
DAG GILLBERG

CURRICULUM VITAE

CONTACT

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PROFESSIONAL EXPERIENCE

2016–present	Faculty member, Department of Physics, Carleton University Associate Professor with tenure since July 2021
2012–2015	CERN Fellow, Marie Skłodowska-Curie COFUND, CERN, Geneva, Switzerland
2009–2012	Postdoctoral Fellow (ATLAS), Carleton University, Ottawa, Canada

EDUCATION

2005–2009	Ph.D., Experimental Particle Physics Simon Fraser University, Canada. Supervisor: Dugan O’Neil Thesis: Discovery of Single Top Quark Production
1998–2004	M.Sc. and B.Sc., Engineering Physics Lund University, Sweden. Thesis supervisor: Paula Eerola Thesis: A Study of Jet Response in the DØ Calorimeters

RESEARCH EXPERTISE & LEADERSHIP HIGHLIGHTS

Precision measurements and machine-learning methods at the LHC

Development of new methods for high-dimensional and unbinned measurements, including machine-learning-based unfolding. Research spans precision Standard Model measurements, jet physics, and modern statistical and machine-learning techniques for particle physics.

Higgs boson and electroweak physics

Leadership and major contributions to ATLAS measurements of Higgs boson properties and electroweak processes, including evidence for $H \rightarrow \mu\mu$, vector-boson-fusion measurements, and determination of the relative sign of the Higgs boson couplings to the W and Z bosons.

Jet reconstruction, calibration and detector performance

Long-standing expertise in hadronic jet reconstruction and calibration, including coordination of ATLAS activities for the High-Luminosity LHC and recent applications of machine learning to precision calorimeter calibration. Contributions to the Carleton ATLAS ITk program through funding, infrastructure and analysis supervision.

Scientific leadership and research training

Former Physics Coordinator of ATLAS-Canada; Deputy Team Leader of the Carleton ATLAS group; former ATLAS Higgs diphoton and jet-performance convener; chair and member of ATLAS editorial boards; supervisor and mentor of graduate and undergraduate researchers.

RESEARCH FUNDING AND GRANTS

AWARDED FUNDING

- 2018–2028 **NSERC Subatomic Physics Project Grants**
The ATLAS Experiment at the Large Hadron Collider
Co-applicant on successive national ATLAS-Canada grants awarded in 2018, 2022, and 2025.
Current: **\$6.3M/year** for three years; 39 investigators from 11 Canadian institutions.
- 2016–2028 **NSERC Major Resources Support Program Grants**
Carleton Technical Team for Subatomic Physics Research
Co-applicant on successive grants awarded in 2016 and 2023. Current: **\$1.60M over five years**; supporting four Carleton technical personnel and associated research infrastructure.
- 2021 **CERN RD50 Research Grant, CHF 32,900**
Charact. of GaN Based Materials, Electronics, and Sensors, Subject to Large Radiation Doses
Co-applicant; one of 14. PI: Thomas Koffas. Joint with NRC researchers.
- 2020 **NSERC Research Tools and Instruments (RTI) Grant, \$147,218**
Deep Level Transient Spectroscopy for Semiconductor Device Development
Co-applicant; one of six investigators.
- 2019– **Canada Foundation for Innovation (CFI), \$24.5M; \$2.25M Carleton**
ATLAS Inner Tracker (ITk) Upgrade
Co-applicant on the national ATLAS ITk infrastructure project. The project subsequently received \$5.09M (\$756k Carleton) from the associated CFI Infrastructure Operating Fund.
- 2017 **Canada Foundation for Innovation – John R. Evans Leaders Fund \$130k**
Infrastructure to develop solid-state detectors for High Luminosity LHC
Principal Investigator.
- 2017 **Carleton University Dean of Science Infrastructure Funding, \$265k**
Infrastructure to develop solid state detectors for High Luminosity LHC
Principal Investigator.
- 2017 **NSERC Research Tools and Instruments (RTI) Grant, \$193k**
Upgrades to the ATLAS Detector at the LHC. Co-applicant.
- 2016 **NSERC Research Tools and Instruments (RTI) Grant, \$220k**
Upgrades to the ATLAS Detector at the Large Hadron Collider. Co-applicant.
- 2016–2018 **NSERC Subatomic Physics Project Grant, \$90k**
Measurements of the Higgs Boson at the Large Hadron Collider
Principal applicant; bridging grant for my ATLAS research during first two years at Carleton.
- 2016 **Carleton University Startup Grant, \$130k**
Research startup funding. Principal Investigator.

APPLICATIONS UNDER REVIEW

- 2026 **NSERC Subatomic Physics Project Grant, ~\$350k/year for three years**
CCIDD – Canadian Collaboration for Integrated Detector Development
Co-applicant; one of 15 investigators from seven Canadian institutions. My contributions focus on real-time machine learning for detector readout and reconstruction.

