

Scientific Computing Department

Activities & Plans

ACOT Meeting, Spring 2026

Department Organization & Area of activities

- Two areas / groups:
 - ATLAS Tier-1 Centre & Distributed Computing / HPC (RT / Di Qing)
 - Machine Learning & Quantum Information Systems (W. Fedorko)
- Nexus for HPC and ML in Canada with strong international connections
- ATLAS Tier-1 Centre personnel:

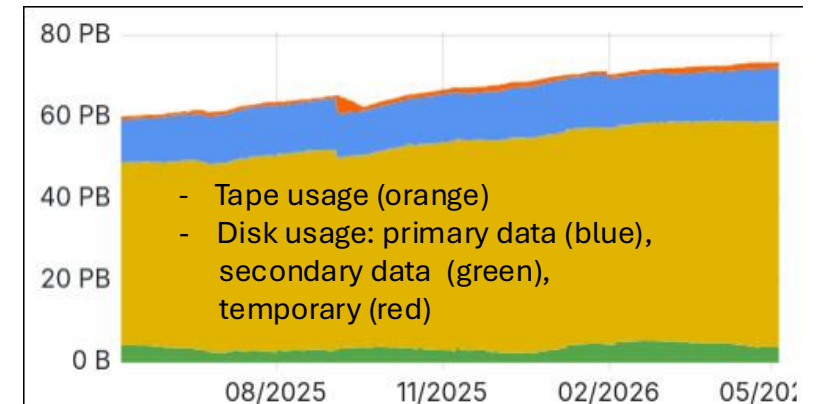
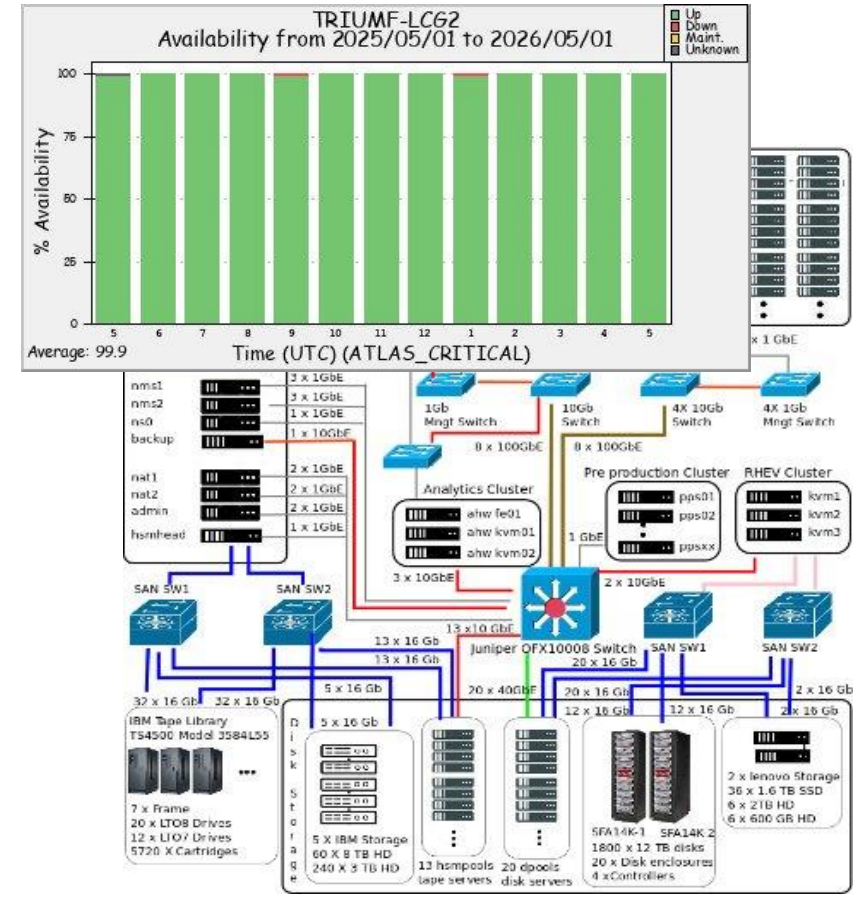
A. De Silva	X. Liu
R. Debhandari	D. Qing(*)
F. Fernandez Galindo	Y. Shin
A. Wong(**)	
- Quantum Machine Learning RA: Javier Toledo (until end of 2025), now Researcher at D-Wave
- **Hiring process ongoing to increase ML effort and support for TRIUMF**
- Another group will be added: focus on software R&D for HL-LHC era (new CFI funding)

(*recently promoted to Tier-1 operations group leadership as of April 1, 2026)

(**retired on July 31, 2025)

ATLAS Tier-1 Centre activities

- Overall smooth 24/7 distributed computing operations with high availability and reliability (~100%)
 - data storage, data processing, simulations, and user analysis in a highly secure environment
 - quasi-online raw data stream from CERN
 - crucial user support for the entire collaboration
- Current capacity: ~10,000 cores ; 22 PB disk ; 79 PB tape
- Primary resources located at SFU (since 2018); old Tier-1 compute resources at TRIUMF still used for simulation tasks (federation of sites)
- New storage infrastructure deployed + data migration
- CFI project (IF 2020) extended to August 2026 to finalize spending. Vendors facing severe supply chains issues.
- New CFI award (IF 2025): \$13.5M total project costs. Announced in December 2025. Condition lifted end of March; BC government application for matching funds submitted in April.



