Etienne Dreyer

Curriculum Vitæ

Postdoc in ATLAS focusing on deep learning for data reconstruction and simulation challenges in particle physics.

Education

09/2015 – 09/2021	**PhD Experimental High Energy Physics** *Simon Fraser University (SFU)*	4.04 GPA
09/2011 – 05/2015	**BSc Physics** *University of the Fraser Valley (UFV)*	4.10 GPA (/4.33)

Employment

10/2021 – present	**Postdoc** *Weizmann Institute of Science (WIS)*
04/2023 – 07/2025	**Teaching assistant** *WIS* Practical Deep Learning for Science (three semesters).
09/2019 – 04/2020	**Teaching assistant** *SFU* Analog Electronics Laboratory (3rd-year); Physics for the Life Sciences (1st-year).
05/2015 – 09/2015	**Research assistant** *SFU* Summer project in high energy physics.
01/2014 – 04/2015	**Student monitor** *UFV Math Center* Drop-in tutor for various math courses.
05/2014 – 09/2014	**Undergraduate research assistant** *SFU* Summer project in nano-imaging lab.
10/2011 – 04/2012	**Physics laboratory assistant** *UFV* Work-study position servicing physics laboratory electronics.

Distinctions

Funding

09/2023	**Faculty Postdoctoral Excellence Fellowship** *WIS*	
10/2021	**Postdoctoral scholarship** *Zuckermann STEM Leadership Program*	(Amounts in CAD)
01/2019	**Michael Smith Foreign Study Supplement** *NSERC*	$6,000
09/2018	**Dr. Howard Malm Graduate Award** *SFU*	$5,200
09/2016	**Canada Graduate Scholarship - Doctoral** *NSERC*	$105,000
09/2015	**Canada Graduate Scholarship - Masters** *NSERC*	$17,500
09/2015	**Faculty of Science Graduate Entrance Scholarship** *SFU*	$2,800
04/2015	**VPR Undergraduate Student Research Award** *SFU*	$4,500
04/2014	**Undergraduate Student Research Award** *NSERC*	$4,500

Awards

02/2020	**Best poster, annual poster competition** *SFU Physics Dept.*	$100
06/2019	**Best oral presentation (particle physics division)** *Canadian Association of Physicists*	$250
06/2019	**Best final project group presenation** *GRIDS (TRIUMF)*	$225/3
09/2018	**Outstanding student contributions to physics outreach** *SFU Physics Dept.*	$50
09/2016	**3rd-best student presentation** *WNPPC*	$250

06/2015 **Dean's medal** *UFV Faculty of Science*
05/2013, 05/2014 **Outstanding achievement award** *UFV Department of Mathematics*
07/2014 **Sponsorship for London International Youth Science Forum** *UFV Faculty of Science*

Coordination

12/2023 – present **Co-convener** *ATLAS Tau Reconstruction & Identification subgroup*
05/2023 – present **Member** *ATLAS Statistics Committee*
03/2023 – 12/2023 **Editorial board chair** *3^{rd}-generation LQ pair production combination – Phys. Lett. B 854 (2024)*
02/2023 – present **Organizer** *WIS experimental HEP joint seminars*
07/2019 **Head volunteer** *CAP Congress Local Organizing Committee*
05/2018 – 04/2019 **Analysis co-coordinator** *Full Run-2 high-mass dilepton analysis – Phys. Lett. B 796 (2019)*
09/2015 – 09/2018 **President, Treasurer** *SFU Physics Graduate Caucus*
09/2013 – 05/2015 **Vice-president** *UFV Physics Students Association*

