

Joseph Katz

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Education

- May 2026 – *University of Toronto and The Hospital for Sick Children (SickKids), MSc Candidate in Applied Immunology by Advanced Standing – Division of Gastroenterology Hepatology and Nutrition, Cell and Systems Biology*
Supervisor: [Dr. Eytan Wine](#)
- Sep 2022 – Apr 2026 *University of Toronto, BSc (Honours) Life Science Program. Physiology and Immunology double major*
Thesis Supervisor: [Dr. Mamatha Bhat](#), University Health Network

Research Experience

- Jul 2026 – Supervisor: [Dr. Eytan Wine](#), Division of Gastroenterology Hepatology and Nutrition, Cell and Systems Biology
Title: Neuroendocrine-Epithelial Interactions in Inflammatory Bowel Disease
- Reviewed literature, identified best single-cell RNA-sequencing datasets for investigation, design of computational methods for transcriptomic analysis
 - Collaborated with SickKids computational scientists to refine study design and execute code with high-performance computing
 - *Primary role is to design and analyze transcriptomics of epithelial cells for signs of neuro-endocrine regulation and interactions using publicly available scRNA-seq data.*
- May 2026 – MSc Student, University of Toronto, Department of Immunology
Supervisor: [Dr. Eytan Wine](#), Division of Gastroenterology Hepatology and Nutrition, Cell and Systems Biology
Title: Fate and Function of Reverse-Transmigrated Neutrophils Following Intestinal Inflammation in Zebrafish
- Developed a transgenic zebrafish line
 - Applied intravital microscopy and flow cytometry to identify intestine-derived neutrophils
 - Evaluated zebrafish neutrophil oxidative stress using RT-PCR array, CellROX fluorescence assay
 - *To better understand the mechanisms responsible for extra-intestinal manifestations of inflammatory bowel disease, I have independently developed a zebrafish model to evaluate migration of intestinal-*

*derived neutrophils following induction of intestinal inflammation.
This will be a primary focus of my MSc work.*

May 2026 –

MSc Student, University of Toronto, Department of Immunology
Supervisor: [Dr. Eytan Wine](#), Division of Gastroenterology Hepatology and Nutrition, Cell and Systems Biology

Title: Causal and Mechanistic Dissection of Ultra-Processed Food-Driven Gastrointestinal Inflammation

- Created R code to develop integrated multi-omic dataset
- Developed machine learning models using XGBoost, Random Forest, and Extra Trees to predict incidence of inflammatory bowel disease
- Evaluating the impact of cytokines and ultra-processed foods on Caco-2 and patient-derived organoid tight-junction integrity
- *Primary role is to evaluate clinical and multi-omic data derived from the UK Biobank, contribute to in vitro cell culture. Given the UK Biobank data breach and freeze, coding is complete and analysis is pending re-opening of UK Biobank, anticipated in 2027. Poster presentations.*

May 2026 –

MSc Student, University of Toronto, Department of Immunology
Supervisor: [Dr. Eytan Wine](#), Division of Gastroenterology Hepatology and Nutrition, Cell and Systems Biology

Title: Spatial Proteomics in Inflammatory Bowel Disease: From Tissue Architecture to Mechanisms and Therapeutic Opportunity

- Performed primary literature review, developed inclusion/exclusion criteria, read & extracted key information from papers, wrote & edited manuscript
- *Primary role was to generate idea independently and compose a narrative review highlighting the unique utility of spatial proteomics in the investigation of Inflammatory Bowel Disease*

Sep 2025 –

Undergraduate Immunology Honours Thesis, University of Toronto
Supervisor: [Dr. Mamatha Bhat](#), Ajmera Transplant Program, University Health Network

Title: Using Imaging Mass Cytometry to Describe the Immune Environment in Liver Allograft Fibrosis

