Xuemeng (Sherril) Wang

(+1)7783258565 xwa265@sfu.ca Burnaby, CA
in/xuemeng-wang-b80200160/

Research Interest

Scientific Computing, Scientific Machine Learning, Active Learning, Sampling Strategy, Sparse Random Features.

Education

Ph.D. in Applied Mathematics (In Progress) *Simon Fraser University(SFU)* **Vancouver, CA** *2024-2028*
Supervisor: Prof. Ben Adcock

M.Sc. in Mathematics *University of British Columbia(UBC)* **Vancouver, BC** *2022-2024*
Supervisor: Prof. Neil Balmforth
Research Focus: Fluid Mechanics, Numerical Methods, Partial Differential Equations, Numerical Methods.
Thesis Topic: Damping of surface waves by a floating dissipative plate

B.Sc. in Mathematics and Statistics (First Class Honours) *Hong Kong Baptist University* **Hong Kong** *2017-2021*

SCET Global Academic Programs *University of California, Berkeley* **Berkeley, US** *2019*

Courses

Undergraduate Statistical Method and Theory, Regression Analysis, Topics in Probability Theory and Stochastic Processes, Data Mining, Graph Theory.

Graduate Deep Learning and Neural Networks, Mathematics of Data Science, Industrial Mathematical Modeling, Numerical Linear Algebra.

Publications & Conference Presentations

Published Wang, X., & Balmforth, N. J. (2022). Damping of surface waves by a floating viscoplastic plate. *Physical Review Fluids*, 7(12), 123302.
Li, S., Ling, L., Ruuth, S. J., & Wang, X. (2024). Realistic pattern formations on surfaces by adding arbitrary roughness. *SIAM Journal on Applied Mathematics*, 84(3), 1163-1185.

Presentations Wang, X., "Damping of surface waves by a floating viscoplastic plate," presented at the 8th Pacific Rim Conference on Rheology, Vancouver, BC, 2023.

Posters *Christoffel Adaptive Sampling for Sparse Random Feature Expansions*, Workshop on Approximation and Learning in High Dimensions, Centre de recherches mathématiques, 2025.

Project Experiences

Beltrami Equation Vector Field Simulation *Type One Energy* *2025*

- Developed and deployed **simulation code** with **Python** to model Beltrami vector fields for plasma confinement, using **FEniCSx** to solve PDEs on complex geometries.
- Implemented **boundary and flux conditions** with Nitsche's method and Lagrange multipliers, improving stability and accuracy.
- Applied **Finite Element Method** for vector PDE systems, analyzing solution behavior and refining mesh and solver configurations.
- Collaborated with a **multidisciplinary team**, sharing results and integrating feedback to enhance simulation performance and physical interpretation.

Breast Cancer Survival Analysis *Simon Fraser University* *2024*

- Built and deployed **multiple classification models** to predict breast cancer survival, optimizing feature selection and class balancing, achieving **45% F1-score improvement** with AdaBoost and **118% precision gain** with Random Forest.
- Applied **data preprocessing and class balancing** to improve model sensitivity, increasing **recall for high-risk patients by 10%** and reducing false negatives.
- Implemented and compared **Naïve Bayes, Logistic Regression (Standard, Lasso, Ridge), KNN (varied K-values), Decision Tree, Random Forest, and AdaBoost**, evaluating performance across key classification metrics.

Numerical Solutions for Advection-Diffusion-Reaction Equations *University of British Columbia* *2022*

- Applied and compared 3 advanced numerical methods for solving ecological differential equations, conducting a comprehensive performance analysis across varying mesh resolutions.
- Implemented modified finite difference schemes that improved accuracy by an **order of magnitude**, reducing L2 error from 10^{-3} to 10^{-4} at high resolutions compared to standard methods.
- Performed rigorous **stability, convergence, and consistency** analysis across multiple mesh densities, generating **15+ performance visualizations** with **10+ numerical experiments** to validate numerical robustness.

Comparison of Different Models and Representations for Addition Problem *Leiden University* *2020*

- Implemented and compared **LSTM, GRU, and SimpleRNN** for learning addition rules, evaluating the impact of **eight unique input representations** on training efficiency and accuracy.
- Generated a dataset of **50,000 training examples** with **4,500 for validation**, training each model for **200 iterations** to analyze performance trends.
- Assessed model effectiveness using **correctness percentage, Mean Squared Error (MSE), and Mean Absolute Error (MAE)**, identifying key differences in learning behavior.

Research Experiences

Damping of Surface Waves by Floating Plate *UBC* *2021 – 2024*

Supervised by Prof. Neil Balmforth

- Investigated the damping effect of floating particles on surface waves, analyzing wave cessation time and changes in attenuation laws for small-amplitude waves.
- Developed a **2D mathematical model** integrating **shallow water and plate theory** to study wave dissipation, incorporating the Herschel-Bulkley viscoplastic model.
- Applied a combination of **numerical (spectral method, Finite Element Method)**, approximate, and asymptotic solutions to evaluate wave behavior, extending the study to dense granular suspensions.

Solving Partial Differential Equations on Rough Surfaces *HKBU & SFU* *2020 – 2021*

Supervised by Prof. Leevan Ling

- Characterized rough surfaces using **analytic parametric equations and random discrete data**, computing the **Laplace-Beltrami operator** to locate target PDEs.
- Implemented **Finite Element Methods (FEM)** to solve reaction-diffusion systems, verifying **convergence rates and numerical accuracy**.
- Simulated **animal skin patterns** using reaction-diffusion models on rough surfaces, demonstrating increasing pattern irregularity with higher roughness amplitude and frequency.

Professional Experiences

Software Research Internship *Tencent, Quantum Lab* **Shenzhen, CN** *09/2021 - 05/2022*

- Addressed challenges in quantum chip design by developing and deploying an **optimized routing algorithm** using **C++**, leveraging topological routing to improve routing success rates by **30-50%**, enhancing scalability and computational efficiency.
- Collaborated with a **multidiciplinary team** of **10+** researchers in mathematics, physics, and engineering, translating **theoretical concepts into practical solutions** and ensuring the timely delivery of project milestones.
- Co-invented the patent **"Directional and Concave Region Approachable Topological Router in Quantum Chip Design"**, driving **innovations** in Electronic Design Automation (EDA) methodologies.

Activities

Member of Institution of Applied Mathematics (IAM) student committee **Vancouver, CA** *Fall 2023*
Canadian Mathematical Society (CMS) Winter Meeting **Vancouver, CA** *2024*
Conference on Neural Information Processing Systems (NeurIPS) **Vancouver, CA** *2024*
Math to Power Industry (M2PI) Workshop **Vancouver, CA** *2025*

Skills

- **Programming and Tools:** Python, MATLAB, R, SQL, LaTeX.
- **Communication and Collaboration:** Experienced in science communication, presenting insights to diverse audiences, and collaborating effectively in cross-functional teams within fast-paced environments.