Julian Forsyth

julianforsyth@hotmail.com LinkedIn Github Personal Site

Education

2020 – 2024 **B.A. Honours in Computer Science,** York University
Graduated First Class with Distinction

2017 – 2018 **B.A. Philosophy,** Concordia University

Publications

2025 **"Universal Sparse Autoencoders: Interpretable Cross-Model Concept Alignment",**
Proceedings of the 2025 International Conference on Machine Learning (ICML)
Access paper here

2024 **"Robot Wheelchair Convoys for Assistive Human Transportation",**
Proceedings of the 2024 IEEE International Conference on Smart Mobility 2024
Access paper here

Research & Technical Experience

09/2024 – 09/2025 **AI Research Assistant, Engineer,** Computer Vision & Imaging Lab
- Collaborated with an inter-institutional team to conduct cutting-edge research focused on interpretability in deep neural networks
- Designed and implemented an innovative training framework
- Developed statistical and visual tools to communicate our findings and reveal model insights
- Contributed as second author to a paper at ICML, a top machine learning conference

05/2024 – 08/2024 **Student AI Researcher, Engineer,** Computer Vision & Imaging Lab
NSERC Undergraduate Student Research Award
Leveraging Sparse Autoencoders to Understand Deep Vision Networks
- Researched and applied advanced interpretability methods to deep vision models to increase transparency and reduce bias
- Collaborated on small team under the supervision of Dr. Kosta Derpanis

05/2023 – 08/2023 **Student Researcher, Software Engineer,** Elder Laboratory
NSERC Undergraduate Student Research Award
Methods of Motion Planning and Obstacle Avoidance on an Automated Wheelchair
- Developed, tested, and analyzed motion control and obstacle avoidance protocols on an autonomous wheelchair robot using Python and ROS
- Contributed to project with a robotics team made up of engineers, developers and Dr. James Elder

2022 – Present **Computer Science Teaching Assistant,** York University, University of Toronto
Courses: Intro to Object-Oriented Programming, Advanced Object-Oriented Programming, Foundations of Computer Science
- Guided students in concepts, data structures, and algorithms in OOP and Java
  - e.g. Inheritance, Generics, Composition/Aggregation, SOLID principles
- Mentored students in problem-solving and debugging in programming assignments
- Graded written tests and assignments

Skills & Domain Knowledge

Languages
Python | C | Java | JavaScript | SQL | MATLAB | Prolog

Frameworks & Libaries
PyTorch | ReactJS | Spring | Swing | Wandb | ROS | p5.js

Machine Learning & AI
Model Architectures | Interpretability Methods | Optimization & Regularization | Validation Methods

Mathematics & Statistical Analysis
Linear Algebra | Probability Theory | Information Theory | Dimensionality Reduction Methods | Time Series Analysis Visualization

Projects

2024 **Short Term Load Forecasting with Generative Adversarial Networks,** with Dr. Michael Jenkin and Dr. Di Wu
- Developed and tested Generative Adversarial model for the purposes of accurately predicting energy usage on residential power grids
- Created a framework to interface with complex new dataset provided by the National Renewable Energy Lab

2023 **"Syntax" Writing Assistance Tool with LLMs**
- Tool which suggests word choice improvements to a given text input; trained using GPT-2 and BERT

2023 **E-Commerce Platform**
- Implemented a model marketplace service on mobile and browser with Java Spring and SQL backend, and JavaScript and React front end. Deployed with AWS.

2023 **Computer Vision Projects**

RANSAC-based Image Stitching
- Generated panoramas using SIFT and RANSAC methods to identify optimal transformation between multiple images

Optical Flow Estimation for Video
- Implemented a Kanade-Lucas-Tomasi (KLT) tracker to identify and track keypoints across images in a video

Image Seam Carving
- Used a generated energy map to resize images by carving out lowest-value vertical/horizontal seams

2023 **Parking System**
- Implemented complex parking system for administrators and clients with Java and Swing GUI

2022 **Rubik's Solver**
- Used declarative language *Prolog* to find shortest solution to a scrambled Rubik's Cube, using a Meet-In-The-Middle search technique

Community, Arts & Leadership

2019 QC **Camp Counsellor,** Coyote Camp (at YMCA Camp Kanawana)
- Helped create a fun and impactful experience for primary school children at a wilderness-survival camp
- Taught campers in a variety of wilderness skills, such as plant identification and shelter building

2018 Halifax, NS **Organizer, Coordinator,** Our Rising (Non-Profit Organization)
- Researched and wrote grants for community projects
- Collaborated with NSPIRG to develop “Political History Tour of K’jipuktuk"
- Managed social media & public outreach

2017 – 2018 Montreal, QC **Dance Class Coordinator,** Association Contact Improvisation
- Organized the teaching schedule for full year of Sunday morning classes
- Managed student registration for classes

2017 Perth, ON **Camp Counsellor,** Easter Seals Camp Merrywood
- Ensured a safe and exciting camp experience for a wide range of campers with physical disabilities: aged 6 - 25
- Attended to all aspects of campers' physical and emotional needs
- Facilitated structured and non-structured group activities: musical jams, games and stories during hangtime, etc.

2013 – 2016 Hamilton, ON **Music Teacher,** Piano & Guitar
- Garnered an excellent reputation teaching for a broad range of students, aged 10 – 55
- Created a safe and fun environment for students to develop a passion for music