RESEARCH LEADERSHIP AND CONTRIBUTIONS

My research program spans precision measurements, Higgs and electroweak physics, machine-learning methods, jet reconstruction and calibration, and detector development within the ATLAS experiment. The following sections summarize my principal scientific contributions and leadership.

1. MACHINE LEARNING, UNBINNED MEASUREMENTS AND PRECISION PHYSICS

My recent research has focused on developing machine-learning methods for precision measurements at the LHC, particularly methods that preserve the high-dimensional structure of collider data rather than reducing measurements to a small number of binned observables.

2020–present **Unbinned measurements and machine-learning-based unfolding**

Co-lead, with Ben Nachman (LBNL/Berkeley), a research program developing high-dimensional and unbinned measurements using OmniFold and related machine-learning techniques. This work formed the basis of Laura Miller’s PhD research and has developed from methodological studies into a [PRL published ATLAS measurement](#).

2022 **Publishing unbinned differential cross-section measurements**

Developed a framework for publishing differential measurements as weighted particle-level events, allowing measurements to be analyzed after publication using observables and phase-space regions not specified in advance. The methodology was presented in [JINST 17 \(2022\) P01024](#).

2023–present **High-dimensional unfolding of ATLAS Z +jets data**

Led development of an ATLAS measurement using machine-learning-based unfolding to simultaneously measure the charged-particle structure of boosted Z +jets events. The analysis uses variable-length particle information and provides an unbinned particle-level result from which many observables can be constructed. PhD topic of M. Smith.

2026 **Practical methodology for unbinned unfolding**

Co-authored *A practical guide to unbinned unfolding*, [Eur. Phys. J. C 86 \(2026\) 106](#), developing validation procedures, uncertainty treatments, and practical recommendations for machine-learning-based unbinned measurements.

2. HIGGS BOSON AND ELECTROWEAK PHYSICS

Higgs-boson and electroweak measurements have been a central component of my ATLAS research program, from the discovery-era Higgs analyses through the development of differential and precision Higgs measurements to recent measurements of rare Higgs processes and Higgs-boson couplings.

2023–2025 **Evidence for $H \rightarrow \mu\mu$**

Supervised major Carleton contributions to the ATLAS search for the dimuon decay of the Higgs boson, including the PhD research of Bryce Norman and subsequent work by Owen Darragh. The resulting Run 2+3 analysis obtained evidence for $H \rightarrow \mu\mu$ and was published in [Phys. Rev. Lett. 135 \(2025\) 231802](#).

- 2021–2024 **Relative sign of the Higgs couplings to W and Z bosons**
 Developed, with a small Carleton team of experimentalists and theorists, a new measurement exploiting interference in electroweak WH production to determine the relative sign of the Higgs-boson couplings to W and Z bosons. The analysis was carried out entirely at Carleton and the [resulting ATLAS publication](#) was a [Phys. Rev. Lett. Editors’ Suggestion](#) accompanied by a [dedicated Physics Synopsis](#).
- 2016–present **Vector-boson-fusion and electroweak Zjj measurements**
 Led and supervised Carleton work on measurements of electroweak Z +two-jet production, an important test of vector-boson-fusion processes and the electroweak gauge structure of the Standard Model. Our [Run 2 differential measurement](#) included the signed azimuthal angle between the two jets, which is particularly sensitive to CP-odd effective-field-theory contributions through their interference with the Standard Model. Stephen Weber’s PhD thesis on this program received the 2021 CAP Particle Physics Division Thesis Award. I am now contributing to a new measurement using the substantially larger Run 2+3 dataset.
- 2013–2018 **Differential and precision Higgs-boson measurements**
 Helped pioneer the ATLAS program of [fiducial and differential Higgs-boson cross-section measurements](#), beginning with measurements in the $H \rightarrow \gamma\gamma$ channel. Through the LHC Higgs Cross Section Working Group, I worked closely with theorists on state-of-the-art gluon-fusion predictions and recommendations for theoretical uncertainties and correction factors, and contributed to the development of the [Simplified Template Cross Section \(STXS\) framework](#). With Carleton student Jim Lacey, I implemented the original STXS categorization in Rivet, which was subsequently incorporated into the ATLAS and CMS simulation workflows.
- 2011–2014 **Higgs-boson discovery and early measurements**
 Held leading roles in the ATLAS Higgs program during the discovery and early measurement period, including serving as co-convener of the $H \rightarrow \gamma\gamma$ analysis group. During the [Higgs-boson discovery](#), I was responsible for ensuring that jet-related systematic uncertainties were consistently evaluated and propagated across the Higgs analyses, with particular responsibility for this aspect of the $H \rightarrow WW$ analysis.