ML & QC activities

- Several projects supported and driven by Scientific Computing in collaboration across departments and divisions, providing a strong basis for HQP training.

- **CaloQVAE w/ Particle Physics:** application of quantum-assisted generative AI using D-Wave quantum annealers for fast calorimeter simulation for the HL-LHC. **ATLAS** data publication in preparation

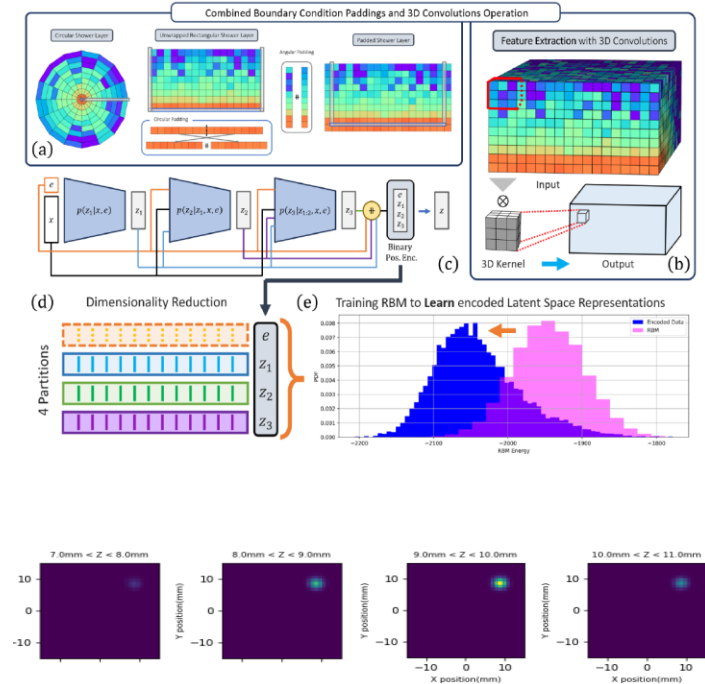
Previously: *npj Quantum Inf* 11, 114 (2025). <https://doi.org/10.1038/s41534-025-01040-x>

- **Therapeutic Isotope Imager with Gamma Rays (TIIGR), w/ Science Technology + Life Sciences:** detector designs studies and ML imaging techniques for theranostic applications focusing on Targeted Alpha Therapy with Ac225 in the ARIEL and IAMI era. UBC EngPhys student supervision – continue in 26/27.

- **Water Cherenkov detectors w/ Particle Physics:** ML techniques are being developed and tested for Super-K and others for reconstruction of lepton momentum and vertex position.

- **Bayesian Optimisation for Ion Steering w/ Accelerator Division:** ML techniques are used for ion beam steering through low, medium and high energy sections of the ISAC accelerator and into the DRAGON experiment.

- **Real time AI using FPGAs for ATLAS trigger w/ Particle Physics:** calorimeter cluster calibration using AI techniques developed and studied for low-latency high-bandwidth evaluations using FPGA for potential deployment for the HL-LHC era.



Future plans & directions

- ATLAS Tier-1 Centre
 - Continuing successful 24/7 operations as per international commitment
 - Hardware refresh and large-scale expansion for the HL-LHC (CFI IF 2025)
 - Software R&D for the HL-LHC (part of CFI IF 2025 request), 3 FTEs.
- ML + QC projects
 - Continuing support and leadership of existing ML & QC projects
 - NRC AQC new round in preparation; Alliance Quantum in preparation
 - ARIEL operations support:
 - Automatic beam tuning will support accepting beam from ARIEL into ISAC
 - ML-assisted target painting for commissioning discussed
 - In-house rapid ML development platform key to the success: purchase of new high-end machine (**delayed**)
 - Additional personnel is key to support a wider research portfolio across TRIUMF
 - Difficult under 5YP constraints. Leveraging on recent Tier-1 personnel retirement and computing evolution to shift effort toward ML initiatives; (interview process finalized, **offer out to candidate**)
 - Nuclear Physics
 - Some opportunities identified (initial interest demonstrated at workshop in 2023)
 - Material Science (w/ CMMS)
 - Quantum Simulation (Alliance Quantum In preparation; NFRF not successful); **Impact+ postdoc** successful
 - Life Sciences (w/ Science & Technology)
 - Medical Imaging (TIIGR) (NFRF not successful)

Thank you!