

Sepehr Moalemi

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Education

M.Sc. Mechanical Engineering (Thesis)

🏛️ McGill University | ✍️ CGPA 4.00/4.00 | 📅 2022 - 2025 (Expected)

👤 Supervisor: Prof. James Richard Forbes

B.Eng. Mechanical Engineering (Honors), Minor in Computer Science, Minor in Mathematics

🏛️ McGill University | ✍️ CGPA 3.70/4.00 | 📅 2017 - 2022

Publications

Peer-Reviewed

[C] S. Moalemi and J. R. Forbes, “[Passivity-Based Gain-Scheduled Control with Scheduling Matrices](#),” *IEEE Conference on Control Technology and Applications (CCTA)*, pp. 7-13, 2024.

Under Review

[J] S. Moalemi and J. R. Forbes, “Input-Output Stability of Gradient Descent: A Passivity-Based Approach,” *IEEE Control Systems Letters (L-CSS)*, [Submitted Sep 2024].

[J] S. Moalemi and J. R. Forbes, “Matrix-Scheduling of QSR-Dissipative Systems,” *IEEE Transactions on Automatic Control (TAC)*, [Submitted May 2024].

Research Experience

M.Sc. Thesis Candidate

🏛️ McGill Dynamics, Estimation, and Control in Aerospace and Robotics (DECAR) Group | 📅 2022 - Present

👤 Supervisor: Prof. James Richard Forbes

Thesis topic: Optimization as a Control Problem.

Developed a novel matrix-gain-scheduling architecture within the context of passivity-based control theory. The use of scheduling matrices is a generalization of the scalar scheduling signals used in the literature, and allows for greater design freedom.

Showed that for a class of functions with sector-bounded gradients, gradient descent method can be interpreted as a passive controller in negative feedback with a very strictly passive system. Consequently, used the passivity theorem to guarantee the input-output stability, as well as the global convergence, of the gradient descent method.

Undergraduate Honors Thesis

🏛️ McGill Computational Aerodynamics Group | 📅 2020 - 2021

👤 Supervisor: Prof. Siva Nadarajah

Thesis: “Discontinuous Galerkin Isogeometric Analysis of Hyperbolic PDEs,” McGill University, 2021.

Developed a higher order 3D grid reader in C++ to read files into the deal.II finite element library and solve various hyperbolic PDEs.

Research Assistant

🏛️ McGill Computational Aerodynamics Group | 📅 Summer 2020

👤 Supervisor: Prof. Siva Nadarajah

Developed a C++ program to solve the 2D Laplace equation using a higher order discontinuous Galerkin method with non-uniform rational B-spline (NURBS) basis functions.

Presentations

Passivity-Based Gain-Scheduled Control with Scheduling Matrices

The 8th IEEE Conference on Control Technology and Applications (CCTA)

📍 Newcastle upon Tyne, UK | 📅 Aug 21, 2024

Input-Output Stability of First-Order Optimization Algorithms: A Passivity Approach

The 25th International Symposium on Mathematical Programming (ISMP)

📍 Montreal, Canada | 📅 Jul 24, 2024

Discontinuous Galerkin Isogeometric Analysis of Hyperbolic PDEs

McGill Mechanical Engineering Undergraduate Honors Thesis Presentations

📍 Montreal, Canada | 📅 Nov 27, 2020

Awards

McGill Engineering Undergraduate Student Masters Award (MEUSMA): \$35,000

📅 2022 - 2023

Graduate Excellence Fellowship Award (GEF): \$3,000

📅 Winter 2023

Tomlinson Engagement Award for Mentoring (TEAM): \$600

📅 Fall 2021

NSERC Undergraduate Summer Research Award (USRA): \$5,625

📅 Summer 2020

Tomlinson Engagement Award for Mentoring (TEAM): \$600

📅 Fall 2019

Teaching

🏛️ McGill University

Teaching Assistant and Grader

Led weekly tutorials, graded assignments, held office hours, and invigilated exams for the following course:

| Mech 309: Numerical Methods | 👤 Instructor: Prof. James Richard Forbes

📅 Fall 2022

Teaching Assistant

Led weekly tutorials and held office hours for the following courses:

| Math 264: Advanced Calculus | 👤 Instructor: Mr. Sean Bibby

📅 Summer 2022

| Math 262: Intermediate Calculus | 👤 Instructor: Prof. Tim Hoheisel & Dr. Kevin Church

📅 Fall 2021

| Math 262: Intermediate Calculus | 👤 Instructor: Prof. Charles Roth

📅 Winter 2020

| Math 264: Advanced Calculus | 👤 Instructor: Prof. Biji Wong

📅 Fall 2019

| Math 262: Intermediate Calculus | 👤 Instructor: Prof. Dmitry Jakobson

📅 Summer 2019

| Math 262: Intermediate Calculus | 👤 Instructor: Prof. Charles Roth

📅 Winter 2019

Engineering Peer Tutoring Service (EPTS) Tutor

Held office hours twice a week and conducted midterm/final exam review sessions for each of the following courses:

| Math 262/263/264: Intermediate Calculus, ODEs, and Advanced Calculus

📅 Fall 2020 - Winter 2022

| Math 133/140/141: Linear Algebra, Calculus 1, and Calculus 2

📅 Fall 2019 - Winter 2020

Coding Workshops

Led an introduction to MATLAB workshop for McGill Biomedical Engineering students

📅 Fall 2024

Led an intermediate MATLAB workshop for McGill BioDesign team

📅 Fall 2023

Led an introduction to MATLAB workshop for McGill BioDesign team

📅 Fall 2022

Led an introduction to Python workshop for McGill Shad program

📅 Summer 2022

Leadership

Vice President Academic

🏛️ McGill Engineering Undergraduate Society (EUS) | 📅 2021-2022

Represented over 3,000 engineering undergraduates in faculty meetings focused on academic affairs.

Chaired a committee responsible for allocating over \$500k in academic funds and lab equipment.

Organized academic workshops, review sessions, feedback forums, and hired EPTS tutors.

Program Assistant

🏛️ McGill Shad | 📅 Summer 2022

Led academic workshops and provided mentorship for the cohort of Shad program, a month-long enrichment initiative focused on STEAM and entrepreneurship for selected students across Canada.

Organized and led a Python workshop and a chess workshop for the participants.

Technology and Involvement Coordinator

🏛️ McGill Engineering Orientation Week (Frosh) | 📅 Summer 2021

Collaborated with a team of 11 to organize an orientation week for 800+ incoming engineering students.

Set up and managed the online server, live streams, and a chess tournament.

Vice President Academic

🏛️ McGill Association of Mechanical Engineers (MAME) | 📅 2020-2021

Represented mechanical engineering undergraduate students in departmental meetings.

Created and managed the MAME online server during remote semesters of the COVID-19 pandemic.

Attended and voted on the Mechanical Engineering curriculum review meetings aimed at restructuring the undergraduate program.

Reviewing

American Control Conference (ACC) | 📅 2025

Programming Languages

Python, MATLAB, LaTeX/TikZ, C++, Java, Bash, MIPS Assembly Language, OCaml

Professional Memberships

IEEE Graduate Student Member

Research Group in Decision Analysis (GERAD) Member