Nathan Willis

Curriculum Vitae

Department of AppliedMathematics
University of California, Merced
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Research Interests

Fluid Dynamics, Applied Mathematics, Numerical Methods

Employment

2022-present **Visiting Assistant Professor**, *University of California, Merced*, Merced, CA.

Education

2016–present **PhD in Mathematics**, *University of Utah*, Salt Lake City, UT. **GPA: 4.0** May 2022.
Advisor: Christel Hohenegger
Thesis: Confinement and Non-Newtonian Effects for Steady Streaming Flow and The Ice Fishing Problem with Surface Tension

2012-2016 **BS in Mathematics**, *University of Utah*, Salt Lake City, UT. **GPA: 3.492** May 2016.

Publications

N. Willis, C. H. Tan, C. Hohenegger, and B. Osting, High spots for the ice fishing problem with surface tension, *SIAM Journal on Applied Mathematics*, 82(4), 2022, pp. 1312-1335

N. Willis, C. Hohenegger, Quasi-three-dimensional viscous steady streaming in a rectangular channel past a cylinder, accepted to SIAM Journal on Applied Mathematics (June 2024)

Research Mentoring

2023-2024 Conor Olive
- Undergraduate applied math student at University of California, Merced

2019-2020 Emma Coates
- Undergraduate math student in ACCESS program at University of Utah

Teaching

Vector Calculus (MATH 023, University of California, Merced)
- Fall 2023, Fall 2024
- Taught two sections totaling 260 students. (Fall 2023)
- Managed 5 teaching assistants across 8 discussions. (Fall 2023)

Intermediate Differential Equations (MATH 125, University of California, Merced)
- Spring 2024

Linear Analysis 1 (MATH 141, University of California, Merced)
- Spring 2023

Differential Equations and Linear Algebra (MATH 2250, University of Utah)
- Summer 2023, Spring 2021 (flipped), Fall 2020 (flipped), Spring 2020, Spring 2018

Precalculus (MATH 2250, University of Utah)
- Spring 2019, Fall 2018

Calculus 1 (MATH 2250, University of Utah)
- Summer 2018, Summer 2017

Teaching Service

2021-2022 University Teaching Assistantship from the University of Utah
- Restructured the lab section of Differential Equations and Linear Algebra.
- Focused on problem-solving fluency, technical career skills, and programming in Python

2020-2021 Flipped Differential Equations and Linear Algebra (MATH 2250, University of Utah)
- Recorded lecture videos for the entire course for students to watch before lecture.
- Wrote lecture notes and daily worksheets for in class activities in collaboration with Chee Han Tan.

2019, 2020 TA training for incoming graduate students (University of Utah)
- Facilitated the TA training for incoming students in the math department.
- Presented on and led a discussion on *what it means to be a grad student* focusing on time management techniques and how to balance teaching and research expectations for new graduate students.
- Presented on and led a discussion on *interactive learning in the mathematics classroom*.

Talks

Nov. 2023 *Box model for colliding turbidity currents via equation discovery methods (upcoming)*
APS Division of Fluid Dynamics, Salt Lake City, Utah

Apr. 2024 *Shallow-water simulations of colliding turbidity currents*
Fluids in Yosemite, Yosemite National Park

Nov. 2023 *Shallow-water simulations of colliding turbidity currents*
APS Division of Fluid Dynamics, Washington D.C.

Feb. 2023 *Confinement and Non-Newtonian Effects for Steady Streaming Flow*
Energy and The Environment Seminar, University of California, Merced

Feb. 2022 *High Spots for the Ice-Fishing Problem with Surface Tension*
Applied Math Seminar, University of California, Merced

Nov. 2019 *Steady-State Streaming in Complex Fluids*
2nd Annual Meeting of the SIAM Texas Louisiana Section, Southern Methodist University

Mar. 2019 *Fun Fluid Facts*
Graduate Student Advisory Committee (GSAC) Colloquium, University of Utah

Mar. 2018 *Sloshing and the Two-Dimensional Ice-Fishing Problem*
Applied Math Collective Seminar, University of Utah

Conferences

Nov. 2024 American Physical Society Division of Fluid Dynamics (upcoming)
Salt Lake City, Utah

Apr. 2024 Fluids in Yosemite
Yosemite National Park

Jan. 2024 Joint Mathematics Meetings
San Francisco, California

Nov. 2023 American Physical Society Division of Fluid Dynamics
Washington D.C.

