

Research Interests

- Computational Fluid Dynamics
- Multiphase & Particle Flow
- Numerical Modeling
- Compressible & Supersonic Flow
- Mesh-Based Graph Neural Networks
- Reacting Flow Simulation
- Scientific Machine Learning
- High Performance Computing
- Turbulent Modeling

Education

- **Master of Applied Science, Mechanical Engineering** Sep 2023 – Jun 2026
Concordia University
Advisor: [Prof. Moussa Tembely](#)
Thesis: *Thermofluid Simulation of Thermal Spray Processes*
GPA: **4.23 / 4.3** | Thesis Grade: **Outstanding** Montréal, Canada
- **Bachelor of Science, Chemical Engineering** Sep 2018 – Sep 2022
Iran University of Science and Technology (IUST)
Advisor: [Prof. HashemAbadi](#)
Thesis: *Design and Manufacturing of a Gas Rotameter Using CFD*
GPA: **3.58 / 4.0** (17.01 / 20) Tehran, Iran

Publications

- [1] *Investigation of Aeroacoustics and In-flight Particle Transport in Thermal Spray Supersonic Jets.*
D. Rahmat Samii, M. Tembely (2026). *arXiv preprint*. [\[Link\]](#)
- [2] *Accelerating Thermal Homann Flow Simulation With Mesh-Based Graph Neural Networks.*
D. Rahmat Samii, M. Tembely (2025). *IEEE Access*. [\[Link\]](#)
- [3] *CFD Based Design Gas Rotameters: Dynamic Mesh Transient Simulation.*
D. Rahmat Samii, S. H. HashemAbadi, P. Margan (2023). *Flow Measurement and Instrumentation*. [\[Link\]](#)

Research Experience

- **Research Assistant** – Concordia University Sep 2023 – Jun 2026
Multiphase Thermofluid Learning Lab Montréal, Canada
 - Simulate cold spray process at 35–65 bar and 707–807 K using high-fidelity CFD methods.
 - Develop analytical model for preliminary aeroacoustic analysis of supersonic jets.
 - Extend `sonicFoam` to `sonicDPMFoam` with Lagrangian particle tracking for two-phase flow modeling.
 - Execute RANS → DDES workflows on Compute Canada HPC clusters (400+ cores).
- **CFD Team Lead** – SpaceConcordia, Solid Rocketry Team Dec 2024 – Present
Montréal, Canada
 - Execute OpenFOAM aerodynamic simulations for CR25 and CR26 (Icarus & Daedalus two-stage rockets).
 - Compute drag, lift, center of pressure, thermal loads, and bending moments across Mach 0.8–2.5 and angles of attack $\pm 5^\circ$.
 - Perform mesh sensitivity studies via Richardson extrapolation; implement multi-step numerical scheme progression from stable to high-accuracy schemes.
 - Contribute to CR25 manufacturing, composite infusion, assembly, and Launch Canada 2025 field operations.
- **Research Intern** – JSPM Imperial College of Engineering Oct 2021 – Jan 2022
Department of Mechanical Engineering Pune, India (Remote)
 - Investigated multiphase solvers in OpenFOAM; collaborated with international research team on systematic solver benchmarking across flow regimes.
- **Engineering Intern** – Partian Battery Jun 2021 – Oct 2021
R&D Department Tehran, Iran
 - Designed and optimized a stirred mixer using COMSOL Multiphysics; validated simulation results against experimental measurements.
 - Developed a parametric simulation application using COMSOL Application Builder (Java-based GUI) to enable rapid design iteration across mixing configurations.

Teaching Experience

- **Teaching Assistant** – Concordia University Sep 2023 – Jun 2026
Department of Mechanical, Industrial & Aerospace Engineering
Recognition: Teaching Excellence Award for Teaching Assistants, May 2026
– Accumulated 1,200+ TA hours across lab demonstration and tutorial leadership roles over 2 years.
– Conducted lab sessions for undergraduate courses in Fluid Mechanics, Heat Transfer, and Thermodynamics.
– Led tutorial sections for C++/Arduino Programming, Statics, Advanced Calculus, and CFD for Aerospace Engineering.
- **Teaching Assistant** – Iran University of Science and Technology Feb 2022 – Jul 2022
Department of Chemical Engineering Tehran, Iran
– Delivered weekly tutorial sessions and graded assignments for undergraduate Fluid Mechanics (~30 students).
- **Private Tutor** – Independent 2020 – Present
– Tutored undergraduate students in Ordinary Differential Equations, Transform Calculus, Fluid Mechanics, and C++ Programming.

Honors & Awards

- **Teaching Excellence Award for Teaching Assistants**, Concordia University May 2026
- **Mitacs Globalink Research Award** – \$6,000 CAD for international research collaboration (France–Canada) Feb 2025
- **Concordia Conference Scholarship** – \$750 CAD travel support for CSME/CSCFD 2024 May 2024
- **Concordia Merit Scholarship** – \$5,000 CAD for academic excellence Sep 2023
- **8th Place**, 27th National Chemical Engineering Olympiad, Iran Oct 2022
- **Direct M.Sc. Admission Qualification** – Top 10% of 2018 cohort; waived entrance exam in Thermo-Kinetics May 2022
- **2nd Place**, Internship Poster Competition (80 participants) Sep 2021
- **1st Place**, “Rahneshan” National Competition (Team Lead) – CFD modeling of particle crystallization and growth Feb 2021