3. JETS, CALORIMETRY AND DETECTOR PERFORMANCE

I have longstanding expertise in jet reconstruction, calorimeter response and precision calibration. My work has progressed from the development of ATLAS jet-calibration techniques to coordination of preparations for the High-Luminosity LHC and, more recently, machine-learning approaches to detector calibration.

- 2022–2025 **Uncertainty-aware neural-network calorimeter calibration**
 Contributed to the development of a neural-network-based calibration of ATLAS calorimeter signals that simultaneously predicts the calibrated response and its uncertainty. The resulting method was published in [SciPost Physics 19 \(2025\) 155](#).
- 2017–2024 **Jet reconstruction for the High-Luminosity LHC**
 Coordinated ATLAS JetEtMiss activities preparing jet reconstruction and performance for the High-Luminosity LHC, including studies of reconstruction strategies in the challenging high-pileup environment.

- 2009–present **Jet energy calibration and performance**
Made sustained contributions to ATLAS jet reconstruction and calibration, including serving as convener of the Jet Calibration and Resolution group and contributing to major ATLAS jet-energy-scale and resolution measurements. My work has included calorimeter response, in-situ calibration, forward jets and systematic uncertainties.
- 2009–present **Jet and QCD measurements**
Contributed to measurements using jets to test perturbative QCD and hadronic structure, ranging from early [inclusive-jet and dijet measurements](#) to recent studies of [high-dimensional jet and charged-particle observables](#).
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4. SCIENTIFIC LEADERSHIP IN ATLAS AND ATLAS-CANADA

In addition to leadership of individual analyses, I have held scientific and organizational roles within the ATLAS experiment and the Canadian ATLAS community, coordinating research activities, reviewing major results, and mentoring researchers across the collaboration.

- 2019–2023 **Physics Coordinator, ATLAS-Canada**
Elected to coordinate the physics activities of the Canadian ATLAS community, facilitating collaboration across Canadian institutes and representing the Canadian physics program within the broader ATLAS collaboration. Re-elected for second term.
- 2019–present **Deputy Team Leader, Carleton ATLAS**
Help coordinate the research activities of the Carleton ATLAS group, including physics analysis, student and postdoctoral research, collaboration responsibilities and connections between detector and physics-analysis activities.
- 2012–present **ATLAS scientific coordination and review**
Held numerous collaboration-wide scientific responsibilities, including co-convener of the Higgs diphoton and Jet Calibration and Resolution groups, coordination of HL-LHC jet-performance activities, Higgs HEPData coordination, and chair or member of ATLAS editorial boards reviewing major physics and detector-performance results.
- 2020–present **Mentoring and collaboration-wide research responsibilities**
Served as technical supervisor for ATLAS qualification projects and mentored students and early-career researchers beyond my formal Carleton supervisory responsibilities, particularly in jet performance, machine learning and physics analysis.
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5. DETECTOR DEVELOPMENT AND INSTRUMENTATION

Detector development complements my physics-analysis program. At Carleton, I contribute to the ATLAS Inner Tracker upgrade and to research on radiation-hard detector technologies, particularly through funding, research infrastructure, software and the supervision of physics analysis by students involved in detector projects.

- 2016–present **ATLAS Inner Tracker upgrade**
Contribute to Carleton’s participation in the construction and commissioning of the ATLAS Inner Tracker (ITk), working closely with Thomas Koffas, who leads the group’s hardware activities. My contributions include funding and administration, computing and laboratory software, and physics-analysis supervision of students whose research combines detector and analysis work.

- 2017–present **Radiation-hard detector technologies**
 Contributed to research on silicon sensors, radiation-hard electronics and semiconductor detector technologies for future particle-physics experiments, including collaborations with CERN RD50, the National Research Council Canada and colleagues in Carleton’s Department of Electronics.
- 2016–present **Detector research infrastructure**
 Contributed to obtaining and developing substantial detector-research infrastructure at Carleton through CFI, NSERC and other funding, supporting ATLAS ITk construction as well as longer-term detector R&D.

6. EARLIER RESEARCH: DISCOVERY OF SINGLE-TOP-QUARK PRODUCTION

My doctoral research with the DØ experiment focused on the search for electroweak production of single top quarks, a process that required extracting a small signal from backgrounds several orders of magnitude larger. This work established my early interests in multivariate methods, precision detector calibration and challenging measurements at hadron colliders.

