

Zain Parihar

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EDUCATION

Queen's University

Honour's Bachelor of Computing, Specialization in A.I.

- Minor in Mathematics & Statistics
- GPA: 4.0
- Dean's Honor List
- Principal's Scholarship

Kingston, ON

Sep. 2022 – Apr. 2026

Pickering High School

Ontario Secondary School Diploma

- GPA: 4.0

Ajax, ON

Sep. 2018 – Apr. 2022

EXPERIENCE

AI Researcher

Division of AI Research, QMind

- Currently conducting research, data analysis, and model implementation using the Microsoft COCO dataset to compare transformers and convolutional recurrent neural networks for image-to-text caption generation.
- Aiming to improve automatic alt text generation, with the goal of benefiting visually impaired users and enhancing content moderation on social media platforms.
- Qmind is a student-run AI Design Team at Queen's University.
- *More info in Projects section*

Fall 2023 - Present

Kingston, ON

Perception Development Researcher

Queen's AutoDrive

- Working on the Perception Development Team to design advanced computer vision algorithms, enhancing the vehicle's visual awareness capabilities.
- Currently researching and implementing cutting-edge machine-learning algorithms for the vehicle's detection and classification systems. This includes Traffic Lights, Street Signs, and Roads/Lanes.
- Autodrive is a challenge sponsored by SAE & GM, where students are developing a Level 4 Autonomous Car by 2025.
- *More info in Projects section*

Fall 2023 - Present

Kingston, ON

Discrete Math Teaching Assistant

Queen's University

- Teaching Assistant for CISC 102 - Discrete Math. Subjects of study include: Proof Methods, Group Theory, Number Theory, Sets, functions, sequences, and relations. Equivalence relations. Linear and partial orderings.

Fall 2023

Kingston, ON

Jr. Full-Stack Developer

Scotiabank

- Developed a consent enforcement system, enabling secure third-party access to customer account information.
- Implemented enterprise Java solutions using the Spring Framework, ensuring robustness and scalability.
- Conducted API testing and development with Postman, ensuring seamless integration and functionality.
- Implemented secure authentication mechanisms using JWTs and Opaque Tokens, safeguarding sensitive account information.
- Collaborated with cross-functional teams to gather and document requirements, ensuring alignment with business objectives.

Summer 2023

Toronto, ON

Electrical Design Team

Winter 2023 - Present

Queen's Hyperloop

Kingston, ON

- Currently developing electronic systems for power and controls onboard an autonomous tunnel boring machine.
- Systems include both custom-built solutions and embedded systems, and off-the-shelf micro-controllers.
- Competed in the Canadian Hyperloop Conference and the European Hyperloop Conference.

Automation Research Intern

Summer 2021

Queen's University

Kingston, ON

- Researched and collected market data to identify common parameters for dependency bots on GitHub.
- Developed strategies to determine dependency settings for new developers using python and the GitHub API.
- *More info in Projects section*

PROJECTS

Comparative Analysis of Transformers and Convolutional Recurrent Neural Networks for Image-to-Text Caption Generation: *Qmind: Division of AI Research*

- Investigated image-to-text caption generation, assessing models' image comprehension.
- Explored influential solutions like "Show and Tell" and Andrej Karpathy's "Connecting Images and Natural Language" dissertation.
- Compared convolutional recurrent neural networks and transformers for captioning, evaluating training speed, output speed, and BLEU scores.
- Utilized the Microsoft COCO dataset with over 200k images, each having five captions.
- Explored key works such as "Show and Tell", "Attention is all you need", and Andrej Karpathy's "Connecting Images and Natural Language" dissertation.
- Leveraged Hugging Face tutorials for transformer-based image captioning.
- Developed an image captioning application incorporating Karpathy's model and fine-tuned Hugging Face transformers.
- Explored dense image captioning and model customization when feasible.
- Employed research methodologies, including data cleaning and architecture design.
- Utilized cloud computing services (AWS, Microsoft Azure), Pytorch, and HuggingFace Hub.
- Enhanced web accessibility, allowing screen readers to describe online images for visually impaired individuals.

Autodrive Challenge II: *Queen's Autodrive*

- Contributed to the AutoDrive Challenge™ II, maintaining the strong partnership between GM and SAE in STEM education.
- Collaborated with General Motors (GM) representatives and Queen's University students during the second series of the competition, building upon the achievements of the original four-year event.
- Participated in the development and demonstration of an autonomous vehicle (AV) capable of urban navigation according to SAE Standard (J3016™) Level 4 automation.
- Researched and implemented novel computational methods and algorithms to enhance the AV's perception of its environment.
- Specialized in designing and implementing Traffic Light Detection and Classification algorithms to ensure accurate recognition and response to traffic signals.
- Worked collaboratively within a multidisciplinary team, including GM representatives and Queen's University students, to integrate and optimize perception algorithms within the AV's software stack.
- Demonstrated strong problem-solving skills and a dedication to advancing autonomous vehicle technology.
- Played a pivotal role in enhancing the AV's safety, reliability, and overall performance in complex urban driving scenarios.

