Andrew Francesco Ilersich

Email	andrew.ilersich@mail.utoronto.ca	**LinkedIn**	andrewilersich
Website	ilersich.com	**Github**	ailersic

I am a PhD student in aerospace engineering with experience in machine learning for complex dynamical systems, experimental aircraft design, stochastic optimization, data assimilation/state estimation, and software development. My current research focuses on learning probabilistic models of physical systems, either entirely from data or partially informed by known physics.

Competencies

Machine learning	Multiscale and stochastic modeling of complex dynamical systems Digital twin development & data assimilation Deep learning frameworks (PyTorch, PyTorch Lightning, Tensorboard)
Aerospace engineering	Conceptual design of aircraft/spacecraft Aerodynamic and structural analysis Classical control theory
Software development	Python, Matlab/Simulink, C/C++, Fortran, Java, Git-based collaboration Web development (JavaScript, real-time data integration, visualization) High performance computing (MPI and OpenMP)
Teaching & mentorship	Developed curriculum for and taught undergraduate university course Extensive experience as teaching assistant Co-founded and led competition-winning student design teams

Education

2021-Now PhD in Aerospace Engineering (candidate)
University of Toronto Institute for Aerospace Studies (UTIAS)
Supervisor: Prof. Prasanth Nair (UTIAS)

2019-2021 MASc in Aerospace Engineering
University of Toronto Institute for Aerospace Studies (UTIAS)
Co-supervisors: Prof. Masayuki Yano (UTIAS), Prof. Adam Steinberg (Georgia Tech)

2014-2019 BASc in Engineering Science, Major in Aerospace, Minor in Robotics
University of Toronto Faculty of Applied Science and Engineering
Undergraduate thesis supervised by Prof. Chris Damaren (UTIAS)

Publications

[1] Andrew F. Ilersich and Prasanth B. Nair. "Scalable Multiscale Latent SDE Models for Chaotic Systems". In: (2026). **In preparation**.

[2] Andrew F. Ilersich and Prasanth B. Nair. "Learning SDE models of spatio-temporal dynamics, with applications to reduced-order modeling and multiscale representations". Submitted, under review. PhD Thesis. University of Toronto, 2026.

[3] * Andrew F. Ilersich, Kevin Course, and Prasanth B. Nair. “Data-driven stochastic reduced-order modelling of parametrized dynamical systems”. In: *Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences* 482.2347 (Oct. 2026), p. 20251046.

[4] * Andrew F. Ilersich and Prasanth B. Nair. “Learning Stochastic Multiscale Models”. In: *Neural Information Processing Systems (NeurIPS)* (2025).

[5] * Andrew F. Ilersich and Prasanth B. Nair. “Deep learning with Gaussian continuation”. In: *Foundations of Data Science* 7.3 (2025), pp. 790–813.

[6] Andrew F. Ilersich and Suraj Bansal. “Conceptual Aerodynamic Design Considerations for a Fixed-Wing Microgravity UAV”. In: *AIAA Aviation Forum* (2023).

[7] * Andrew F. Ilersich, Kyle A. Schau, Joseph C. Oefelein, Adam M. Steinberg, and Masayuki Yano. “Augmenting covariance estimation for ensemble-based data assimilation in multiple-query scenarios”. In: *Combustion Theory and Modelling* 26.6 (2022), pp. 1041–1070.

[8] Andrew F. Ilersich, Kyle A. Schau, Joseph C. Oefelein, Adam M. Steinberg, and Masayuki Yano. “Reducing the Cost of Ensemble-Based Data Assimilation in Multiple-Query Scenarios through Covariance Augmentation”. In: *AIAA Propulsion and Energy Forum* (2021).

[9] Andrew F. Ilersich, Adam M. Steinberg, and Masayuki Yano. “Reducing the Cost of Ensemble-based Data Assimilation in Multiple-query Scenarios through Covariance Augmentation”. Master’s Thesis. University of Toronto, 2021.

[10] Andrew F. Ilersich and Christopher J. Damaren. “Spacecraft Attitude Control by Magnetic Actuation and Double-Gimbal Variable-Speed Control Moment Gyroscope”. Bachelor’s Thesis. University of Toronto, 2019.

