

TOWA SHIXUN HUANG

📞 902-620-1080 ✉️ towaxun.huang@mail.utoronto.ca [🌐 linkedin.com/in/towa-huang](https://www.linkedin.com/in/towa-huang) [🐙 alessange.github.io](https://github.com/alessange)

RESEARCH INTERESTS

I am interested in the intersection of graphics, scientific computing, and robotics, aiming to develop computational tools that combine mathematical structure with machine learning. My interests include structure-preserving model reduction, physics-based simulation, and neural architectures informed by optimization, PDEs, convexity, and symmetry. Broadly, I hope to design reliable and generalizable algorithms that advance simulation and numerical computation across scientific and engineering domains.

EDUCATION

University of Toronto

Toronto, Ontario

Bachelor of Science in Mathematics and Computer Science

Sep. 2022 – Jun. 2026

- Major in **Mathematics** and **Computer Science**, Minor in **Statistics**
- **CGPA: 3.89/4.00**

EXPERIENCE

Dynamic Graphics Project Lab

Apr. 2025 – Present

UTEA Undergraduate Student Researcher | **Supervisors:** Eitan Grinspun, Yue Chang

Toronto, ON

- Developed a convex-inspired reduced model for full-space deformable simulations, achieving stable and reliable performance under large deformations and collisions for full robustness
- Implemented and optimized Newton-based solvers for nonlinear material and contact energies, integrating PCA/AE/ICNN subspaces into the deformation reconstruction/simulation pipeline
- Demonstrated improved stability and out-of-distribution generalization through extensive benchmarking against challenging full-space motion trajectories

Dalla Lana School of Public Health

Jun. 2024 – Jan. 2026

Undergraduate Student Researcher | Jude Dzevela Kong

Toronto, ON

- Developed advanced SEIRS models using differential equations with seasonal forcing via Fourier series, and Bayesian inference (**MCMC**, **rstan**) for precise parameter estimation calibrated on Canadian influenza data
- Applied numerical methods and nonlinear optimization techniques to refine model calibration and validation
- Conducted a systematic review of 120 studies on mathematical and machine learning approaches in epidemiology, synthesizing methodologies, trends, and best practices

PUBLICATIONS

Huang, S., Grinspun, E., & Chang, Y. (2025). *Odd-DC: Generalizable Neural Model Reduction via Odd Difference-of-Convex Structure*. Under review for SIGGRAPH 2026. [arXiv:2511.18241](https://arxiv.org/abs/2511.18241)

Huang, S., Bragazzi, N. L., *et al.*, & Kong, J. D. (2025). *A Systematic Review of Mathematical and Machine Learning Models of Avian Influenza*. *One Health*, 21, 101203. [DOI:10.1016/j.onehlt.2025.101203](https://doi.org/10.1016/j.onehlt.2025.101203)

PROJECTS

Superconductor Transition Temperature Prediction | PyTorch, Transformer

Nov. 2024 – Dec. 2024

- Curated superconducting datasets via Materials Project API, including CIF structures and transition temperatures
- Encoded atomic data into 25D Gaussian-mapped feature vectors and designed sentence-structured representations
- Trained Transformer-based models with preliminary MAEs of 0.85–0.99 across two configurations

Numerical Methods for Option Pricing | MATLAB, Iterative Methods, Finite Difference

Mar. 2025 – Apr. 2025

- Implemented finite difference solvers for the **Black–Scholes PDE** and analyzed numerical stability and convergence
- Solved American put options via projected SOR to enforce early-exercise inequality constraints
- Generated technical visualizations of solution surfaces and convergence trends for reporting

- Reviewed key LoRA literature and analyzed intruder-dimension findings through empirical study
- Built a controlled Qwen-0.5B fine-tuning pipeline to test LoRA ranks 2–256 and analyze weight matrices
- Found $r = 2$ offers strongest generalization in empirical analysis, while higher ranks overfit via intruder dimensions

AWARDS AND TALKS

Awards: University of Toronto Excellence Award (\$8,000, \$12,000), Dean’s List Scholar (3 years),

Talks: Annual Ontario-Quebec pre-SIGGRAPH Workshop 2025 Speaker, ARIA 2025 Poster Presenter

TEACHING

MAT186: Calculus I, University of Toronto – Teaching Assistant, Fall 2025

MAT187: Calculus II, University of Toronto – Teaching Assistant, Winter 2026

COURSES

Real Analysis; Linear Algebra; Probability and Statistics; Numerical Methods; Differential Equations; Computational Finance (Graduate); Computational Differential Equations (Graduate); Mathematical Theory of Finance (Graduate); Deep Learning Theory (Graduate); Physics-Based Animation

TECHNICAL SKILLS

Technical Topics: Neural Fields, Deep Learning for Animation, Physics-Informed Neural Networks, Graph Neural Networks, Numerical Analysis, LLM Training/Inferencing

Programming Languages: Python, Java, C, C++, MATLAB, R, SQL, Mathematica

Developer Tools: VS Code, Git, Linux Shell, PyCharm, IntelliJ, Blender, Unity, \LaTeX

Frameworks and Libraries: pandas, NumPy, SciPy, PyTorch, pymatgen, scikit-learn, PyMC, Warp