Ethan Elliot Rajkumar

ethanrajkumar2001@gmail.com | linkedin.com/in/ethanrajkumar | github.com/ethraj2001 | eraj.netlify.app

Education

University of British Columbia 2019 - 2025
BSc, Chemistry and Statistics Vancouver, BC

- cGPA: 3.3, Current GPA: 3.75

Research Experiences

Bizotto Group Vancouver, BC
Undergraduate Research Assistant *August 2024 – Present*

- Constructed predictive models for estimating the state of health in Li-Ion batteries using galvanostatic electrochemical impedance spectroscopy.
- Created Python scripts to analyze charge/discharge cycles, enhancing insights into Li-Ion battery performance.
- Engineered Bayesian Estimators with GPy and BoTorch to predict State of Charge and State of Health in ML2032 batteries.

Roman Krems Group Vancouver, BC
Undergraduate Research Assistant *May 2022 – Present*

- Implemented error-mitigation strategies in DVR-VQE algorithms for predicting ro-vibrational energy levels using the `ibm_quebec` quantum computer, Qiskit, and Pennylane
- Executed a hardware-efficient measurement protocol on quantum hardware to optimize complexity constraints
- Designed a Bayesian Optimization algorithm with MILA and McMaster University to improve quantum circuit design and algorithm scalability

Department of Chemistry, University of British Columbia Vancouver, BC
Teaching Assistant for CHEM 1XX Labs/Resource Center *September 2021 – Present*

- Teaching assistant and General Resource Center TA for my lab section of 24 students
- Holding office hours to clarify any misunderstandings with content
- Performing demonstrations for training students in how to use lab equipment
- Marked student assignments and provided constructive feedback on them

Acceleration Consortium Toronto, ON
Summer Undergraduate Research Assistant *May 2024 – Aug. 2024*

- Developed Python scripts and calibration protocols to integrate Rotating Disk Electrode (RDE) into low-cost, open-source platforms.
- Contributed RDE configuration and STL files to science-jubilee and Jubilee libraries, improving functionality.
- Customized Jubilee 2.2.2 for SDL2, optimizing performance with Duet3 electronics and 3D-printed parts.
- Presented automation advancements at the 2024 Accelerate Conference.

UBC Biomolecular Design (BIOMOD) Team Vancouver, BC
Wetlab and Computational Team Lead, Undergraduate Researcher *Nov. 2019 – Jan. 2024*

- Developed self-assembled DNA nanorobotic arms and a modular enzyme delivery vehicle for biomedical diagnostics and biofilm targeting.
- Designed and optimized DNA-Origami Structures (DOS) *in situ* using CaDNAno and Python for both projects
- Co-developed a Python library for thermal annealing analysis and detecting design flaws in DOS
- Presented work at major conferences, including Harvard NCRC, UBC MURC, and BIOMOD Japan Open.

Xenon Pharmaceuticals Burnaby, BC
Compound Properties Group Co-op Student *Jan 2022 – April 2022*

- Developed mass spectrometry-based methods for analyzing BLAST results, integrating chromatographic techniques to enhance peptide and metabolite identification.

- Applied targeted multiple reaction monitoring (MRM) mass spectrometry to validate BLAST-detected transmembrane protein expression in biological tissues.
- Optimized mass spectrometry workflows to improve sequence alignment accuracy and facilitate quantitative proteomics in BLAST-identified protein targets.

Vallance Lab Vancouver, BC

Summer Undergraduate Research Assistant *May 2021 – August 2021*

- Developed an *in vitro* model of *C. rodentium* infection using 2D IEC monolayers derived from organoids.
- Examined pattern recognition receptors that detect pathogen-associated molecular patterns and activate the innate immune response in epithelial cells.
- Used techniques such as pathogen burden assays, qPCR, Nanodrop UV spectrophotometry, ELISA, and immunofluorescence staining to characterize the mucosal response.
- Performed thorough data analysis using CellProfiler, Fiji, Excel, R, and Python, and developed a pipeline for automated cell counting.

Vaccine Evaluation Center Vancouver, BC

Summer Undergraduate Research Assistant *May 2019 – August 2019*

- Designed in vitro assay for antibodies produced against B. pertussis for vaccinated pregnant women by plating, setting up gels, analyzing sequenced data and entering in data on S.T.A.R. platform.
- Determined MALDI-TOF vs PCR, efficacy in species identification for *B. Cepacia* Complex
- Performed thorough data analysis using CellProfiler, Fiji, Excel, R, and Python, and developed a pipeline for automated cell counting.

Publications

Rajkumar, et al., *Machine Learning and Causal Approaches to Predict Readmissions and Its Economic Consequences Among Canadian Patients with Heart Disease: A Retrospective Study*, *JMIR Formative Research*, 2023.

Law, et al., *Self-Assembly of a Repeatable DNA Nanohinge System Supporting Higher-Order Structure Formation*, 2023.