[11] * Anna Taddio, Andrew F. Ilersich, Anthony N. Ilersich, and Jenny Wells. “From the Mouth of Babes: Getting Vaccinated Doesn’t Have to Hurt”. In: *Canadian Journal of Infectious Diseases and Medical Microbiology* 25 (2014), p. 470261. ISSN: 1712-9532.

* Peer-reviewed publication

Awards and Funding

2025-2026	Doctoral Completion Award - $6000
2025	Departmental Teaching Assistant Award for Aircraft Design Capstone
2024-2025	Queen Elizabeth II Graduate Scholarship in Science and Technology - $5000/semester
2024	UTIAS Molson Kenneth Fellowship (declined) - $2000
2023-2024	Queen Elizabeth II Graduate Scholarship in Science and Technology - $5000/semester
2022	International Small Wind Turbine Contest at TU Delft (Netherlands) - First Place
2022	University of Toronto Aerospace Team - Technical Excellence Award
2020-2021	Ontario Graduate Scholarship - $5000/semester
2014-2018	University of Toronto Dependents’ Scholarship for Academic Achievement - $3000/year
2018	Second Annual International Drone Competition for the Youth (China) - Third Place
2018	Association for Unmanned Vehicle Systems Intl. Contest (USA) - Sportsmanship Award
2017	Unmanned Systems Canada UAV Competition (Canada) - Grand Prize
2016	Canadian Space Agency (CSA) - Canadian Reduced Gravity Experiment (CAN-RGX) Finalist
2016	National Science & Engineering Research Council - Undergraduate Student Research Award
2014	University of Toronto Entrance Scholarship - $5000

Research Experience

Sept 2021 - Present University of Toronto Institute for Aerospace Studies, Toronto, ON
Doctoral Candidate - Graduate Thesis

Developing machine learning framework and PyTorch library for fast variational inference of latent SDE models from time-series data. Using it as the foundation for multiscale models, a novel framework for physical systems that require the state to be resolved across a wide continuum of length and time scales [4]. The multiscale approach imposes a scale separation between directly-resolved macroscale features and inferred microscale features and models their dynamics as a coupled pair of SDEs, allowing for efficient inference and prediction. Additionally applied to learning reduced-order models conditioned on variable model parameters and time-varying control input [3]. Parameter inference for this sort of framework is a highly non-convex optimization problem, so also studied optimization by Gaussian continuation [5]. Supervisor: Prof. Prasanth B. Nair (UTIAS).

Sept 2019 - June 2023 University of Toronto Institute for Aerospace Studies, Toronto, ON
Independent Student Researcher

Independently researched optimal design of a small airplane capable of carrying payload and simulating a zero-gravity environment. Developed a design methodology based on aerodynamic simulation that maximizes zero-gravity time and stability. Presented this research at the AIAA Aviation forum [6].

Sept 2019 - Aug 2021 University of Toronto Institute for Aerospace Studies, Toronto, ON
Master of Applied Science (MASc) - Graduate Thesis

Developed techniques to assimilate experimental data into mathematical models of fluid flow. I applied these techniques to combustion simulation for the purposes of jet engine design and analysis. These can be used to produce better estimates of flow conditions or to refine the model for better performance when data are not present [7, 8]. Thesis available online [9]. Supervisors: Prof. Masayuki Yano (UTIAS) and Prof. Adam Steinberg (Georgia Tech).

Aug 2017 - Sept 2019 Flight Research Laboratory, National Research Council, Ottawa, ON
Independent Student Researcher

Independently designed reduced-gravity experiment for a parabolic jet. Funded by the 2016 Canadian Reduced Gravity Experiment (CAN-RGX) student research award. Studied how viscous fluid jets coil like a rope when impacting a plate. Featured in UofT News. This was continued into the microgravity UAV project (see above).

Sept 2018 - Apr 2019 University of Toronto Institute for Aerospace Studies, Toronto, ON
Undergraduate Thesis

Designed and evaluated a proposed spacecraft attitude control system consisting of a combination of magnetic actuation (MA) and a control moment gyroscope (CMG) [10]. Simulated detumbling and pose-holding scenarios. Derived effective bounds on the MA control gains given the CMG control gains and demonstrated superior performance to pure MA system. Supervisor: Dr. Chris Damaren (UTIAS).

