

# ISHAN SHAH

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## EDUCATION

### University of Waterloo

Bachelor of Computer Science

Sept. 2025 – Apr. 2030

3.82/4.00

## EXPERIENCE

### WAT.ai

Machine Learning Engineer

Jan. 2026 - Present

Waterloo, ON

- Researching **preference learning** and **human-feedback-driven optimization** for sequential decision-making models
- Implementing and evaluating **learning pipelines in Python/PyTorch**, collaborating with researchers on experimental design and analysis

### Watonomous

Autonomous Software Developer

Jan. 2026 - Present

Waterloo, ON

- Built a **C++ ROS 2 (Humble)** real-time navigation and control system in simulation, enabling reliable point-to-point planning and execution using sensor-driven state estimation, packaged and deployed via **Docker**.
- Implemented and optimized **grid-based spatial data structures** for obstacle representation, fusing local and global maps via transform-based updates and reducing update frequency by **60%**.
- Designed and integrated an **A\*** path-planning algorithm and a real-time trajectory tracking controller, validating system behavior through structured visualization and debugging tools.

### IPMD

July 2025 - Sept. 2025

Software Engineer Intern

San Mateo, CA

- Replaced custom auth logic with **Flask-JWT-Extended**, centralizing token management across **10 endpoints** and resolving registration edge cases.
- Modularized frontend by extracting **5+ reusable components**, reducing code duplication by **30%** and accelerating future feature development.
- Built a **React chat interface in TypeScript** that performed **real-time facial expression and emotion analysis** during conversations, integrating a computer vision backend to surface live sentiment feedback in the UI.

## TECHNICAL SKILLS

**Languages:** Python, JavaScript, TypeScript, C++, SQL, HTML/CSS

**Frameworks/Libraries:** React, Next.js, Node.js, React Native, FastAPI, Flask, PyTorch

**Tools/Deployment:** PostgreSQL, MongoDB, Redis, Docker, AWS, Azure, Linux, Git

## PROJECTS

### Study Buddy

- | *React, FastAPI, MediaPipe, MongoDB, Redis*
- Built a real-time **Computer Vision** distraction tracker using **MediaPipe** for gaze and head-pose estimation, served via a high-concurrency **FastAPI** streaming backend.
  - Optimized data retrieval by **80%** through a multi-layer caching strategy using **Redis** and **MongoDB**, enabling **sub-100ms latency** for personalized AI study feedback.
  - Integrated **Gemini API** for automated summarization of study sessions, utilizing asynchronous task queues to ensure a non-blocking UI experience.

### OperAid

- | *Next.js, FastAPI, Supabase, OpenAI, Eleven Labs*
- Developed a voice-controlled medical interface using **Whisper** and **GPT-4o** to transcribe, interpret, and execute natural language commands for patient record retrieval, reducing simulated lookup time by **70%**.
  - Engineered a low-latency audio pipeline integrating **Eleven Labs** for real-time vocal feedback, facilitating hands-free operation in clinical environments.

### Reinforcement Learning for Continuous Control

- | *Python, PyTorch, Gymnasium, Numpy*
- Developed a from-scratch implementation of **Proximal Policy Optimization (PPO)** with **Generalized Advantage Estimation (GAE)** to solve continuous action space environments.
  - Architected a custom **Actor-Critic** network in **PyTorch**, optimizing hyperparameters to achieve convergence on the BipedalWalker-v3 environment.
  - Implemented **orthogonal weight initialization** and **learning rate annealing**, improving training stability and reducing variance in episodic returns.