

Mohammad Reza Daneshvar Garmroodi

[MRDanesh.github.io](https://github.com/MRDanesh)

Mohammadrezadaneshvar1994@gmail.com

+1(438)9291779

SUMMARY

I'm a fluid mechanician with a strong foundation in computational fluid dynamics and applied mathematics. I develop simplified model problems that capture the essential physics of real-world and industrial systems, with particular interest in non-Newtonian, multiphase, turbulent, and heat transfer phenomena.

EDUCATION

Ph.D., Concordia University, Montreal, Canada

Sep 2019 - August 2025

Advisor: [Ida Karimfazli](#)

Department of Mechanical, Industrial and Aerospace Engineering

GPA: 4.1/4.3 (A^+)

Thesis title: Mixing Dynamics in Yield Stress Fluids

Committee: Rob Poole, Ali Dolatabadi, Alex De Visscher, Charles Basenga Kiyanda

M.A.Sc., Amirkabir University of Technology, Tehran, Iran

Sep 2017 - Aug 2019

Advisor: [Ali Ahmadpour](#)

Department of Mechanical Engineering

GPA: 19.54/20 (Ranked first)

Thesis title: Numerical Study of Two-Phase Yield Stress Fluids and Water in Different Flow Regimes

Committee: Ehsan Amani, Mohammad Reza Hajmohammadi

B.Sc., University of Tabriz, Tabriz, Iran

Sep 2013 - Aug 2017

Advisor: [Faramarz Talati](#)

Department of Mechanical Engineering

Thesis title: Numerical Study of Mixed Convection in a Lid-Driven Cavity

Committee: Sima Baheri Islami

PROFESSIONAL EXPERIENCE

Postdoctoral Fellow, Concordia University, Montreal, Canada

Feb 2026 – Present

- In collaboration with [Université de Lorraine](#).
- Developing an enthalpy based numerical solver to model conjugate heat transfer with melting material in OpenFOAM.
- Validating the solver against benchmark datasets. The code is available in my [GitHub](#).
- Designing and optimizing PV panel geometry with an embedded conductor to maintain lower operating temperatures.

Postdoctoral Fellow, Concordia University, Montreal, Canada

Aug 2025 – Feb 2026

- In collaboration with [SINTEF](#).
- Developing two model problems (nozzle injection and a mixing chamber) to quantify conditioning efficiency of oil-based drilling fluids in a dual-shear-gun system.
- Proposing an iterative conditioning strategy as an alternative to increasing nozzle pressure drop to achieve target fluid properties.
- Developing an eddy-viscosity turbulence model for viscoplastic flows in OpenFOAM based on [Lovato et al.](#)
- Validating the solver against published [DNS benchmarks](#). The code is available in my [GitHub](#).
- Co-authoring two conference papers submitted to the [45th International Conference on Ocean, Offshore and Arctic Engineering \(OMAE\)](#).

SKILLS

- **Modeling & control:** Time-series and spatiotemporal modeling, Kalman filtering, Reinforcement learning, Physics-informed neural network, Sparse sensing, Dynamic mode decomposition, Proper orthogonal decomposition.
- **CFD tools:** OpenFOAM, Basilisk, Ansys Fluent, COMSOL.
- **Experimental & Diagnostics:** Particle Image Velocimetry systems, Flow visualization, Data acquisition and post-processing, Carbopol preparation, Rheometry for estimating rheological properties.
- **Mathematics & Modeling:** Linear Algebra, Ordinary and partial differential equations, Probability and statistics, Dynamical systems, Control theory.

- **Physics & Engineering:** Multiphase flows, Non-Newtonian fluid mechanics, Porous media, Turbulence, Convective heat transfer.
- **Version Control & Scripting:** Git, GitHub, Bash scripting.