- 2005–2009 **Evidence and discovery of single-top-quark production**
 Made major contributions to the first evidence and subsequent discovery of electroweak single-top-quark production with the DØ experiment. Developed and optimized boosted decision-tree techniques used to separate the signal from large backgrounds and contributed to the measurement of the production cross section.
- 2009 **Presentation of the DØ single-top discovery**
 Selected by the DØ Collaboration to present the single-top-quark discovery at the Rencontres de Moriond. My doctoral thesis on the measurement was subsequently published as a Springer thesis and received the Simon Fraser University Dean of Graduate Studies Convocation Medal.
- 2005–2009 **Jet energy calibration at DØ**
 Contributed to precision jet-energy calibration, including studies of calorimeter response and systematic uncertainties that supported the single-top measurement and the broader DØ physics program.
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RESEARCH SUPERVISION AND MENTORING

GRADUATE STUDENTS

I have supervised and co-supervised graduate students working across particle-physics analysis, machine learning, jet and detector performance, and detector development. Selected research and subsequent outcomes are summarized below.

2026–present	Rowan Clendening, PhD: Jet calibration and Higgs-boson physics with ATLAS. Co-supervised with Thomas Koffas.
2023–present	Owen Darragh, PhD: Higgs-boson physics with ATLAS: $H \rightarrow \mu\mu$, and calibration of forward jets. Co-supervised with Manuella Vinciter.
2021–present	Matthew Smith, MSc/PhD: Mentored throughout his MSc research (2021–2023) and subsequently became his formal co-supervisor for his PhD (2023–); research on machine-learning-based unfolding and precision measurements with ATLAS. Co-supervised with Alain Bellerive.
2021–2025	Ezekiel Staats, PhD: Associated WH production via vector-boson fusion at the High-Luminosity LHC and the ATLAS Inner Tracker upgrade. Co-supervised with Thomas Koffas. PhD completed December 2025.
2019–2025	Bryce Norman, PhD: Search for and evidence of the $H \rightarrow \mu\mu$ decay with ATLAS. Co-supervised with Thomas Koffas. PhD completed December 2025; research contributed to the ATLAS evidence for this decay.
2018–2023	Laura Miller, PhD: High-dimensional and unbinned measurements using machine-learning methods with ATLAS data. PhD completed August 2023; subsequently appointed as a postdoctoral researcher at TRIUMF.
2017–2021	Stephen Weber, PhD: Measurements of electroweak Z +two-jet production with ATLAS. Co-supervised with Alain Bellerive. His thesis received the 2021 CAP Particle Physics Division Thesis Award.
2022–2023	Gustav Lindberg, MSc: Particle-level definition of dark jets. Co-supervised with Caterina Doglioni, Lund University.
2016–2018	Tae Hyon Park, MSc: Measurement of the ATLAS jet energy resolution using momentum-balance techniques.
2016–2018	Steven Lee, MSc: Development and evaluation of ATLAS Inner Tracker strip sensors and detector modules. Co-supervised with Thomas Koffas.

POSTDOCTORAL RESEARCHERS

I have provided scientific mentoring to postdoctoral researchers in the Carleton ATLAS group, particularly in physics analysis, jet reconstruction and calibration, and machine-learning methods. Listed below are researchers with whom I have worked particularly closely.

2024–present	Yuzhan Zhao, Postdoctoral Fellow: Scientific mentoring on the design and implementation of a precision electroweak Zjj measurement, including analysis strategy, software framework, n-tuple production and treatment of systematic uncertainties.
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2023–present	Jeffrey Dandoy, Postdoctoral Fellow: Close collaboration and mentoring in ATLAS jet reconstruction and calibration and machine-learning-based unbinned measurements. Jeff currently serves as an ATLAS JetEtMiss convener. We also jointly planned and organized the 2024 ATLAS Hadronic Calibration Workshop in Ottawa.
2022–2026	Melpomeni (Magda) Diamantopoulou, Postdoctoral Fellow: Close mentoring in ATLAS jet calibration following her move from CMS, including regular supervision as she developed expertise in in-situ calibration. She subsequently became an ATLAS in-situ jet-calibration convener and is currently a postdoctoral researcher at Tel Aviv University.
2019–2026	Christoph Klein, Postdoctoral Fellow: Mentoring and collaboration on quality control, testing and commissioning of the ATLAS ITk strip detector.
2017–2025	John Keller, Postdoctoral Fellow: Mentoring and close collaboration on ATLAS physics analyses and detector activities, including the vector-boson-fusion WH analysis probing the relative sign of the Higgs-boson couplings to vector bosons, and work on the ATLAS ITk strip detector.
2016–2017	Ioannis Nomidis, Postdoctoral Fellow: Close mentoring in Higgs-boson physics, including the $H \rightarrow ZZ^* \rightarrow 4\ell$ and $H \rightarrow \gamma\gamma$ channels. Our collaboration continued after he left Carleton; he subsequently served as an ATLAS $H \rightarrow \gamma\gamma$ convener from 2019–2021.

