# Justin Domagala-Tang

*Physics & Scientific Computing Undergraduate* • *Data Analysis, Machine Learning, Optimization & Simulation*

London, Ontario, Canada • jdomaga2@uwo.ca • justindt.ca • linkedin.com/in/justind-t

## EDUCATION

**Honours Bachelor of Science in Physics, Major in Scientific Computing & Numerical Methods** **September 2024 – Present**
*University of Western Ontario* *London, Ontario, Canada*

- Dean's Honour List (2024–25, 2025–26); Scholar's Electives Program (3% admission rate), an interdisciplinary module with a supervised, credit-bearing research project in each year of study.
- **Relevant coursework:** Quantum Mechanics, Electromagnetic Theory, Classical Mechanics, Data Structures & Algorithms, Computer Simulations in Physics, Partial Differential Equations, Probability & Statistics.

## PROFESSIONAL EXPERIENCE

**Undergraduate Researcher, Planetary Defence** **September 2026 – Present**
*Department of Physics & Astronomy, Western University* *London, Ontario, Canada*
Supervisor: Prof. Paul Wiegert

- Building a Python analysis of the Minor Planet Center catalogue and JPL Close Approach Database to measure how much warning recently discovered near-Earth asteroids give before their closest approach to Earth.
- Back-propagating orbits to estimate when each object first became detectable, and relating warning time to solar elongation, size, miss distance, and orbit class to locate blind spots in current sky surveys.
- Comparing these catalogue-based results with earlier simulation studies to give an empirical benchmark for planetary defence strategy and the design of future survey telescopes.

**Visiting Researcher, Mitacs Globalink** **April – August 2026**
*Faculty of Aerospace Engineering, Delft University of Technology* *Delft, Netherlands*
Supervisors: Dr. Vincent Meijer, Dr. Denis Vida

- Installed and commissioned a contrail detection camera at the NEOSAT Lab, then built a camera-to-geodetic projection and computer-vision tracking chain that turns its images into calibrated atmospheric measurements.
- Developed a Gaussian-process regression model that corrects ERA5 upper-troposphere winds using these observations, with exact Cholesky inference, L-BFGS-B hyperparameter fitting, and CuPy GPU acceleration.
- Built the ETL pipeline fusing contrail annotations, ADS-B flight tracks, and cloud-hosted ERA5 data (Zarr, xarray), structured as a modular Python library with swappable CPU and GPU back-ends.
- Reduced wind-speed RMSE from 2.50 to 1.84 m/s in walk-forward cross-validation, removing about 60% of the error above the measurement noise floor; presented at the London Contrail Workshop 2026.

**Undergraduate Researcher, Quantum Optics** **September 2025 – April 2026**
*Submillimetre Astronomy Laboratory, Western University* *London, Ontario, Canada*
Supervisor: Prof. Martin Houde

- Designed and assembled precision optical and millimetre-wave equipment for an experiment to observe steady-state quantum subradiance in a room-temperature molecular gas, iteratively revising components to improve sensitivity.
- Detected gas-phase thermal emission from $CH_3CN$ near 331 GHz, writing Python acquisition and instrument-control tools (PyVISA, PySerial) and refining measurement procedures along the way.
- Presented the experiment at PhUnC 2026 (2nd place) and the Western Student Research Conference 2026 (3rd place).

**Undergraduate Summer Research Intern** **April – September 2025**
*Western Meteor Physics Group, Western University* *London, Ontario, Canada*
Supervisors: Dr. Peter Brown, Dr. Denis Vida

- Built an automated pipeline that detects and measures very faint meteors in EMCCD detector video, combining OpenCV computer vision, particle-swarm optimisation, and numerical model fitting to replace manual reduction.
- Achieved 4× better spatial accuracy and 3× lower measurement uncertainty than manual analysis, making about 200,000 faint-meteor trajectories available for studies of the meteoroids that threaten satellites.
- Presented results to NASA's Meteoroid Environment Office and at Asteroids, Comets, Meteors 2026 (Poznań, Poland) with Canadian Space Agency travel funding; first-author manuscript in preparation.

