscopic regime of a Single Vortex to obtain a variational solution for the order parameter that yielded results of good approximation. A first-principles derivation of Abrikosov's solution for GL theory for Type-II superconductors was also established.

Identification of Transcription-Factor Binding Sites
Advisor: Dr. Rahul Siddharthan *May 2013 – Aug 2013*
Department of Physics, Institute of Mathematical Sciences, Taramani

A Biophysical model of RNA-TF interaction was developed based on the Free-Energy of binding. The free-parameters of the model were estimated using a Supervised Machine-Learning algorithm in `Python`. The model's accuracy was quantified against test-data to yield good results.

Stochastic Processes in Biological Systems
Instructor: Dr. Ronojoy Adhikarai *Aug 2012 – Dec 2012*
Department of Physics, Institute of Mathematical Sciences, Taramani

A reading project. We studied various applications of statistical physics in biological systems. Algorithms for numerical computation of stochastic partial differential equations were implemented in `Maple`.

Corrosion in Ferretic Samples
Advisor: Dr. Shamima Hussain *May 2012 – Aug 2012*
Indira Gandhi Center for Atomic Research, Kalpakam

An experimental investigation was conducted using Scanning Electron Microscopy to study the progression of oxidation in Ferritic samples. `Python` scripts were written to analyze the experimental data and quantify the rate of corrosion in relation to environmental factors of humidity and salinity as well as intrinsic chemical composition of the Ferretic samples.

Awards & Certificates

C++ Certified Associate Programmer *Oct 2024*
C++ Institute, verified link

President's Award for poster presentation *June 2018*
Canadian Mathematical Society, verified link

Kishore Vaigyanik Protsahan Yojana Scholarship *Aug 2014 - April 2016*
Department of Science and Technology, Government of India

Schools & Conferences

Canadian Mathematical Society, Summer Meet *June 2018*
Attended various talks and breakout sessions on mathematical/computational tools for non-linear systems. Delivered a poster presentation about my Masters research.

CAMBAM/NSERC Complex Dynamics Summer School *June 2018*
Attended various talks and breakout sessions on mathematical/computational tools for non-linear systems. Collaborated on a group project to analyze experimental data in neuroscience. Presented a lightning talk on my Masters research.

Projected Futures 2: Science Journalism Summer School *July 2018*
Attended workshops by renowned journalists on the societal impacts of science and science journalism, with an emphasis on synthetic biology. Collaborated on group projects conduct street interviews, and publish evidence-based multimedia articles.

Volunteer

Program coordinator *July 2017*
The Western Conference on Science Education

Co-Host, Producer *May 2017 - April 2018*
Gradcast: Official podcast of Society of Graduate Students

Science activities program coordinator *Aug 2016 - April 2018*
Pudiyador, India

References

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[1] Dr. Tadmor is currently on sabbatical and not reachable over phone