UNDERGRADUATE RESEARCH STUDENTS

I regularly supervise undergraduate research through full-year Honours projects and summer research programs. Honours projects span the academic year and culminate in an Honours thesis, while summer students typically work full-time on a research project through programs such as the NSERC USRA and IPP. I particularly value these opportunities to introduce undergraduate students to research, and have supervised summer students in most years since joining Carleton.

Honours research projects

2025–2026	Kieran Macqueen-Ladouc, BSc Honours: <i>Improved Calibration of Hadronic Jets Under High Pileup Conditions at ATLAS</i>
2024–2025	Maya Gyi, BSc Honours: <i>Look at this graph: Kernel based visualization of unbinned data</i>
2024–2025	Ajmer Thethy, BSc Honours: <i>Determining jet energy resolution using a convolution based method.</i>
2024–2025	Ratulkannan Rengaprabhu, BSc Honours: <i>Jet Calibration using the Forward Folding Technique.</i>
2023–2024	Lei Zhong, BSc Honours: <i>3D visualization of ATLAS particle collision events;</i> co-supervised with J. Heilman.
2018–2019	Alex Duran Buchsbaum, BSc Honours: <i>Simulation of particle showers in electromagnetic calorimeters.</i>

Summer research students

2026	Evan Rhyness: Invited to return for a second summer of research, supported directly by the ATLAS grant. Studied the rate and properties of pileup jets and techniques for their mitigation in ATLAS.
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2025	Evelyn Bodnar, NSERC USRA: Search for the lepton-flavour-violating Higgs-boson decay $H \rightarrow e\mu$, and development of final-state-radiation corrections for leptonic Higgs-boson decays. Co-supervised with J. Heilman.
2025	Evan Rhyness, NSERC USRA: Investigated measurements of Z -boson polarization and differential cross sections in electroweak Zjj production.
2023	Thomas Admiral, NSERC USRA: BDT vs. NN: Comparing performance for density reweighting.
2023	Maya Gyi, NSERC USRA: AI-aided modelling of background process to Higgs bosons decaying to muons.
2021	Kristopher Samant, NSERC USRA + IPP: Machine-learning methods for quark–gluon jet identification.
2021	J��r��mie LePage-Bourbonnais, NSERC USRA: Research on dark-matter emerging-jet signatures; co-supervised with Kevin Graham.
2019	Caitlyn Dewar, NSERC USRA: Modelling high-intensity pileup interactions for ATLAS collision data.
2018	Gareth Smith, NSERC USRA + IPP: Unsupervised machine-learning algorithms for hadronic-jet identification.
2017	Andrew Zwaniga, CUROP: Fiducial Higgs-boson cross-section measurements.
2016	Audrey Vallencourt, NSERC USRA: Visualization tools for high-energy collisions and QCD pull-vector studies.

ADDITIONAL RESEARCH MENTORING

My formal supervision record does not capture the full extent of my research mentoring. Throughout my career as a faculty member, CERN Fellow, and postdoctoral researcher, I have regularly provided substantial day-to-day scientific supervision to students and junior researchers for whom I was not the formal academic supervisor. Within ATLAS, this has included serving as technical supervisor for qualification projects, particularly in jet calibration, and mentoring students working in the JetEtMiss and Higgs groups. During my years based at CERN, I also regularly provided hands-on supervision to visiting students working on analyses within groups in which I held coordination or senior analysis roles, often meeting with them weekly throughout their projects. As a faculty member, I have continued this type of mentoring through physics-analysis supervision of students whose formal supervision is associated with detector projects or other faculty members.

Selected examples of earlier mentoring

2010	Miram Diamond: Supervised during my postdoctoral research at Carleton on alignment and energy-response studies of the ATLAS Forward Calorimeters using early collision data. She is now a professor at the University of Toronto.
2012	Steven Schramm: Supervised his ATLAS qualification project in jet calibration while I was a CERN Fellow. He subsequently served as an ATLAS JetEtMiss convener and is now a professor at the University of Geneva.

UNIVERSITY TEACHING AND TEACHING DEVELOPMENT

Since joining Carleton in 2016, I have maintained a full teaching load of three courses per year, except during my sabbatical and my first year, when I received one course release. My teaching spans large introductory service courses, core undergraduate physics, computational and statistical methods, and advanced graduate particle physics. I have taught PHYS 1004, a large first-year engineering service course with approximately 1,200 students across three or four sections, particularly frequently, and have served as course coordinator. I have also contributed substantially to teaching in computation and statistical data analysis, including the development of the new second-year Computational Methods course (PHYS 2801).

