

# Rundong Zhou

## Curriculum Vitae

### Contact Information

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### Research Interests

Ocean turbulence, Geophysical fluid dynamics • Statistical physics, Nonlinear dynamics • Computational mathematics, Spectral methods

### EDUCATION

Candidate for **Master of Science**

**Chalmers University of Technology**

Joint with the **University of Gothenburg, Department of Physics**

Major in Complex Adaptive Systems

expected June 2024

Gothenburg, Sweden

cGPA 4.75/5

**Erasmus+ Exchange Program**

**University of Twente**

Placement in the **Physics of Fluids group**

*Master's thesis supervisor:* Dr. Christopher J. Howland and Prof. Detlef Lohse

August 2023 - June 2024

Enschede, Netherlands

cGPA 8.25/10

**Bachelor of Applied Science in Engineering Science**

**University of Toronto**

Major in Engineering Physics

*Bachelor's thesis supervisor:* Prof. Nicolas Grisouard

June 2021

Toronto, Canada

cGPA 3.28/4

### LIST OF PUBLICATION

Zhou, R. and Grisouard, N. *Spectral solver for Cauchy problems in polar coordinates using discrete Hankel transforms*. Preprint, 2023. [arXiv:2210.09736](https://arxiv.org/abs/2210.09736)

### HONOURS AND AWARDS

**Avancez Scholarship**

**Chalmers University of Technology**

75% tuition fee reduction, increased to 85% reduction in the second year for excellency.

2022 - 2024

**Erasmus+ Exchange Travel Grant**

**Chalmers University of Technology & University of Twente**

€5,500 travel grant in total.

2023 - 2024

**Undergraduate Research Fellowship**

**Canadian Institute for Theoretical Astrophysics**

CAD \$2,000 per month for four months.

2018

**Dean's Honor List**

**University of Toronto**

Pass with honor, >80% average.

2015 Fall, 2016 Fall

2020 Fall, 2021 Winter

### RESEARCH EXPERIENCE

**Master's Thesis**

**Physics of Fluids group, University of Twente**

*Supervisor:* Dr. Christopher J. Howland and Prof. Detlef Lohse

June 2023 - June 2024

Enschede, Netherlands

Swirling Kolmogorov flow, modelling ocean turbulent mixing driven by near-inertial waves. Performing instability analysis and direct numerical simulation using Dedalus (Python) and GHOST (Fortran) spectral PDE solver libraries on supercomputers. Understanding the fundamental physical processes, mixing of passive scalar, the energy-helicity cascades, and the fluid structures of the flow via turbulence theory, statistical mechanics, and dynamical systems approaches.

**Bachelor's Thesis****Division of Engineering Science, University of Toronto***Supervisor:* Prof. Nicolas Grisouard

September 2020 - April 2021

Toronto, Canada

Developing a novel spectral method for solving the Gross-Pitaevskii equation for Bose-Einstein condensates in polar coordinates. Improving the accuracy of the method and experimenting the method on annulus domains. Experience with computational physics.

**Research Assistant<sup>1</sup>****Department of Physics, University of Toronto***Supervisor:* Prof. Nicolas Grisouard

April 2021 - October 2022

Applying the novel Fourier-Bessel based spectral method using the discrete Hankel transform to various kinds of PDEs under Dirichlet boundary conditions in polar coordinates. Analyzing the boundary-dependent convergence rate of the method and validating the error estimation. Experience with numerical analysis and spectral theorems.

**Research Assistant****Department of Mechanical Engineering, University of Ottawa***Supervisor:* Prof. Natalie Baddour

January - April 2022

Developing a new type of 2-D discrete Fourier transform under Neumann boundary conditions in polar coordinates using Dini series. Validating the discrete orthogonality relation with Hankel-Schl fli integral. Experiences with complex analysis.

**Summer Undergraduate Research Program****Canadian Institute for Theoretical Astrophysics**

Experience with data analysis on Galactic Legacy Infrared Midplane Survey Extraordinaire (GLIMPSE) database.

May - September 2018

Toronto, Canada

**Summer Schools & Other Experiences****Summer School in Mathematics****Universit  Grenoble Alpes, Institut Fourier**

June 2023

Grenoble, France

Topics in new trends in mathematical fluid mechanics: Mathematical analysis of incompressible fluid flow, Geophysical flows, Theory of water waves, Singular solutions of the Euler or Navier-Stokes equations, etc.

**Featured Courses**

**Toronto:** Continuum Mechanics, Computational Physics, Nonlinear Physics, Statistical Mechanics, Groups and Symmetries

**Chalmers:** Dynamical Systems, Non-equilibrium Processes in Physics Chemistry and Biology, Quantum Field Theory, Artificial Neural Networks

**Twente:** Advanced Fluid Mechanics, Turbulence, Functional Analysis, Mathematical and Numerical Physics

**Programming Skills**

**Experienced:** *Languages:* Python, Matlab, L T X, Mathematica

*Libraries:* Dedalus, NumPy, Matplotlib, SciPy

**Familiar:** *Languages:* C, Fortran, JavaScript, HTML

*Libraries:* HDF5, Pandas

Latest Update: March 1, 2024

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<sup>1</sup>As the continuation of the bachelor's thesis.