- Independently developed an R workflow for human liver Imaging Mass Cytometry preprocessing, single-cell segmentation, immune-cell phenotyping, and dimensional analysis (UMAP, t-SNE)
- *I developed a pipeline to use spatial-proteomics to compare pre- and post-transplant liver allograft biopsies to better understand the immunologic changes that contribute to allograft fibrosis. 2 poster presentations and one oral presentation completed, manuscript in preparation.*

Jan 2025 – Jul 2026

Research Volunteer and Office of Research Trainees Summer Research Program, Ajmera Transplant Program, University Health Network

Supervisor: [Dr. Mamatha Bhat](#)

Title: Multi-Agent AI Evaluation of Donor Suitability in Liver Transplantation

- Designed a Python-based multi-agent system simulating a liver-transplant selection committee to optimize donation and mitigate liver discard
- Implemented current donor guidelines with Retrieval Augmented Generation in the processing of clinical data of over 40,000 donors to support realistic decision-making
- Participated in summer seminar series covering research design, ethics, data interpretation, and scientific communication
- *My goal was to see if an AI-driven approach could reduce the discard of livers potentially suitable for transplantation. I presented this work in oral and poster form.*

Jan 2024 – Sep 2024

Research Student, Zane Cohen Centre for Digestive Diseases, Lunenfeld-Tanenbaum Research Institute, Mount Sinai Hospital

Supervisor: [Dr. Mark Silverberg](#)

Title: Identification of genetic molecular risk factors for development of inflammatory bowel disease

- Performed blood DNA extraction and quantification, ELISA assays (fecal calprotectin) independently
- Created data analysis tables, data visualization tools, and performed comparative and regression statistical analyses across cohorts of inflammatory markers using Excel and R programming
- *My role was to generate data for a biobank of IBD patients and investigate any relationships within the clinical and molecular data.*

Publications

Manuscripts

Katz JA, Wine E. Spatial Proteomics in Inflammatory Bowel Disease: From Tissue Architecture to Mechanisms and Therapeutic Opportunity. (2026). *Frontiers in Immunology*. **Narrative Review. In submission.**

Katz JA, Ghosh S, Bhat M. Immunopathogenesis of Graft Fibrosis Following Liver Transplantation: A Spatial Profiling Approach Using Imaging Mass Cytometry. **Primary Research Article. In preparation.**

Abstracts

Katz JA, Ghosh S, Bhat M. Immunopathogenesis of Graft Fibrosis Following Liver Transplantation: A Spatial Profiling Approach Using Imaging Mass Cytometry. *Department of Immunology Fall Retreat 2026*. Toronto, ON. **Abstract**.

D'Agostini E, Jiang C, **Katz J**, Wang ZY, Weiner M, Wine E. Effects of Ultra-Processed Food Additives on Intestinal Epithelial Barrier Integrity in Inflammatory Bowel Diseases. *SickKids Summer Research Symposium 2026*. Toronto, ON. **Abstract**.

Katz JA, Ghosh S, Bhat M. Immunopathogenesis of Graft Fibrosis Following Liver Transplantation: A Spatial Profiling Approach Using Imaging Mass Cytometry. *Ontario Cell Biology Symposium 2026*. Niagara, ON. **Abstract**.

Presentations

Oral Presentation

Katz JA. CSI: Liver Fibrosis *Department of Immunology Fall Retreat 2026*. Toronto, ON. **Lightning Talk**.

Katz JA. Machine Learning in Immunology: From Cell Discovery to Clinical Decision-Making. *SickKids Cell and System Biology Department Trainee Seminar*, August 2026. Toronto, ON. **Oral Presentation**.

Poster Presentation

Katz JA, Ghosh S, Bhat M. Immunopathogenesis of Graft Fibrosis Following Liver Transplantation: A Spatial Profiling Approach Using Imaging Mass Cytometry. *Department of Immunology Fall Retreat 2026*. Toronto, ON. **Poster presentation**.

