Abtin Ameri

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EDUCATION

Doctor of Philosophy, Minor in Computer Science
Massachusetts Institute of Technology 2020-Present

B. Eng, Minor in Physics
McGill University CGPA **3.99/4.00** 2016-2020

PUBLICATIONS

- **A. Ameri**, E. Ye, P. Cappellaro, H. Krovi, N.F. Loureiro. *Quantum algorithm for the linear Vlasov equation with collisions*. Physical Review A (2023).
- F. Hannard, M. Mirkhalaf, **A. Ameri**, F. Barthelat. *Segmentations in fins enable large morphing amplitudes combined with high flexural stiffness for fish-inspired robotic materials*. Science Robotics (2021).
- A. Rafiee, P. Pirkola, P.B. Hall, N. Galatee, J. Rogerson, and **A. Ameri**. *Vanishing Absorption and Blueshifted Emission in FeLoBAL Quasars*. Monthly Notices of the Royal Astronomical Society Main Journal (2016).

HONORS AND AWARDS

- **Research Fellowships**
  - MathWorks Fellowship: $96,000 (2023-2024).
  - National Science and Engineering Research Council of Canada (NSERC) Postgraduate Scholarship – Doctoral (PGSD): $63,000 (2020-2023).
  - Fonds de recherche Nature et technologies (FRQNT): $2,000 (2019).
  - NSERC Undergraduate Summer Research Award (USRA): $13,500 (2017-2019).
- **Scholarships**
  - Neekyfar Fellowship: $5,000 awarded to a graduate student of Iranian descent demonstrating research and academic excellence (2023-2024).
  - Schulich Leader: $80,000 awarded nationally to 50 students demonstrating academic excellence and leadership (2016-2020).
  - Hatch: $10,000 awarded on the basis of high academic standing and overall contribution to university life (2019).
  - Louis C. Ho: $7,000 awarded to students in high academic standing (2018).
  - Brodeur-Drummond $3,000 awarded to students in the top 5% of faculty (2017).
- **Academic**
  - Ernest Brown Gold Medal: awarded to the graduating student demonstrating he highest ability throughout the undergraduate program, in academics and extracurriculars (2020).
  - David E. and Ronnie Schouela Memorial Prize: Awarded for the most outstanding thesis in the Honors Mechanical Engineering program (2020).
  - Rhodes Scholarship Finalist: among the 12 finalists in Quebec interviewed for the Rhodes Scholarship (2019).
  - Dean's Honor List (2017 - 2020).
  - Canadian Physics Olympiad Finalist: ranked 7th in the national stage (2016).

RESEARCH EXPERIENCE

PhD Candidate

Department of Nuclear Science and Engineering
2020 – Present MIT

- Thesis topic: quantum algorithms for nonlinear differential equations with applications to plasma physics and fluid dynamics.
- Worked at the intersection of plasma physics and quantum computing to develop a quantum algorithm for the linearized collisional Vlasov equation which yielded a quadratic speedup in system size compared to classical algorithms.

- Compared with and quantified the performance of an existing quantum algorithm using classical numerical simulations.
- Investigating nonlinear mappings of partial differential equations and identifying the parameter regime for quantum speedup.
- Developing a quantum algorithm for the linear magnetohydrodynamic (MHD) stability problem for fusion reactors.
- Leading biweekly meetings with plasma physics, quantum computation, and industry experts to bridge the gap between the fields.
- Supervisors: Professors Nuno Loureiro and Paola Cappellaro.
- Thesis committee members: Nuno Loureiro, Paola Cappellaro, Aram Harrow, Hari Krovi.

Undergraduate Honors Thesis

Computational Aerodynamics Group

2019 – 2020 McGill University

- Thesis topic: Improving the Numerical Stability of Higher Order Methods with Applications to Fluid Dynamics.
- Enhanced the stability of the discontinuous Galerkin (DG) formulation of the Euler equations by splitting the convective flux term.
- Used finite element libraries in C++ to implement the discretization of the equations on supercomputers.
- Supervisor: Professor Siva Nadarajah.

Research Assistant

Biomimetics and Advanced Materials Group

May – Aug 2018 McGill University

- Investigated the morphing mechanics of ray-finned fish fins using techniques such as quasi-static loading, 3D reconstruction, and stereolithography (SLA) 3D printing.
- Developed analytical and finite-element models describing the mechanics of the fin.
- Developed a new material with high morphing capacity, applicable to future aircraft wings.
- Best poster award winner in advanced materials among 100 engineering summer research students.
- Supervisor: Professor François Barthelat.

Research Assistant

Shockwave Physics Group

May – Aug 2017 McGill University

- Fully designed and built a hypervelocity launcher capable of launching metallic jets up to 15 km/s.
- Worked with class 3R and 4 lasers, powell and convex lenses, filters, and photodetectors to assemble a jet detection mechanism.
- Used Photon Doppler Velocimetry (PDV) and Schlieren photography as diagnostic methods.
- Supervisor: Professor Andrew J. Higgins.

Research Assistant

Biology Department

Jul – Aug 2016 York University

- Studied the memory and learning capacity of honey bees.
- Performed memory retention experiments on more than 1,000 bees, and analyzed the data on Excel.
- Supervisor: Professor Amro Zayed.