Sept 2017 - Apr 2018 University of Toronto Institute for Aerospace Studies, Toronto, ON
Student Researcher

Studied the tradeoff between spectral radius and truncation error of summation-by-parts finite difference operators. Demonstrated that weighted optimization of spectral radius and error does not produce more efficient operators than optimizing for error alone, which is current standard practice. Supervisor: Dr. David Zingg (UTIAS).

May 2016 - Aug 2016 University of Toronto Institute for Aerospace Studies, Toronto, ON
Student Researcher

Performed simulations of fluid flow for two projects: airfoil optimization with prediction of laminar-to-turbulent flow transition, derivation/implementation of flow boundary values for modelling turbofan engines. Supervisor: Dr. David Zingg (UTIAS).

Sept 2010 - Aug 2014 Hospital for Sick Children
Volunteer Research Assistant

Participated in data gathering and data analysis for research into minimizing distress during vaccination. Designed and deployed apps to aid in recording data from interviews with patients. Assisted in writing research abstract and preparing online education materials. Co-authored manuscript [11].

Teaching Experience

Jan 2023 - Apr 2023 University of Toronto, Toronto, ON
Course Instructor for Introduction to Learning from Data (Undergraduate Core Course)

Independently delivered lectures, managed course logistics, and evaluated students for a full semester. Designed course materials and new assignments to strengthen connections between theory and implementation. Covered core ML methods relevant to computational science and engineering: clustering, PCA, regression/classification, kernel methods, ensemble learning, neural networks, and generalization theory. Mentored students in applying machine learning to engineering problems, emphasizing reproducibility and sound computational practice.

Teaching Assistantships

Jan - Apr 2021-22, '25 University of Toronto, Toronto, ON
Teaching Assistant for Aircraft Design (Undergraduate Capstone Course)

Instructed students on the aircraft design process with a model airplane design challenge. Students learned aerodynamic and structural design skills, as well as how to build and test fly their airplanes. Won the departmental teaching assistant award in 2025 (see Awards).

Sept 2024 - Jan 2025 University of Toronto, Toronto, ON
Teaching Assistant for Spacecraft Design (Undergraduate Capstone Course)

Instructed students on the spacecraft design process, using a low-Earth orbit spacecraft recovery mission as an example. Students learned systems design within strict constraints imposed by launch provider, communications systems, and regulations.

Sept 2019 - Jan 2020 University of Toronto, Toronto, ON
Teaching Assistant for Vector Calculus & Fluid Mechanics (Undergraduate Core Course)

Instructed microfluidics lab and graded lab reports for $\sim$100 students. Taught students safe handling of fluids and how to collect data on local fluid velocity by tracking fluorescent beads under a microscope.

Industry Experience

May 2018 - Aug 2018 Drone Delivery Canada, Toronto, ON
Aerodynamicist

Worked at Drone Delivery Canada on the Robin and Sparrow quadrotors. Designed aerodynamic shells for minimizing drag and correcting yaw instability. Developed rudimentary flight dynamics models of the quadrotors and assisted with flight testing under the supervision of Transport Canada.

May 2017 - Apr 2018 Bombardier Aerospace - deHavilland Site, Toronto, ON
Aircraft Simulation Engineer

Worked at Bombardier Aerospace on the Global and Q400 programs. Validated simulation results with flight test data, developed tools to partially automate model tuning. Rewrote sections of flight dynamics model based on computer predictions to reflect changes to design.

Community & Volunteer Activities

Mar 2026 - Aug 2026 Aerospace Students Association, UTIAS
Muralist

Independently designed and led a team of students in painting a large mural for a renovated study lounge at UTIAS. It commemorates UTIAS' 75th anniversary by showing its original location at Downsview Airport as it appeared when it was founded in 1949. The mural depicts DeHavilland Canada, a major aircraft manufacturer that once occupied the site. Featured on the Aerospace Students Association's Instagram page.