D'Agostini E, Jiang C, **Katz J**, Wang ZY, Weiner M, Wine E. Effects of Ultra-Processed Food Additives on Intestinal Epithelial Barrier Integrity in Inflammatory Bowel Diseases. *SickKids Summer Research Symposium 2026*. Toronto, ON. **Poster Presentation**.

Katz JA, Ghosh S, Bhat M. Immunopathogenesis of Graft Fibrosis Following Liver Transplantation: A Spatial Profiling Approach Using Imaging Mass Cytometry. *Ontario Cell Biology Symposium 2026*. Niagara, ON. **Poster presentation**.

Katz JA, Azarfar G, Hasjim B, Bhat H. Multi-Agent AI Evaluation of Donor Suitability in Liver Transplantation. *University of Toronto Trinity College Undergraduate Research Conference 2026*. Toronto, ON. **Poster presentation**.

Katz JA, Azarfar G, Hasjim B, Bhat H. Multi-Agent AI Evaluation of Donor Suitability in Liver Transplantation. *University Health Network (UHN) Summer Training And Research (STAR) Research Day Conference*. Toronto, ON. **Poster presentation**.

Teaching Experience

- Sep 2026 – Teaching Assistant, *University of Toronto, Department of Physiology*: PSL372 - Mammalian Physiology Laboratory.
- Independently leading 20 3rd year physiology students
 - Responsible for delivering instructional lectures and guiding hands-on laboratory activities
 - Instruct students on experimental methods, physiological concepts, data analysis, and scientific report writing
 - Teach experimental principles across cellular, neuromuscular, sensory, cardiovascular, respiratory, renal, and fluid-balance physiology.
 - Evaluate, grade laboratory reports and coursework, providing detailed feedback to support students' scientific reasoning and communication.
- Sep 2026 – **Undergraduate Research Supervisor** – Undergraduate Thesis Project. *University of Toronto, Department of Immunology*: IMM450 - Research Project in Immunology
- Directing the day-to-day research activities of an undergraduate IMM450 thesis student investigating intestinal inflammation and neutrophil function in zebrafish
 - Training the student in experimental design, zebrafish techniques, microscopy, data acquisition, and analysis.
 - Oversee project progression and provide feedback on scientific interpretation, presentations, and thesis preparation.

Honours & Awards

- Sep 2026 **Best Lightning Talk, *University of Toronto Department of Immunology***
Top award for lightning oral presentation at the Department of Immunology Graduate Conference from over 20 talks. From 1st author presentation titled "CSI: Liver Fibrosis" based on undergraduate thesis project.
- Jun 2023, 2024, 2025, 2026 **University of Toronto Dean's List Scholar *U of T***
Recognized for achieving a cumulative GPA of 3.50 or higher, awarded after completing 5 and 10 credits.
- Apr 2022 **General Proficiency Award *Upper Canada College***
Honored for academic achievement during the 2021–2022 school year.
- Apr 2021 **Maurice Clarkson Prize of Academic Honours with Distinction**
Awarded to students in the top 10% of academic standing.

Mar 2018 **University of Toronto Science Fair Provincial Gold Recipient**
 Recognized for research comparing the efficacy of naturopathic remedies and antibiotics in inhibiting E. coli and Staphylococcus aureus growth.

Professional Memberships

May 2026 – **Canadian Children Inflammatory Bowel Disease Network (CIDCaNN), Trainee Member**

Leadership & Community Service

Sep 2026 – **SickKids Hospital: NICU Patient-Care Volunteer**

- Assist with administrative tasks in the NICU including medication delivery, patient admission, and welcome-package creation
- Interact with and provide support for parents and siblings through conversation and entertainment
- Hold, soothe, and comfort infant patients

Jul 2026 – **Big Brother Big Sister Toronto (BBBST): Mentor, Big Brother**

- Provide consistent two-hour weekly, one-to-one mentorship focused on confidence, personal growth, and social connection.
- Build a dependable relationship through active listening, positive role modelling, and interest-based activities.