COURSES TAUGHT

2016–present	PHYS 1004 – Introductory Electromagnetism and Wave Motion: Large first-year engineering service course; approximately 1,200 students annually across three sections. Taught on seven occasions by 2027, including service as course coordinator.
2024–present	PHYS 2801 – Computational Methods for Physics: New second-year course that I helped develop, introducing numerical methods, scientific computing, data analysis and machine learning earlier in the undergraduate physics program.
2016–2024	PHYS 4807/5002 – Statistical Data Analysis: Combined senior-undergraduate/graduate course covering statistical methods and computational techniques for physics.
2020–present	PHYS 4409 – Thermodynamics and Statistical Physics: Senior undergraduate course in thermodynamics and statistical mechanics.
2017–2021	PHYS 2401 – Thermal Physics: Core undergraduate introduction to thermal physics.
2019, 2025	PHYS 6602 – Advanced Particle Physics Phenomenology: Graduate special-topics course taught jointly by four faculty members; my section covers LHC physics.

TEACHING DEVELOPMENT AND PEDAGOGY

I take an active approach to course development and regularly revise my teaching in response to student needs, new technologies and experience from previous offerings. My teaching emphasizes active problem solving, quantitative reasoning and the ability to interpret computational and statistical results critically. I make extensive use of interactive questions, computational demonstrations and Jupyter notebooks, and have increasingly incorporated structured tutorials and hands-on exercises. More recently, I have also developed approaches for teaching students to use modern AI tools critically and responsibly.

2020–2022	Physics Department Teaching Mentor: Provided guidance and technical support to instructors, including during the transition to online and mixed-mode teaching.
2019	Course Design Fundamentals: Completed all five workshops offered by Carleton’s Educational Development Centre.

2024–present	Development of PHYS 2801: Helped develop and refine the new second-year Computational Methods course, with an emphasis on hands-on computational skills, numerical problem solving, statistical reasoning and critical interpretation of results.
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ACADEMIC AND PROFESSIONAL SERVICE

I have contributed to academic service at the departmental, university, and international scientific-community levels throughout my time at Carleton. My activities include academic governance and curriculum development, organization of seminars and scientific meetings, scientific review and editorial responsibilities within ATLAS, thesis examination, and outreach.

UNIVERSITY AND DEPARTMENTAL SERVICE

2023–present	Institute of Data Science: Physics Department representative.
2023–present	School of Computer Science Board: Physics Department representative.
2023–present	Physics Equity, Diversity and Inclusion Committee: Member of the departmental committee.
2023–2025	Physics Seminar Organization Committee: Chair; coordinated the departmental seminar program and visiting speakers.
2023–2025	Undergraduate Summer Research Program: Departmental coordinator for NSERC USRA and IPP summer students.
2019–2022	Carleton University Senate: Elected member of the University’s senior academic governing body.
2016–2022	Physics Curriculum Committee: Contributed to undergraduate and graduate curriculum development, including program revisions and implementation of learning outcomes.
2016–2017	Physics Recruitment and Retention Committee: Contributed to student recruitment and outreach activities.

SERVICE TO THE SCIENTIFIC COMMUNITY

2024–present	Institute of Particle Physics (IPP) Trustee:: Serve as a Trustee of Canada’s national organization for particle physics, contributing to governance and activities supporting the Canadian particle-physics community.
2023	IPP Thesis Prize Committee:: Served as a reviewer for the IPP thesis prize.
2024	ATLAS Hadronic Calibration Workshop: Local organizer and host of the international workshop at Carleton’s Dominion-Chalmers Centre, with 58 participants.
2020–present	ATLAS Editorial and Scientific Review Boards: Member or chair of collaboration-wide review boards for publications spanning Higgs physics, jet and detector performance, and heavy-ion physics.
2016–2024	ATLAS Higgs HEPData Coordination: Coordinated the publication of numerical results and associated data for the ATLAS Higgs Physics Group.
2018–present	Journal Peer Review: Referee for scientific journals, including the Canadian Journal of Physics, Advances in High Energy Physics, and Frontiers in Artificial Intelligence.

2012–present **Conference Organization and Session Convening:** Session convener and organizer for international scientific meetings.

THESIS EXAMINATION

2026	Alexandre René, PhD, University of Ottawa: External examiner.
2025	Guilmot Ernotte, PhD, University of Ottawa: External examiner.
2024	Alexander Bachi, PhD, Carleton University: Departmental examiner.
2024	Andrew Erlandson, PhD, Carleton University: Departmental examiner.
2023	Stefan Marinov, MSc, Carleton University: Departmental examiner.
2023	Shivam Garg, PhD, Carleton University: Departmental examiner.
2022	Evan Thomas, MSc, University of Ottawa: External examiner.
2020	Louis-Guillaume Gagnon, PhD, McGill University: External examiner.
2019	Braeden Veenstra, MSc, Carleton University: Departmental examiner.
2019	Alicia Sit, MSc, University of Ottawa: External examiner.
2019	Jacob Watkin, MSc, Carleton University: Departmental examiner.
2018	Mark Reimer, MSc, Carleton University: Departmental examiner.
2018	Hugo Laroque, MSc, University of Ottawa: External examiner.
2017	Warren Cree, MSc, Carleton University: Departmental examiner.
2016	Frederic Bouchard, MSc, University of Ottawa: External examiner.