Jun 2025 - Aug 2025 TTCmap.ca - Toronto Transit Network Status Map
Developer

Developed TTCmap.ca, a public-facing, real-time web tool for visualizing Toronto's transit network. Integrated live data feeds with efficient algorithms to ensure responsive performance. Demonstrated strong coding practices, system design, and delivery of a functional large-scale software product. Presented to the TTC board on July 17, 2025, where it received widespread media coverage as a useful tool for transit riders. Featured in media: Toronto Star, CP24, CTV News, NOW Toronto, and The GitHub Podcast.

Sept 2023 - Mar 2024 Student Experience Committee, UTIAS
Student Representative

Participated in the development of a UTIAS-wide student survey to distill key areas of dissatisfaction with student experience. Developed recommendations which were then provided to the UTIAS faculty.

Sept 2022 - Oct 2022 Re-Election Campaign for Councillor Mike Colle, Ward 8, Toronto
Volunteer Data Analyst

Joined the campaign to re-elect Mike Colle as councillor for Ward 8, Toronto. Worked as a data analyst, identifying neighbourhoods by strong and weak levels of support for Colle in order to direct door-to-door campaigning efforts. Advocated for and brought about changes to campaign strategy in this regard. Also joined door-to-door efforts with other campaign volunteers.

Nov 2020 - June 2022 University of Toronto Wind Power Club (UTWind), University of Toronto
Cofounder, Vice President, Aerodynamics Lead

Cofounded a club to compete at the International Small Wind Turbine Design Contest. Built club infrastructure including branding and recruitment and secured initial funding. Led the aerodynamic design of turbine blades and external housing, producing a wind turbine that won first place at the contest (see Awards and Distinctions). Featured in UofT News.

Aug 2020 - Apr 2023 University of Toronto Aerospace Team, University of Toronto
Fixed-Wing Aircraft Design Specialist, Aerodynamics Lead

Aerodynamicist and fixed-wing aircraft designer to the new UAS (Unmanned Aerial Systems) division of the Aerospace Team. Worked on airframe design and mentoring junior members on aerodynamics, computer-aided design, and fabrication techniques. The aircraft compete at the SAE Aero Design student competition.

Sept 2015 - Apr 2020 University of Toronto Project Holodeck, University of Toronto
Founder, President

Founded the virtual/augmented reality design club. Led meetings, designated roles, and secured ∼$4000 in annual funding. Developed haptic-feedback gloves, an all-direction treadmill, and a handheld 3D scanner for environment modelling. Built an "arcade machine" for public exhibition of games and tech developed by the club.

Sept 2018 - May 2019 University of Toronto Aerospace Team, University of Toronto
Advisor, Multirotor Aircraft

Advisor on multirotor aircraft design to the UAV (Unmanned Aerial Vehicle) division and Aerial Robotics division of the Aerospace Team. Mentor to junior members on aerodynamics, structural mechanics, fabrication techniques, flight testing, and Transport Canada certification.

Jan 2016 - Sept 2018 University of Toronto Aerospace Team, University of Toronto
Project Lead, Multirotor

Project Lead for the UAV division's multirotor aircraft. Designed and built an original airframe, worked with team members on flight control systems. This airframe continued to be used as the UAV division's main multirotor for over a year after I left. Competed annually at Unmanned Systems Canada and Association of Unmanned Vehicle Systems International.

References

Prof. Prasanth Nair
University of Toronto Institute for Aerospace Studies
prasanth.nair@utoronto.ca
Relationship: Doctoral supervisor (see Education & Research Experience)

Prof. Masayuki Yano
University of Toronto Institute for Aerospace Studies
masa.yano@utoronto.ca
Relationship: MASc co-supervisor (see Education & Research Experience)

Prof. Adam Steinberg
Georgia Institute for Technology
adam.steinberg@gatech.edu

Relationship: MASc co-supervisor (see Education & Research Experience)

Prof. Peter Grant University of Toronto Institute for Aerospace Studies
peter.grant@utoronto.ca
Relationship: Instructor for Aircraft Design (see Teaching Assistantships)

Prof. Chris Damaren University of Toronto Institute for Aerospace Studies
chris.damaren@utoronto.ca
Relationship: Instructor for Spacecraft Design (see Teaching Assistantships)

Prof. Alis Ekmekci University of Toronto Institute for Aerospace Studies
ekmekci@utias.utoronto.ca
Relationship: Instructor for Vector Calculus (see Teaching Assistantships)