Posters/Presentations

Affordable Automation Can Unlock Electrochemistry Workflows Vancouver, BC

August 6, 2024

- **Presentation Type** Poster and Powerpoint Presentation
- **Authors: E. Rajkumar**, Y. Cao, I. Yakavets, Han Hao, A. Aspuru-Guzik, Sophie Rosseaux
- **Presented at:** Accelerate Conference 2024, Democratizing SDLs Workshop

A BIOMODular Enzyme Delivery Vehicle to Target Biofilms Narita, Tokyo, Japan

November 4th, 2023

- **Presentation Type:** Powerpoint Presentation
- **Authors** E. Rajkumar, K. Akhmedova, K. Gunawardena, M. Wang, M. Tsai, P. Ghavimi, V. Zheng

DVR-VQE for Ro-vibrational Levels in Pennylane Toronto, ON

February 9, 2024

- **Presentation Type** Powerpoint Presentation
- **Authors:** E. Rajkumar
- **Presented at:** Xanadu's QHACK IRL 2024 at Xanadu HQ

Predicting Patient Readmission as a Preventative and Cost-Effective Measure Vancouver, BC

July 16, 2022

- **Presentation Type** Powerpoint Presentation
- **Authors: E. Rajkumar**, K. Nguyen, S. Radiç, J. Paa
- **Presented at:** National International University Big Data Challenge Final

Novel and Stable Self Polymerization of DNA Origami Hinges Vancouver, BC

Jan 2022, Dec 2021, March 2021, March 2022

- **Authors:** S. Nguyen, I. Abdi, M. Law, C. Sushams, J. Malhi, R. Lally, N. Louie, **E. Rajkumar**, E. Halbe, M. Lei, L. Ju, R. Yeung.
- **Presented at:** Life Sciences Research Night (LSRN), Multidisciplinary Undergraduate Research Conference (MURC), Harvard National Collegiate Research Conference

A Closer Examination into Innate Epithelial Response Regulation by Gut Microbiota Against Enteric Pathogens — Vancouver, BC
July 26, 2021, July 29, 2021

- **Authors: E. Rajkumar**, J. Allaire, Y. Chen, L. Celiberto, E. Verdu, M. Hill, B. Vallance
- **Presented at:** BC Children's Hospital Research Institute Poster Day, BCCHR Summer Studentship Presentation (Oral Presentation)

Honors/Awards

Acceleration Consortium Summer Undergraduate Research Award ($7,500) — Toronto, ON
Awarded for contributions to automation and self-driving lab research — *May 2024 – August 2024*

NSERC Summer Quantum Computing USRA Top-Up ($1,250) — Vancouver, BC
Awarded for research contributions in quantum computing — *May – August (2023, 2024)*

IBM Quantum Challenge Fall 2022 - Advanced — Vancouver, BC
Awarded for successfully completing challenges focused on implementing algorithmic routines using Qiskit Primitives. — *November 2022*

QHack Coding Challenges — Vancouver, BC
Awarded 27th/727 (2023), 36th/800 (2022) for performances in coding challenges — *February (2022, 2023)*

Samsung Solve For Tomorrow - 3rd Place ($2,500) — Vancouver, BC
Awarded for repurposing old Android phones into dashcams, reducing e-waste and enhancing road safety in BC — *February 2024*

SF iUBDC JMIR Innovation Award — Vancouver, BC
APF waiver for team research contributions in the field of health economics and econometrics — *May 2022*

BIOMOD Japan Open - Grand Champion — Tokyo, Narita Japan
Awarded to team that accumulates the highest number of points in the BIOMOD Japan Open

BioTalent Canada Student Work Placement Award ($2,790 per month) — Burnaby, BC
Integrated learning initiative that equips students with the skills and experience needed to start their career in the bio-economy — *February 2022*

Canadian Association of Gastroenterologists Summer Student Award ($6,000) — Vancouver, BC
Awarded for Research Contribution in Gasteroenterology and to study — *May - August 2021*

Student Ambassador Program Award ($1000) — Vancouver, BC
Awarded to a student who shines especially bright by representing the Beedie Luminaries community through actions and activities which align with the Beedie Luminaries values, including resilience, grit, determination, creativity and empathy. — *November 26, 2020*

Technation Canada's Future of Work Challenge - 3rd Place ($750) — Vancouver, BC
Awarded for addresseing how to streamline the talent pipeline while fostering a healthy, conducive environment that nurtures strong relationships and ensures consistent, high-quality work—redefining the formula for meaningful work. — *February 7th, 2022*

Horatio Alger FairFax Financial Award ($5,000) — Vancouver,BC
Awarded for outstanding perseverance, leadership, and commitment to education in the face of adversity. Recognized for academic excellence, community involvement, and resilience in overcoming challenges. — *April 2019*

Beedie Luminaries ($40,000) — Vancouver,BC
Awarded to high-potential students facing financial adversity by removing barriers to education and providing comprehensive support. — *April 2019*

Technical Skills

Languages: Python, LaTeX, R, MATLAB, HTML5, CSS, JavaScript, Git, Java, Haskell
Frameworks/Libraries: Qiskit, PennyLane, Cirq, scikit-learn, TensorFlow, OpenCV, Node.js, Angular.js, Vue.js, Pandas, GPy, Jax, Pytorch, Botorch
Technologies: Linux, Raspberry Pi, Arduino, MongoDB, Fusion 360, Blender, GitHub
Chemistry: Electrochemical Impedance Spectroscopy, Cyclic Voltammetry, Gravity and Vacuum Filtration, Evaporation, Recrystallization, 1H, 13C, and 31P NMR, IR, and Mass Spectrometry, TLC, Column Chromatography, Melting Point Analysis, HPLC, GC, ICP-MS, UV-Vis, and NIR Spectroscopy
Molecular Biology: Gel Electrophoresis, PCR, UV-Spectrophotometry, Western Blot, ELISA, BLAST, Organoid Monolayer Growth and Infection, Immunohistochemistry, Immunofluorescence Staining, Salt Screens, Buffer Preparation, SDS-PAGE Gel, DNA Nanostructure Filtration Techniques, Flow Cytometry