Toyota Innovation Challenge: *University of Waterloo Engineering*

- Developed an image classification project using Python, OpenCV, and deep learning techniques.
- Collaborated with team members to develop a conceptual image classification solution to identify incorrectly applied or missing components in the manufacturing process of Toyota vehicles.
- Contributed to the design and implementation of a proof-of-concept model using Python, OpenCV, and deep learning techniques.
- Focused on exploring image processing, label encoding, and dense neural network architectures using Tensorflow for the proposed solution.
- Engaged in extensive research and development efforts to create a feasible approach for addressing the manufacturing challenge presented by Toyota.
- Presented the conceptual solution and findings to judges during the Toyota Innovation Challenge, showcasing the team's innovative approach to quality control in vehicle manufacturing.

GitHub Developer Tools Automation Analysis: *Queen's University School of Computing*

- Researched and collected market data to identify common parameters for dependency bots on GitHub.
- Developed strategies to determine dependency settings for new developers using Python and the GitHub API.
- Collaborated with a team of researchers to design and implement automation solutions aimed at optimizing software development processes.
- Conducted in-depth analysis of GitHub repositories to understand the dependencies and trends in open-source projects, contributing to the development of efficient dependency strategies.
- Presented research findings and automation solutions to a diverse audience, demonstrating the potential for improving software development workflows.

COURSEWORK

Computer Science:

- Digital Logic - Logic gates and digital circuit design.
- Neural Networks - Deep learning models and applications.
- Decision Trees - Decision tree algorithms for classification and regression.
- Data Visualization - Skills in visualizing data.
- Decision Making & Reasoning in Computers - AI decision-making processes.
- Cognitive Architectures - Analysis of cognitive models and architectures.
- Data Structures & Algorithms - Fundamental algorithms and data structures.
- Computer Architecture - Computer system architecture and design.
- Instruction-Set Architectures - Instruction sets of computer processors.
- Software Specifications - Software development specifications and requirements.
- Propositional & Predicate Logic - Symbolic logic and formal reasoning.
- Assembly - Low-level programming languages.

Mathematics:

- Linear Algebra - Vector spaces and linear transformations.
- Calculus & Differential Equations - Calculus and ordinary differential equations.
- Discrete Math - Combinatorics, graph theory, and discrete structures.
- Combinatorics - Counting, permutations, and combinations.
- Vector Calculus - Vector fields, line integrals, and calculus theorems.

Statistics:

- Data Science with R - Data analysis using R, with practical projects.
- Linear Data Analysis - Linear regression models applied to real-world data.
- Statistical Inference - Principles of statistical hypothesis testing and estimation.
- Probability - Probability theory and stochastic processes.

Languages:

- English (Native)
- French (Proficient)
- Spanish (Basic)

AWARDS

- Dean's Honor List
 - Recognized for outstanding academic performance at Queen's University.
- Principal's Scholarship
 - Awarded for exceptional academic performance at Queen's University.
- Skills Ontario Electronics Gold Medalist
 - Recognized for outstanding performance in designing, constructing, and analyzing circuits, including RLC and solid-state switching circuits.
- Skills Canada Electronics Silver Medalist
 - Achieved a Silver Medal for exceptional skills in Electronics, including the application of digital integration using Operational Amplifier systems.
- U of Waterloo Contest Distinction
 - Received a Special Distinction from the University of Waterloo for outstanding performance on the Canadian Computing Competition in 2021 & 2022, and the Canadian Senior Mathematics Competition in 2022.
- Academic Proficiency Award
 - Honored with an award for achieving the highest marks in Grade 12 Computer Science (100%) and Grade 12 Computer Engineering (100%).

VOLUNTEER EXPERIENCE

President of Math Club and Competitive Team

Pickering High School

Ajax, ON

- Organized math contests in collaboration with universities such as University of Waterloo.
- Led help sessions for students struggling in math classes.

Computer Science Club President

Pickering High School

Ajax, ON

- Facilitated activities within the Computer Science Club, fostering a passion for programming and problem-solving.
- Contributed to organizing and leading various club events and workshops.

Robotics Club President

Pickering High School

Ajax, ON

- Participated in planning and execution of robotics-related events and projects.
- Collaborated with team members on various robotics initiatives.

STEM Summer Camp Tutor

STEM4KIDS

Ajax, ON

- Mentored and guided young learners in STEM topics during a summer camp program.
- Provided assistance and support in various STEM-related activities.

SKILLS

Java, Python, Javascript, C/C++ for Arduino, Git, GitHub, Anaconda, Electronics & Circuit Design, Tensorflow, OpenCV, Keras, Joblib, Pandas, NumPy, Machine & Deep Learning, Image & Data processing, SKLearn, PyTorch.