Presentations

Conferences

07/2025 [↗] **Hypergraph learning for full event reco. at pp and e^+e^- colliders** EPS-HEP (Marseille)
12/2024 [↗] **DL for particle reconstruction** Digital Twins for Nuclear and Particle physics (Genova)
11/2023 [↗] **Generic representations of jets at detector-level with SSL** ML4Jets (DESY)
11/2023 [↗] **Aspects of deep learning in particle flow** Hammers & Nails (Ascona)
04/2023 [↗] **Configurable Calorimeter for AI applications** IPS annual meeting (Tel Aviv)
11/2022 [↗] **Particle reconstruction in jets with hypergraph prediction** ML4Jets (Rutgers)
08/2022 **Particle reconstruction in jets with object condensation** Hammers & Nails (WIS)
06/2019 [↗] **The search for exotic dilepton signatures in the full LHC Run-2 dataset collected with the ATLAS detector** Canadian Association of Physicists Congress (SFU), ★ 1^{st}-place in division
04/2019 [↗] **The search for high mass dilepton resonances in Run II data from ATLAS** ALPS (Obergurgl)
09/2018 [↗] **Z' & Contact interactions searches at the LHC: Experiment overview** CKM (Heidelberg)

ATLAS workshops

10/2024 [↗] **Tau Combined Performance Group Report** ATLAS Collaboration Week (CERN)
08/2024 [↗] **Jet Definitions: Future developments** Hadronic Calibration Workshop (Ottawa)
Session co-chair; responsible for synthesizing contributions.
10/2022 [↗] **Machine learning hands-on tutorial** Exotics Workshop (Amsterdam)
Also co-chaired the Statistics and ML session.

Seminars

11/2024 [↗] **Deep learning for reconstructing and simulating particles in collider experiments** (BGU)
08/2022 [↗] **Disentangling particle jet using deep learning on graphs and hypergraphs** (SFU)
11/2020 [↗] **Searching for new physics with ATLAS in the dilepton spectrum and beyond** (TRIUMF)

Outreach talks

10/2020 [↗] **Quarks, leptons, and the Z in between: particle physics at the high energy frontier** UFV
2018 [↗] **Ideas in collision: physics at the high energy frontier** Saturday Morning Lecture (TRIUMF)
Also presented at Campus des Nations, Kings Community, and Robert Bateman secondary schools.

Publications

HEP & ML papers (ordered by contribution)

2025 [↗] **Extending Hypergraph Particle Flow to Collider Event Reconstruction** *7 authors* (EPJC)
Conceptualization, data creation, model training, investigation, visualization, writing, supervision.

2023 [↗] **Reconstructing particles in jets using set transformer and hypergraph prediction networks** *11 authors* (EPJC)
Conceptualization, data creation, model training, investigation, visualization, writing.

2025 [↗] **Self-Supervised Learning Strategies for Jet Physics** *8 authors* (arXiv)
Model training, investigation, visualization, editing, supervision.

2023 [↗] **Configurable calorimeter simulation for AI applications** *12 authors* (MLST)
Software development, vizualization, writing.

2024 [↗] **Automated Approach to Accurate, Precise, and Fast Detector Simulation and Reconstruction** *6 authors* (PRL)
Data creation, investigation, editing.

2025 [↗] **Conditional Deep Generative Models for Simultaneous Simulation and Reconstruction of Entire Events** *5 authors* (arXiv)
Data creation, editing.

2024 [↗] **Diffusion models for fast simulation of reconstructed particles** *6 authors* (PRD)
Data creation, editing.

2024 [↗] **Denoising Graph Super-Resolution towards Improved Collider Event Reconstruction** *3 authors* (arXiv)
Data creation, investigation, writing.

2024 [↗] **CaloGraph: Graph-based diffusion model for fast shower generation in calorimeters with irregular geometry** *4 authors* (PRD)
Conceptualization, editing.

2024 [↗] **PASCL: Supervised Contrastive Learning with Perturbative Augmentation for Particle Decay Reconstruction** *6 authors* (MLST)
Conceptualization, editing.

2023 [↗] **Set-conditional set generation for particle physics** *9 authors* (MLST)
data creation.

ATLAS results (ordered by contribution)

2019 [↗] **Search for high-mass dilepton resonances using 139 fb^{-1} of pp collision data collected at $\sqrt{s}$=13 TeV with the ATLAS detector** (PLB) ↻ 482 citations
Coordination, sample pipeline development, background estimation, statistical analysis.