PEER-REVIEWED JOURNAL PUBLICATIONS

- M.R. Daneshvar Garmroodi** and I. Karimfazli. Yield-stress fluid mixing: localisation mechanisms and regime transitions. *Journal of Fluid Mechanics*. 1021:A42, 2025. ([Link](#))
- M.R. Daneshvar Garmroodi** and I. Karimfazli. Mixing in heterogeneous fluids: An examination of fluid property variations. *Journal of Non-Newtonian Fluid Mechanics*, 325, p.105196, 2024 ([Link](#))
- M.R. Daneshvar Garmroodi** and A. Ahmadpour. Numerical simulation of stratified waxy crude oil and water flows across horizontal pipes in the presence of wall heating. *Journal of Petroleum Science and Engineering*, 193:107458, 2020 ([Link](#))
- M.R. Daneshvar Garmroodi** and A. Ahmadpour. A numerical study on two-phase core-annular flows of waxy crude oil/water in inclined pipes. *Chemical Engineering Research and Design*, 159:362–376, 2020 ([Link](#))
- M.R. Daneshvar Garmroodi**, A. Ahmadpour, and F. Talati. MHD mixed convection of nanofluids in the presence of multiple rotating cylinders in different configurations: a two-phase numerical study. *International Journal of Mechanical Sciences*, 150:247–264, 2019 ([Link](#))
- M.R. Daneshvar Garmroodi**, A. Ahmadpour, M. R. Hajmohammadi, and S. Gholamrezaie. Natural convection of a non-Newtonian ferrofluid in a porous elliptical enclosure in the presence of a non-uniform magnetic field. *Calorimetry*, 1–17, 2019 ([Link](#))

IN PREPARATION

- M.M. Nasiri, **M.R. Daneshvar Garmroodi**, D.C. Vadillo, and M. Tembely, Experimental study of the impact of a hollow polymer droplet. Submitted to *Physics of Fluids*.
- M.R. Daneshvar Garmroodi** and I. Karimfazli. Mixing dynamics and vortex shedding in laminar stirring flows. Submitted to *Physics of Fluids*.
- M.R. Daneshvar Garmroodi** and I. Karimfazli. From jet collision to emulsion quality: nozzle dynamics.

CONTRIBUTED TALKS

- M.R. Daneshvar Garmroodi** and I. Karimfazli, From Jet Collision to Emulsion Quality: Nozzle Dynamics, *45th International Conference on Ocean, Offshore and Arctic Engineering*, Tokyo, Japan, June 2026.
- M.R. Daneshvar Garmroodi** and I. Karimfazli, Jet Collision and Emulsion Quality: On the Hydrodynamics of Nozzle *1st Canadian Congress on Computational Science and Engineering*, Montreal, Canada, May 2026.
- M.R. Daneshvar Garmroodi** and I. Karimfazli, Mixing Yield-Stress Fluids: Localization Mechanisms and Regime Transitions, *Second European Fluid Dynamics Conference*, Dublin, Ireland, August 2025.
- M.R. Daneshvar Garmroodi** and I. Karimfazli, Fluid mechanics of mixing in a two-dimensional stirred: regimes and mechanisms, *The Canadian Society for Mechanical Engineering International Congress*, Montreal, Canada, May 2025.
- M.R. Daneshvar Garmroodi** and I. Karimfazli, Scalar mixing in viscoplastic fluids, *26th International Conference of the Theoretical and Applied Mechanics*, Daegu, Republic of Korea, August 2024.
- M.R. Daneshvar Garmroodi** and I. Karimfazli, Understanding Mixing Dynamics in Yield Stress Fluids, *The Canadian Society for Mechanical Engineering International Congress*, Toronto, Canada, May 2024.
- M.R. Daneshvar Garmroodi** and I. Karimfazli, Scalar mixing in viscoplastic fluids, *The Annual European Rheology Conference*, Leeds, United Kingdom, April 2024.
- M.R. Daneshvar Garmroodi** and I. Karimfazli, Localization of stirring flows: the effect of the yield stress, *8th PACIFIC RIM conference on rheology*, Vancouver, Canada, May 2023.
- M.R. Daneshvar Garmroodi** and I. Karimfazli, Chaotic mixing of complex fluids: on the effects of viscosity ratio, *The Canadian Society for Mechanical Engineering International Congress*, Edmonton, Canada, May 2022.
- M.R. Daneshvar Garmroodi** and I. Karimfazli, Mixing of heterogeneous fluids: buoyancy effects, *The Annual European Rheology Conference*, Seville, Spain, April 2022.
- M.R. Daneshvar Garmroodi** and I. Karimfazli, Mixing of complex fluids: on the effects of inhomogeneity. *The Canadian Society for Mechanical Engineering International Congress*, May 2021.