Aug. 2023 MAA Mathfest (as a participant of ProjectNExT)
Tampa Bay, Florida

Nov. 2019 2nd Annual Meeting of the SIAM Texas Louisiana Section
Southern Methodist University, Dallas, Texas

Apr. 2019 The Second SIAM Wasatch Student Chapters Conference
Utah State University, Logan, Utah

Apr. 2018 The First SIAM Wasatch Student Chapters Conference
University of Utah, Salt Lake City, Utah

Computer Skills

Advanced Matlab, LaTeX, Python (Pandas, matplotlib, numpy),

Basic R, Unix, Git, Chebfun, Gurobi

Internships and Workshops

Summer 2020 NSF Mathematical Sciences Graduate Internship
US Army Corps of Engineers in Hanover, New Hampshire (completed virtually)

- Learned the fully nonlinear weakly irrotational Boussinesq-Type Equations and FUNWAVE-TVD (Fully Nonlinear Waves - Total Variation Diminising) model.
- Investigated inherent instabilities in the fully nonlinear weakly irrotational Boussinesq-Type Equations.
- Worked to correct these instabilities in the FUNWAVE-TVD (Fully Nonlinear Waves - Total Variation Diminising) model.

Summer 2019 IMA Math-To-Industry Boot Camp IV
University of Minnesota, Minneapolis, Minnesota

- Attended several mini-courses covering Python, statistic basics, R, stochastic modeling, optimization, Gurobi, and introduction to machine learning.
- Worked on a machine learning project posted by Kaggle on a team of 5.
- Modeled a time series analysis for Cargill Inc. on a team of 4 and alongside a Cargill mentor.

Awards

Fall 2023 MAA Project NExT Fellow (green 2023 cohort)

Fall 2021 University of Utah University Teaching Assistantship

Summer 2020 University of Utah Department of Mathematics Summer Research Fellowship

May 2019 SIAM Student Chapter Certificate of Recognition

May 2018 Outstanding Graduate Student, University of Utah

Professional Affiliations

2023-present American Physical Society (APS)

2017-present Society for Industrial and Applied Mathematics (SIAM)

2016-present Mathematical Association of America (MAA)

Relevant Coursework

Spring 2019 Numerical Methods for Conservation Laws

Spring 2019 Reading Course based in Convex Analysis

Fall 2018 Orthogonal Polynomials and Spectral Methods for PDEs

Fall 2018	Intro to Optimization
Spring 2018	Fluid Mechanics II
Spring 2018	Finite Element Method
Fall 2017	Fluid Mechanics I
Fall 2017	Asymptotic and Perturbation Methods
Spring 2017	Partial Differential Equations
Spring 2017	Applied Complex Variables and Asymptotic Methods
Fall 2016	Ordinary Differential Equations
Fall 2016	Applied Linear Operators and Spectral Methods

Leadership and Service

Spring 2024	Co-organized Fluids in Yosemite Conference
Spring 2024	Co-organized Energy and the Environment Seminar
2023-2024	Co-organized Applied Math Seminar
2021-2022	GSAC mentor to Zhonggan Huang
2021-2022	Tutor for the Utah Refugee Center
Fall 2021	QSide Institute Datathon4Justice
Fall 2021	Participated in the University of Utah Math Modeling Workshop to prepare high school students for COMAP and SIAM M3 Challenge
2020-2021	GSAC mentor to Samantha Linn
2020-2021	GSAC mentor to Delaney Mosier
2020-2021	Vice President, University of Utah SIAM Student Chapter
Fall 2020	Directed Reading Program mentor to Payton Thomas
2019-2020	Organized Applied Math Collective Seminar
2018-2020	Secretary, University of Utah SIAM Student Chapter
Spring 2019	AWM graduate mentoring program
Fall 2018	Organized graduate student reading course on Sobolev Spaces, University of Utah
Apr. 2018	Initiated, organized, and hosted the first SIAM Wasatch Student Chapters Conference, University of Utah
Fall 2016	K-12 Science Fair Judge, Granite School District