OUTREACH AND COMMUNITY ENGAGEMENT

2016–present **Physics Outreach:** Public and student lectures, high-school visits, and activities introducing students and the public to particle physics and the LHC.

PUBLICATIONS AND SCHOLARLY OUTPUT

I am a long-standing member of the ATLAS Collaboration, one of the four LHC experimental collaborations jointly awarded the [2025 Breakthrough Prize in Fundamental Physics](#).

SELECTED PUBLICATIONS WITH SIGNIFICANT INDIVIDUAL CONTRIBUTIONS

The publications below are selected from my broader publication record to highlight work to which I made substantial individual contributions. For large ATLAS Collaboration publications, authors are listed alphabetically; I therefore briefly describe my individual role in each publication.

2026 **[High-dimensional unbinned measurement of \$Z\$ +jets production](#)**
ATLAS Collaboration, ATLAS-CONF-2026-009; submission to *PRX Intelligence* imminent.
Contribution: Led the development of this high-dimensional measurement using OmniFold and variable-length particle inputs, including the unfolding strategy, machine-learning methodology and validation.

- 2026 **A Practical Guide to Unbinned Unfolding**
Eur. Phys. J. C **86** (2026) 106.
Contribution: Developed practical methodology for validating, publishing and using unbinned differential cross-section measurements, building on our earlier proposal for this new form of experimental result.
- 2025 **Evidence for the Higgs-boson decay to a pair of muons**
ATLAS Collaboration, Phys. Rev. Lett. **135** (2025) 231802.
Contribution: Supervised the Carleton contribution to the $H \rightarrow \mu\mu$ analysis, including the PhD research of Bryce Norman, contributing to the ATLAS evidence for this rare Higgs-boson decay.
- 2024 **Determination of the Relative Sign of the Higgs Boson Couplings to W and Z Bosons Using Production via Vector-Boson Fusion**
ATLAS Collaboration, Phys. Rev. Lett. **133** (2024) 141801; Editors' Suggestion.
Contribution: One of three Carleton researchers who carried out the analysis, motivated by theoretical work at Carleton (D. Stolarski, et. al). I supervised the student contribution and, together with John Keller, wrote the paper.
- 2022 **Publishing unbinned differential cross section results**
JINST **17** (2022) P01024.
Contribution: Co-developed a framework for publishing differential cross-section measurements as weighted particle-level events rather than conventional binned histograms, establishing the methodological basis for my subsequent unbinned-measurement program.
- 2021 **Differential cross-section measurements for the electroweak production of dijets in association with a Z boson**
ATLAS Collaboration, Eur. Phys. J. C **81** (2021) 163.
Contribution: Led and supervised the Carleton analysis, including the PhD research of Stephen Weber, whose thesis on this program received the 2021 CAP Particle Physics Division Thesis Award.
- 2021 **Jet energy scale and resolution measured in proton–proton collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector**
ATLAS Collaboration, Eur. Phys. J. C **81** (2021) 689.
Contribution: Made substantial contributions to ATLAS jet calibration and resolution measurements and to the development and validation of the associated calibration and uncertainty procedures.
- 2021 **Initial tests of large format sensors for the ATLAS ITk strip tracker**
Nucl. Instrum. Meth. A **986** (2021) 164677.
Contribution: Contributed to the Carleton program characterizing large-format silicon-strip sensors for the ATLAS Inner Tracker upgrade, including scientific supervision and interpretation of detector-testing studies.
- 2020 **Determination of jet calibration and energy resolution in proton–proton collisions at $\sqrt{s} = 8$ TeV using the ATLAS detector**
ATLAS Collaboration, Eur. Phys. J. C **80** (2020).
Contribution: Contributed to the development of ATLAS in-situ jet-calibration techniques and their systematic uncertainties, part of my long-standing work on precision jet-energy measurements.