SELECTED PROJECTS & COURSES

Sparse and physics-informed reconstruction of fluid flows

I developed and compared two data-driven frameworks for reconstructing high-dimensional velocity and pressure fields of a 2D cylinder wake from sparse sensor measurements. I implemented a compressed sensing approach using LASSO-based sparse snapshot reconstruction and a physics-informed neural network enforcing the Navier–Stokes equations. Finally, I evaluated the tradeoffs between the two approaches. The codes are available on my [GitHub](#).

Interpretable reduced-order model for periodic flows: POD oscillators vs DMD

I developed and compared two reduced-order modeling frameworks for predicting the high-dimensional 2D cylinder-wake flow field from simulation snapshots. I implemented a 4-mode POD approach with a two-frequency harmonic regression model to forecast modal coefficients and reconstruct the flow, and a rank-4 DMD model to learn a low-rank linear time-advance operator for direct field prediction. Finally, I evaluated the tradeoffs between POD-based coefficient modeling and DMD-based spectral forecasting under the same train–test split. The codes are available on my [GitHub](#).

Developing a phase-field melting solver in OpenFOAM.

In an ongoing research collaboration with *Université de Lorraine*, I am developing a solver to model Rayleigh–Bénard convection with a melting boundary. I implemented the phase-field formulation of [Favier et al.](#) and validated the solver against [Ulvrova et al.](#) benchmarks. The codes are available on my [GitHub](#).

Numerical implementation and validation of dynamic subgrid-scale models for Burgers turbulence in MATLAB.

I implemented a high-resolution solver for the stochastic one-dimensional Burgers equation and reproduced both direct numerical simulation and large-eddy simulation results using dynamic Smagorinsky and dynamic Wong–Lilly subgrid-scale models. The solver employed Adams–Bashforth and forth-order Runge–Kutta time integrations, and stochastic forcing, following the methodology of [Basu](#). The full implementation and discretization details are available on my [GitHub](#). The course material is also available in [GitHub page](#) of [Dr. Ehsan Amani](#), the instructor of the course.

Numerical simulation of hollow viscoelastic droplet impact on a wetting surface in Basilisk.

I am developing the numerical component of an experimental study in collaboration with Dr. Mohammad Mahdi Nasiri, focusing on viscoelastic effects and interface dynamics during impact.

Adding dynamic mesh capability to twoLiquidMixingFoam in OpenFOAM.

As part of my PhD thesis, I extended `twoLiquidMixingFoam` with dynamic-mesh functionality to simulate yield-stress fluid mixing localization. The solver is available on my [GitHub](#).

Developing a finite-volume MATLAB solver for non-isothermal annular Newtonian flow using the SIMPLE algorithm.

As the second project of *Advanced Computational Fluid Dynamics* course, I implemented the SIMPLE method in MATLAB in cylindrical coordinates to simulate axisymmetric annular flows with heat transfer. The full implementation and discretization details are available on my [GitHub](#).

Developing a MATLAB solver for mixed convection flow in a lid-driven cavity using streamfunction - vorticity.

As the first project of *Advanced Computational Fluid Dynamics* course, I implemented the a solver for mixed convection and reproduced the results of [Abu-Nada et al.](#) The full implementation and discretization details are available on my [GitHub](#).

HONORS & AWARDS

MITACS Internship for postdoctoral researcher, Concordia University.

Summer 2025

This scholarship is considered for outstanding postdoctoral researchers who have a topic to develop and make a collaboration between the university and the industry. The project is with collaboration with [SINTEF](#). *Monetary value: 30,000 CAD for one year.*

Nominated among the finalists of NSERC photo contest.