Jun 2023 – Aug 2023 **Magen David Adom: Paramedic First Responder Volunteer**

- Delivered emergency care in high-pressure settings and transported patients to hospital.
- Administered CPR and first aid for stroke, myocardial infarction, trauma, and respiratory emergencies while collaborating with a multidisciplinary team in Hebrew.

Jun 2022 – Aug 2022 **Video Producer and Editor: Canadian Glomerulonephritis Registry**

- Produced and edited a promotional video used to support a research grant application for the Canadian Glomerulonephritis Registry.
- Awarded Best Visual Effects by the Can-Solve CKD organization for innovative and engaging video content.

Nov 2021 – Mar 2022 **Musician and Manager: Baycrest Senior Service Society**

- Founded and managed a band that performed for Alzheimer's patients at Baycrest Hospital, organizing regular performances and recording an album to raise funds for the hospital.
- Led the group's practices, played piano and saxophone, and coordinated logistics to ensure seamless performances.

- Dec 2020 – Jan 2021 **Covid Lab Volunteer: *Shared Hospital Laboratory***
- Supported Ontario's COVID-19 case surge in PCR test processing and sample organization.
 - Coordinated patient sample flow and logged patient data, ensuring proper test management.
 - Contributed to organizing storage and organization systems for patient samples based on variant identification.
- Sep 2020 – Dec 2021 **Musician and Head of Publicity: *Skyky SickKids Concert***
- Led the organization and promotion of fundraising concerts, utilizing emails, posters, and announcements across schools and local neighbourhoods.
 - Performed in a Jazz Quartet and collaborated with team members to plan, practice, and execute the performances.
 - Successfully raised over \$5,000 for research at SickKids Hospital through strategic event promotion and community outreach.

Employment

- May 2023 – Jul 2023 **Lifeguard: *Superior Pool Spa and Leisure***
- Supervised the safety of patrons, performing regular inspections of pool equipment and ensuring adherence to safety protocols.
 - Conducted routine repairs on pool systems and actively engaged with patrons to build relationships and maintain a safe environment.
- May 2022 – Aug 2022 **Canoe Lifeguard and Staff: *Camp Kadimah***
- Independently managed groups of 15–20 children, teaching canoeing and ensuring their safety during water sports activities.
 - Provided immediate responses to minor injuries and worked collaboratively with co-workers to ensure a secure and enjoyable environment.
 - Taught children the basics of canoeing and boat safety.

Research and Technical Skills

Computational and Data Analysis

- R, RStudio, Python programming
- Data cleaning, normalization, visualization, exploratory analyses
- Regression analysis and statistical modeling
- Machine learning (supervised and unsupervised) and visualization techniques (t-SNE, UMAP)
- Spatial proteomics: Cell segmentation and image analysis (Ilastik, CellProfiler, Mesmer)
- Retrieval Augmented Generation (RAG)
- AI agent frameworks (CrewAI, LangChain)
- Python data science libraries: NumPy, Pandas

Wet Laboratory Techniques

- DNA extraction, PCR, Gel electrophoresis, ELISA, scRNA-seq, fluorescence assays (CellROX)
- Cell, bacterial, and patient-derived organoid culture
- Zebrafish care, intravital microscopy
- Microscopy and slide preparation
- Biospecimen collection and processing
- Organic and biochemical purification techniques
- Dissection techniques
- Physiology lab techniques: Electrophysiological measurements, EMG, force transducer setup, spirometry and pulmonary function testing, blood typing and blood pressure assessment

Certifications

- National Lifeguard Certification
- CPR-C, Standard First Aid
- Israel National First Responder Certification

Co-Curricular Activities

Sep 2024 –	Weekly Jewish Torah Studies: Forest Hill Jewish Center
Sep 2022 –	Member & Instructor: <i>Harthouse</i> Athletics Weightlifting Club
Sep 2011 –	Recreational and RCM Piano
Sep 2022 – Jan 2024	Volleyball Player: <i>University of Toronto</i> Intramurals League