Research Assistant

Molecular Biology Department

Mar 2016 Lunenfeld-Tanenbaum Research Institute

- Investigated protein signalling and transduction.
- Performed DNA extraction, gel electrophoresis, and cell culture experiments.
- Supervisor: Professor Jeff Wrana.

Research Intern
Physics and Astronomy Department
Jul – Aug 2015 York University

- Studied the spectra of low-ionization iron broad absorption line (FeLoBAL) quasars.
- Wrote a computer code that automated quasar spectra comparison for detecting changes in absorption and emission.
- Supervisor: Professor Patrick B. Hall.

Junior Researcher
Mathematics Department
Jan – May 2015 University of Toronto

- Researched the growth rate of Perron-Frobenius matrices and their relation to directed graphs.
- Worked on developing a lower bound on the growth rate of the matrices.
- Supervisor: Professor Kasra Rafi.

LEADERSHIP

Co-President
American Nuclear Society
2022-2023 MIT

- Representing the department's student population during department and faculty meetings.
- Supervising the organization of various events throughout the year.
- Managing a board of 13 members with a budget of $25k.
- Organizing monthly check-ins with the members to monitor progress.

Communication Fellow
Nuclear Science and Engineering Department
2021-2022 MIT

- Coached clients on improving their technical communication, from conference presentations to faculty applications.
- Wrote blog posts and articles on scientific communication for the department website.
- Organized and led workshops on writing effective statements of purpose for graduate school.

Events Coordinator
Persian Students Association
2021-2022 MIT

- Restarted the Association following a COVID hiatus.
- Organized quarterly events with the aim of bringing Persian culture to MIT.

Co-Social Chair
American Nuclear Society
2021-2022 MIT

- Coordinated monthly events for over 100 students in the department.
- Managed an events budget of $10k.
- Attended monthly board meetings.

Vice President Academic
Engineering Undergraduate Society of McGill
2019 – 2020 McGill University

- Represented more than 3000 engineering undergraduates in faculty meetings.
- Managed over $0.5million in academic funds and ensured their proper utilization.
- Resolved urgent academic conflicts.
- Delegated tasks to departmental VP Academics.

Vice President Academic
McGill Association of Mechanical Engineers
May 2018 – Apr 2019 McGill University

- Represented the Mechanical Engineering undergraduate students and voiced their academic concerns.
- Sat on curriculum review meetings intended to restructure the Mechanical Engineering undergraduate curriculum.
- Made substansial efforts to push the department for availability of lecture recordings in classes.
- Organized LaTeX and MATLAB workshops for undergraduate students.

Editor and Head of Technology
McGill Science Undergraduate Research Journal
Sep 2016 – Aug 2019 McGill University

- Edited scholarly articles submitted by students and contacted peer reviewers.
- Maintained consistent traffic on the journal's website.
- Used Adobe InDesign to design the layout and format of the journal.
- Organized the annual journal launch event with other editors.

TEACHING AND MENTORING

Undergraduate Student Advisor
Plasma Science and Fusion Center
2023-Present MIT

- Supervising undergraduate students JJ Detweiler.
- Investigating the convergence bounds of Carleman linearization of the viscous Burgers' equation through numerics and analytical calculations.
- Meeting weekly to discuss research progress and identify next steps.

Student Mentor
McGill Alumni Association
2021-Present McGill University

- Mentoring freshman student Alexander Lyakishev.
- Meeting quarterly to discuss the challenges of university and providing advice on how to overcome them.

Undergraduate Student Advisor
Plasma Science and Fusion Center
2020-2022 MIT

- Supervised undergraduate students Andrew Jenkins, Kelly Fang, and Kai Van Brunt.
- The team investigated the physics and confinement of single species plasma traps through numerical simulations.
- Met weekly to discuss research progress and identify next steps.

Teaching Assistant
22.611: Introduction to Plasma Physics
Fall 2021 MIT

- Created and graded assignments for 20 students.
- Assisted students during weekly office hours.

Co-Director and Lecturer
McGill Physics Olympiad Program
2017 – 2020 McGill University

- Conducted weekly 3-hour-long lectures for high school students covering university-level physics content.
- Provided challenging weekly problems for students to solve.
- Promoted physics and STEM education to a diverse community of students.

- Prepared students for prestigious physics competitions.

Course Assistant
MECH 309: Numerical Methods
Jan - Apr 2019 McGill University

- Held office hours and conducted a midterm exam review session.
- Co-wrote the midterm exam for the course.
- Created and graded weekly MATLAB assignments.
- Assisted students with the course's coding projects.

Teaching Assistant
MATH 264: Advanced Calculus
Jan - Apr 2018 McGill University

- Held office hours to assist students with course problems.
- Conducted weekly tutorials consisting of problem solving.
- Received the highest teaching rating out of 3 TAs for the course.

Tomlinson Award Teaching Assistant
MECH 210: Mechanics 1
Jan - Dec 2018 McGill University

- Held weekly office hours to assist students with assignments.
- Conducted three two-hour review sessions for the course exams.

LANGUAGES

- English (fluent).
- Farsi (fluent).
- French (beginner).