**Orbital Dynamics Team Lead** **November 2024 – September 2025**
*The Western Skylark CubeSat, Institute for Earth & Space Exploration* *London, Ontario, Canada*

- Designed and completed 7 Canadian Space Agency-mandated tests for a $350,000 CSA-funded 3U CubeSat, modelling conjunction, de-orbit, and debris-propagation scenarios with Ansys STK and NASA DAS.
- Led orbital analysis for about 1,000 remote Arctic MOTUS wildlife-tracking stations as the youngest team lead in a 60+ member multidisciplinary team, coordinating testing and technical documentation.

## PUBLICATIONS

- **Domagala-Tang, J.**, Vida, D., Brown, P., Vovk, M. "Development of an Automated Very Faint Meteor Analysis Algorithm Applied to EMCCD Sensor Measurements." Manuscript in preparation for *Experimental Astronomy*.
- Vovk, M., Brown, P., Vida, D., Campbell-Brown, M., Aubry, B., **Domagala-Tang, J.** "A New Entry Model for Iron Meteoroids: Observational Signatures and the I-Type Micrometeorite Link." *Journal of Geophysical Research: Planets*, in review.
- Vovk, M., Brown, P., Vida, D., Lee, C., **Domagala-Tang, J.**, Harmos, R. "Physical Properties of Sporadic Meteoroids: Insights into the Dominant Source of Satellite Impacts." Manuscript in development.

## PRESENTATIONS

- **2026:** Asteroids, Comets, Meteors (Poznań, Poland) • London Contrail Workshop (London, UK) • Global Meteor Network Annual Meeting • PhUnC (2nd place) • Western Student Research Conference (3rd place) • Research Opportunities in Physics
- **2025:** Western Meteor Group NASA Day • USRI Research Conference • Western Quantum Innovation Showcase • PhUnC

## TECHNICAL SKILLS

- **Programming & tools:** Python (advanced), C, Java, SQL; Linux/Unix, Git, Docker, Conda, Jupyter, LaTeX.
- **Data & scientific computing:** NumPy, SciPy, Pandas, xarray, Zarr, CuPy (GPU), OpenCV, AstroPy, Matplotlib.
- **Machine learning & optimisation:** Gaussian processes, Bayesian model fitting, cross-validation, particle-swarm and convex optimisation, Kalman filtering, robust regression, scikit-learn, PyTorch.
- **Space & instrumentation:** Ansys STK, NASA DAS, orbit propagation, camera calibration, astrometry, EMCCD detectors, optical and millimetre-wave systems, high-vacuum handling.
- **Quantum computing:** IBM Qiskit, D-Wave Ocean SDK, QUBO formulation.

## LEADERSHIP & EXTRACURRICULAR EXPERIENCE

**Director of Photography** **September 2025 – Present**
*CAISA Fashion Show* *London, Ontario, Canada*

- Lead a 5-member photography team for one of Canada's largest student-run charity fashion shows, which has raised over $440,000 for Children's Health Foundation, running mentorship, workshops, and shoots.

**Co-Vice President, External Affairs** **September 2025 – Present**
*Vietnamese Students' Association, Western University* *London, Ontario, Canada*

- Identify, pitch, and manage corporate sponsorships for the association's events, coordinating partner communications.

**Quantum Developer** **September 2024 – April 2025**
*Western Quantum Computing Club* *London, Ontario, Canada*

- Formulated ETF portfolio selection as QUBO problems with D-Wave Ocean SDK and IBM Qiskit, and led benchmarking of quantum against classical optimisers on historical market data.

**Also:** Science Soph, Faculty of Science Orientation (2026–Present) • Scholar's Electives Peer Mentor (2025–Present) • VP Communications, Physics & Astronomy Student Association (2025–26) • Western Science Day Volunteer (2025–26) • Media Executive, Taiwanese Association at Western (2024–25)

## AWARDS, TRAINING & LANGUAGES

**Awards:** Rogers Family Award, $2,500 (2026) • CSA travel funding, ACM 2026 • International Learning Award (2025) • Western Admission Scholarship Study Abroad Funding (2025) • Western Scholarship of Distinction (2024)

**Training & hackathons:** ESA/ELGRA Gravity-Related Research Summer School, Belgium (2026) • QAI Ventures GenQ Quantum Hackathon, 5th place • UWO AI Automotive Challenge • HackWestern (2026) • NASA Space Apps Challenge (2026)

**Languages:** English (native), French (DELF B1), Polish (A2) • **Interests:** film photography, canoe tripping, strength training