- 2017 **Handbook of LHC Higgs Cross Sections: 4. Deciphering the Nature of the Higgs Sector**
 LHC Higgs Cross Section Working Group, CERN Yellow Report, CERN-2017-002-M.
Contribution: Worked closely with theorists on gluon-fusion predictions, comparisons of state-of-the-art calculations, and recommendations for theoretical uncertainties and correction factors. I also contributed to the development of the Simplified Template Cross Section framework and, with Carleton student Jim Lacey, implemented the original STXS categorization in Rivet, subsequently incorporated into the ATLAS and CMS simulation workflows.
- 2014 **Measurements of fiducial and differential cross sections for Higgs boson production in the diphoton decay channel at $\sqrt{s} = 8$ TeV with ATLAS**
 ATLAS Collaboration, JHEP **09** (2014) 112.
Contribution: Helped pioneer the development of fiducial and differential Higgs-boson cross-section measurements in ATLAS, working closely with Florian Bernlochner and Andy Pilkington. This analysis established an early framework for model-independent precision measurements of Higgs-boson production.
- 2012 **Observation of a new particle in the search for the Standard Model Higgs boson with the ATLAS detector at the LHC**
 ATLAS Collaboration, Phys. Lett. B **716** (2012) 1–29.
Contribution: Responsible for ensuring that jet-related systematic uncertainties were consistently evaluated and propagated across the Higgs searches, with particular responsibility for this aspect of the $H \rightarrow WW$ analysis during the discovery review.
- 2012 **Jet energy measurement with the ATLAS detector in proton–proton collisions at $\sqrt{s} = 7$ TeV**
 ATLAS Collaboration, Eur. Phys. J. C **73** (2013) 2304.
Contribution: Played a leading role in the development of early ATLAS jet-energy calibration, including in-situ calibration methods and the evaluation of jet-energy-scale uncertainties.
- 2009 **Observation of Single Top Quark Production**
 D0 Collaboration, Phys. Rev. Lett. **103** (2009) 092001; Editors’ Suggestion.
Contribution: Played a major role in the D0 single-top-quark analysis, developing multivariate analysis and software methods used to extract the small signal from background. This work formed the core of my PhD thesis and contributed to the first observation of single-top-quark production.
- 2007 **Evidence for production of single top quarks and first direct measurement of $|V_{tb}|$**
 D0 Collaboration, Phys. Rev. Lett. **98** (2007) 181802.
Contribution: One of three researchers at Simon Fraser University who carried out the final analysis, developing a boosted-decision-tree method to separate the single-top signal from backgrounds; this was among the early applications of BDTs in high-energy physics.

PUBLICATION RECORD

As of September 2026, I am an author of 1,634 peer-reviewed publications, primarily as a member of the ATLAS Collaboration. In large ATLAS publications, authors are listed alphabetically and authorship therefore does not indicate the magnitude of an individual’s contribution. The selected publications above identify papers for which I made substantial direct contributions. My complete publication record, including citation information, is available at my [INSPIRE author profile](#).

SELECTED INVITED TALKS AND SEMINARS

Selected invited seminars and conference presentations are listed below. These include talks for which I was invited directly as well as presentations for which I was selected to represent the ATLAS Collaboration.

- 2026 **Recent results from ATLAS with emphasis on QCD:** Invited presentation representing the ATLAS Collaboration. QCD@Work 2026, Trani, Italy.
- 2024 **Anomaly detection in ATLAS:** Invited presentation representing the ATLAS Collaboration. LHCP2024, Boston, United States.
- 2022 **Multidimensional measurements using multivariate techniques:** Invited seminar, Lund University, Lund, Sweden.
- 2022 **Multidimensional measurements using multivariate techniques:** Invited seminar, University of Manchester, Manchester, UK.
- 2021 **Recent observation and measurements of vector-boson fusion and scattering with ATLAS:** EPS Conference on High Energy Physics; selected to represent the ATLAS Collaboration (online).
- 2019 **Measurement of VBF production at ATLAS and CMS:** MBI 2019, Thessaloniki, Greece.
- 2017 **Exploring the Higgs boson using the ATLAS detector:** 30th Ottawa-Carleton Institute for Physics December Symposium, Ottawa, Canada.
- 2017 **Exploring the Higgs Boson with ATLAS Data:** Western Nuclear and Particle Physics Conference (WNPPC), Banff, Canada.
- 2016 **Operation and Performance of the ATLAS detector in LHC Run-II:** Canadian Association of Physicists Congress, Ottawa, Canada; Invited talk.
- 2014 **Combination of the Higgs Boson Main Properties Measurements using the ATLAS Detector:** European Physical Society conference, Valencia, Spain; selected to represent the ATLAS Collaboration.
- 2012 **The search for the Higgs boson at the ATLAS experiment:** Invited seminar, McGill University, Montreal, Canada.
- 2011 **Small- x and forward measurements at ATLAS:** International Workshop on Deep-Inelastic Scattering and Related Subjects (DIS), Newport News, USA
- 2010 **Performance of the ATLAS Forward Calorimeters in First LHC Data:** CALOR 2010, Beijing, China; selected to represent ATLAS.
- 2009 **Discovery of Single Top Quark Production:** Rencontres de Moriond QCD, La Thuile, Italy; invited to present the $D\bar{0}$ single-top-quark discovery shortly after its announcement.
- 2007 **First Evidence of Single Top Quark Production:** Fermilab Users' Meeting, Batavia, USA; invited presentation following the first evidence for this process.