

# Amirmahdi Mostofinejad

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## SUMMARY

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I am a fourth-year Ph.D. candidate at the University of Toronto. My graduate school projects focus on mathematical model development for different biological phenomena, with my master's on tumor-induced angiogenesis (PDE-based) and my Ph.D. on neotissue growth in bioreactors (ODE-based). I have also developed a parameter estimator for biology-informed deep learning in SDE-based dynamical systems. My interests are mathematical modeling, optimization, multiphysics, dynamical systems, deep learning, and physics-informed machine learning.

## EXPERIENCE

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**University of Toronto** — Research and teaching assistant May 2019 – Dec. 2023

- Modeling the recellularization process in the tracheal scaffolds using optimization and parameter identification supervised by Prof. Cristina Amon
- Developing a methodology for inferring explainable biologically-informed mathematical models and applying it to *in vitro* cell population dynamics using SciML (Julia) and COMSOL Multiphysics
- Performing model-based design of experiments to optimally run BEAS-2Bs and iPSCs growth experiments
- Instructing tutorials, held office hours, and graded exams, reports, and projects (details in the Teaching section)

**University of Waterloo** — Research and teaching assistant Sept. 2016 – May 2019

- Modeled tumor-induced angiogenesis by modeling the migration of the endothelial cells and their interaction with the extracellular matrix, supervised by Prof. Adil Al-Mayah
- Solved a system of partial differential equations describing the biochemical, mechanical, and vasculature using nonlinear finite element analysis in MATLAB

**Prestige Land Iran Co.** — Intern May 2014 – Aug. 2014

- Sampled and tested the quality of concrete specimens
- Checked the final stage of construction, design calculations, and drawings

## SKILLS

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Languages	Julia, Python, MATLAB, C/C++
Libraries	SciML, SciPy, scikit-learn, PyTorch, TensorFlow
Numerical solvers	COMSOL Multiphysics, FEniCS, Ansys, Abaqus FEA
Misc.	ParaView, MeshLab, Solidworks, AutoCAD, gmsh, Git, Linux, L <sup>A</sup> T <sub>E</sub> X

## PROJECTS

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**Physics-informed deep learning for inference in dynamical systems** [Report](#)

Developed a TensorFlow code for parameter estimation of stochastic differential equations using noisy synthetic data.

**SIMPLE solver for the lid-driven cavity problem** [Report](#)

Developed a Python solver from scratch to solve the Navier-Stokes equations using “SIMPLE” method.

**ATP production in cancer cells**

Developed a mathematical model for investigating the three different methods for ATP production in cells.

**Effects of matrix degradation on pressure-diameter curves in vessels**

Modeled multilayer common iliac artery using GOH model. Investigated effects of different matrix densities on the pressure-diameter curve of the common iliac artery.

## EDUCATION

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Sep 2019 - present    Ph.D. (Mechanical Engineering) at **University of Toronto**  
Sep 2016 - May 2019    M.A.Sc. (Civil Engineering) at **University of Waterloo**  
Sep 2011 - Sep 2015    B.Eng. (Civil Engineering) at **Sharif University of Technology**

## HONORS & AWARDS

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**Barbara and Frank Milligan Graduate Fellowship** Oct. 2020  
Graduate studies scholarship issued by the MIE department.

**William Dunbar Memorial Scholarship** Apr. 2020  
Graduate studies scholarship issued by the MIE department.

**MIE fellowship** May 2019  
Entrance fellowship provided by the MIE department.

**OGS award** July 2018  
Graduate studies scholarship issued by the province of Ontario.

**PGS award** July 2018  
President's Graduate Scholarship.

## LEADERSHIP

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**Director of Academic & Professional Development** AMIGAS, UofT  
**Member of Executive Committee** ISAW, UWaterloo  
**Vice President of Scientific Activities** Civil Engineering Student Association, Sharif  
**VP of Entrepreneurship** Green Tomorrow, Sharif  
Student-led charity for struggling families

## PUBLICATIONS & PRESENTATIONS

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Mostofinejad, Amirmahdi et al. (2021). "In Silico Modeling of Lung Cell Proliferation". In: *Medicine by design Symposium*.

– (2022). "In Silico Modeling Of BEAS-2B Cell Population Dynamics". In: *TERMIS-AM*. Vol. 28, pp. 47–48.

## COURSES

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Artificial intelligence, Nonlinear modeling of biological systems, Mathematical cell biology, Cancer mechanics, Finite element analysis, Continuum mechanics, Computational fluid mechanics, Probabilistic modeling.

## TEACHING

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### University of Toronto

MIE334, Numerical Methods I (x3), CSC108, Computer Fundamentals (x4),  
MIE1625, Data Science & Quantitative Analysis (x2), APS105, Intro to Computer Programming (x2),  
BME1478, Coding for Biomedical Engineers (x2).

### University of Waterloo

Statics, Structural Concrete Design I,  
Mechanics of Solids II.

### Sharif University of Technology

Concrete Technology and Lab.