2017 [↗] **Search for new high-mass phenomena in the dilepton final state using 36.1 fb^{-1} of proton-proton collision data at $\sqrt{s}$=13 TeV with the ATLAS detector** (JHEP) ↻ 492 citations
Statistical p-value and trials factor computation.

2020 [↗] **Search for new non-resonant phenomena in high-mass dilepton final states with the ATLAS detector** JHEP
Propagating systematic uncertainties into expected signal yield.

2024 [↗] **Combination of searches for pair-produced leptoquarks at $\sqrt{s}$=13 TeV with the ATLAS detector** (PLB)
Editorial board chair.

2024 [↗] **Constraints on simplified dark matter models involving an s-channel mediator with the ATLAS detector in pp collisions at $\sqrt{s}$=13 TeV** (EPJC)
Developed full reinterpretation pipeline for full Run-2 limits on dilepton resonances.

2023 [↗] **Electron Identification with a Convolutional Neural Network in the ATLAS Experiment**
I helped derive the high-statistics sample of fake electron candidates from data.

2020 [↗] **Testbeam studies of barrel and end-cap modules for the ATLAS ITk strip detector before and after irradiation** Nucl. Instrum. Meth. A
Analysis of data from testbeam campaigns at DESY, where I contributed in April 2019.

2017 [↗] **Technical Design Report for the ATLAS Inner Tracker Pixel Detector** ATLAS-TDR-030
The figures in section 3.1.3 are from my studies on the impact of misaligned pixel detector modules.

Community papers

2022 [↗] **Summarizing experimental sensitivities of collider experiments to dark matter models and comparison to other experiments** *A. Boveia, C. Doglioni, et al.* (Snowmass whitepaper)
Dilepton reinterpretation framework.

2022 [↗] **Machine Learning and LHC Event Generation** *A. Butter, T. Plehn, et al.* (SciPost Phys.)
Writing.

2024 [↗] **CaloChallenge 2022: A Community Challenge for Fast Calorimeter Simulation** *C. Krause et al.* (arXiv)
CaloGraph contribution.

Graduate course papers

2021 [↗] **The search for new high-mass resonances in the dilepton final state using the full Run-2 ATLAS dataset of 13 TeV proton-proton collisions** (PhD thesis)

2019 [↗] **Foundations of Gravitational Waves** (General Relativity course)

2017 [↗] **String Theory at First Glance** (Quantum Field Theory II course)

2016 [↗] **The Higgs as a Pseudo Nambu Goldstone Boson** (Graduate Particle Physics course)

Schools & programs attended

2025 **Postdoctoral Leadership Course** *WIS*

2022 [↗] **Learning to Discover** *Institut Pascal, Orsay*

2019 [↗] **Graduate Instrumentation and Detector School (GRIDS)** *TRIUMF*

2018 [↗] **European School of High-Energy Physics** *Maratea*

2017 [↗] **The Building Blocks of Science Writing** *CERN*

2017 [↗] **Winter Nuclear and Particle Physics Conference** *Banff*

2016 [↗] **TRISEP Summer School** *TRIUMF*

Volunteering

- Virtual tutor, *ATLAS Software Tutorial* — Feb 2021
- Tour guide of Phys. Dept., *Discover Physics @ SFU* — Oct 2015, 2016, 2017, 2019
- CERN tour guide — Spring 2019
- Virtual visits moderator, *CERN International Masterclass* — Mar 2019
- Volunteer, SFU annual *ATLAS Masterclass* — Apr 2016, 2017, 2018
- Student mentor, *What Can YOUth Do?* workshop for gifted high school students — Apr 2017
- Tour guide of Phys. Dept. *SFU 50th event* — Sep 2015
- Divisional judge, *Fraser Valley Regional Science Fair* — Apr 2012, 2014
- Volunteer, *Math Mania* and *Math Challengers* Fraser Valley Regional Competitions — 2014, 2015
- Helped organize student tours of *D-Wave Systems* and *General Fusion* — Dec 2014, Feb 2015