Selected Projects

- **Aeroacoustic CFD Simulation of Thermal Spray (Master’s Thesis)** Ongoing
Extended `sonicFoam` with DPM to create `sonicDPMFoam`; validated particle–shock interaction against literature. Executed RANS-to-DDES workflow with field mapping; verified turbulence via Kolmogorov energy cascade. Applied FW-H acoustic analogy (`libAcoustics`) to link particle distribution with aeroacoustic signatures.
- **CR25 Rocket Aerodynamics – SpaceConcordia** Ongoing
Simulated Launch Canada 2025 rocket (CR25, Aether) using OpenFOAM. Evaluated fin sizes, design changes, and flight performance across Mach 0.8–2.5. Documented performance metrics and failure points from CFD analysis.
- **Mesh-Based GNN for Accelerating CFD – GitHub** Published, IEEE Access 2025
Generated large-scale CFD dataset via parameterized CAD, meshing, and OpenFOAM simulation. Converted `polyMesh` to graph inputs; tuned GNN architectures with Optuna. Achieved **100× speedup** over traditional solvers.
- **Gas Rotameter Design and Manufacturing with CFD (Bachelor’s Final Project) – Article**
Performed transient ANSYS Fluent simulations with dynamic mesh; validated against experimental data. Compared triangular vs. quadratic mesh deformation schemes; published in *Flow Measurement and Instrumentation*.
- **Design of Mixing Tank using CFD – Project Link**
Internship project at *Partian Battery Inc.* Designed and optimized a stirred mixer for battery cathode agglomerate production. Investigated the Population Balance Model (PBM) to simulate cathode particle agglomeration within the mixer. Developed a parametric app using COMSOL Application Builder (Java) for rapid design iteration; validated locally and globally against experimental data.
- **py-distillation Package – GitHub**
Python package for distillation tower calculation. Implements Ponchon-Savarit and McCabe methods; supports open-steam, multiple-feed, and side-stream configurations. Fully documented and installable via standard package repositories.
- **Arduino PID Ball Balancer – GitHub**
Built a 3D-printed PID controller using Arduino Uno to balance a ping-pong ball. Fine-tuned PID coefficients for improved performance; utilized ultrasonic sensors for position detection and servo-controlled plate adjustments.
- **Poisson Equation with DEAL.II – GitHub**
Used DEAL.II (FEM, C++) to solve Poisson’s equation on circle, ring, and square geometries.

Conferences

- [1] *Computational Fluid Dynamics (CFD) Analysis of a Supersonic Rocket.*
Conférence annuelle de fuséologie d'Oronox 2026 March 2026
Polytechnique Montréal
- [2] *Numerical Simulation and Prediction of Particle Distribution Based on Aeroacoustic Signals Emitted by the HVAF Process.*
32nd Annual CSME-CFDSC-CSR 2025 (abstract) May 2025
École de technologie supérieure (ÉTS), Montréal
- [3] *Accelerating Simulations of Plasma Flow and Substrate Interaction in Thermal Spray.*
31st Annual CSME/CFD 2024 (abstract) May 2024
University of Toronto

Technical Skills

- **CFD & Simulation:** OpenFOAM (custom solver development), ANSYS Fluent, COMSOL, ParaView
- **CAD & Meshing:** SpaceClaim, DesignModeler, FreeCAD, Salome, Onshape, SolidWorks
- **Programming:** Python (NumPy, Pandas, PyVista, SciPy), C/C++, MATLAB, Bash scripting
- **ML & Scientific Computing:** PyTorch, PyTorch Geometric, scikit-learn, Optuna, fast.ai, Stable-Baselines
- **HPC & DevOps:** Slurm, Linux, Git, Docker, SSH, tmux, vim
- **Visualization & Documentation:** ParaView, PyVista, Manim (mathematical animation), L^AT_EX

Languages

- **English:** Professional
- **French:** Intermediate (B1, actively developing)
- **Persian:** Native

Certifications

- L3, L2, L1 Rocketry Certificate, Canadian Association of Rocketry May 2026, Oct 2025, May 2025
- Game Theory, Stanford & UBC ([Credential](#)) Apr 2023
- From Nand to Tetris, Hebrew University of Jerusalem ([Credential](#)) Aug 2023
- Fundamentals of Reinforcement Learning, University of Alberta ([Credential](#)) Sep 2020
- Deep Learning Specialization, DeepLearning.AI ([Credential](#)) Aug 2020
- Machine Learning, Stanford Online ([Credential](#)) May 2020

Graduate Course Grades

- Advanced Fluid Mechanics: **A+**
Prof. [Ida Karimfazli](#)
- Applied Artificial Intelligence: **A**
Prof. [Rene Witte](#)
- Deep Learning: **A+**
Prof. [Eugene Belilovsky](#)
- Coatings and Surface Engineering: **A+**
Prof. [Christian Moreau](#)

Selected Undergraduate Course Grades

- Fluid Mechanics I: 19.42/20
- Fluid Mechanics II: 19.5/20
- Thermodynamics I: 17/20
- Thermodynamics II: 18.67/20
- Numerical Analysis: 18/20
- Chem. Eng. Mathematics: 19/20
- Computational Fluid Dynamics: 17.5/20
- Statics and Material Strength: 18.41/20

References

Moussa Tembely, Assistant Professor moussa.tembely@concordia.ca
Mechanical, Industrial and Aerospace Engineering Department, Concordia University
Relation: Master's Advisor

Seyed Hassan HashemAbadi, Assistant Professor hashemabadi@iust.ac.ir
Chemical Engineering Department, Iran University of Science and Technology
Relation: Bachelor's Thesis Advisor

Peter Sakaris, Laboratory Specialist peter.sakaris@concordia.ca
Mechanical, Industrial and Aerospace Engineering Department, Concordia University
Relation: Supervisor during Teaching Assistantship in Heat Transfer, Fluid Mechanics, and Thermodynamics Labs