Winter 2025

Selected among finalists across Canadian universities. This picture came out of the collaboration with my colleague, Dr. Mohammad Mahdi Nasiri. The title of our picture is "*Recreational destruction: The art of polymer dynamics*".

Concordia University International Tuition Award of Excellence, Concordia University.

Fall 2019

This award exempted me from paying international tuition fees. *Monetary value: 39,915 CAD.*

Graduate Fellowship for Ph.D. program in Mechanical Engineering, Concordia University.

Fall 2019

Monetary value: 20,000 CAD per year for five years.

Graduate Fellowship for Ph.D. program in Marine Engineering, NTNU University. Fall 2019
 I received admission offer from Dr. Lars Erik Holmedal to study Ph.D. under his supervision. *Monetary value 479,600 NOK for three years, declined.*

Graduate Fellowship for Ph.D. program in Mechanical Engineering, Ghent University. Fall 2019
 I received admission offer from Dr. Dieter Fauconnier and Dr. Joris Degroote to study Ph.D. under their supervision. *Monetary value 30,000 Euro (approximately 45,000 CAD per year) for three years, declined.*

Ranked 1st Among 60 Master students of Amirkabir University. Spring 2019

Accepted in the First Stage of the National Computer and Mathematical Olympiads. Fall 2010-2012
 Every year, among all the high school students between 16 and 18 years old (around 500000 participants), 1000 students are selected for each topic. I was accepted into the first stage for three consecutive years.

VOLUNTEER COMMUNITY & ACADEMIC SERVICES

• **Peer reviewing manuscripts for** *Journal of Non-Newtonian Fluids Mechanics, International Conference on Ocean, Offshore and Arctic Engineering, Iranian Annual Conference of Mechanical Engineering.*

• **Volunteer conference participations:**

◦ (July 2025) **The International Association of Automation and Robotics in Construction, Concordia University, Montréal, Canada.**

I was a volunteer in helping to organize this conference. I helped with the registration, food distribution, and cleaning the venue. The coordinators of this conference were Ms. Golnaz Mirzae and Ms. Hosna Ghorab. The Organizer was Professor Amin Hammad.

◦ (May 2023) **Pacific Rim Conference on Rheology, University of British Columbia, Vancouver, Canada.**

I was a volunteer in helping to organize this conference. I helped with food distribution, and cleaning the venue. The coordinator of this conference was Dr. Mahdi Izadi and the Organizer was Professor Ian Frigaard.

◦ (May 2020, Hybrid), **28th Iranian Annual Conference of Mechanical Engineering, Amirkabir University of Technology, Tehran, Iran**

I was invited by Dr. Mohammad Reza Hajmohammadi, who was the conference organizer, to be a member of the committee to review the submitted papers. I reviewed the papers in Fluid Mechanics and Heat Transfer sections.

TEACHING EXPERIENCES

Instructor, SuperKids, Montreal, Canada 2024-present
Teaching linear algebra and calculus to high school and college students

Teaching assistant, Concordia University, Montreal, Canada 2019-2025
Applied Advanced Calculus, Partial Differential Equations, Ordinary Differential Equations, Fluid Mechanics I, Fluid Mechanics II, Heat Transfer I, Heat Transfer II, Thermodynamics I

Teaching assistant, Amirkabir University of Technology, Tehran, Iran 2017-2019
Fluid Mechanics, Heat Transfer I, Non-Newtonian Fluid Mechanics, Continuum Mechanics

WORKSHOPS

• **Introduction to Latex, Amirkabir University of Technology, Tehran, Iran.** Fall 2018
 • **Numerical modelling in ANSYS FLUENT, University of Tabriz, Tabriz, Iran.** Fall 2016
 • **Numerical modelling in COMSOL, University of Tabriz, Tabriz, Iran.** Fall 2016

LANGUAGES

English Fluent

Persian Native

French Upper Intermediate (B2)