

Patrick Maxiao Ma

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Education

University of Waterloo, Waterloo, ON

2024-2029

Bachelor of Computer Science (Co-op Program)

Cumulative Average: 92

Work Experience

Full Stack Developer Intern

May 2025 – Aug 2025

SparkLease, Toronto, Canada

Web: <https://www.sparklease.com/>

- Developed and maintained core backend services in **ASP.NET Core MVC**, **Azure** and **C#**, supporting a production platform with 100,000+ annual users.
- Refactored 8 core frontend pages and optimized frontend **JavaScript** logic, increasing page views by 17%.
- Engineered a vehicle search pipeline on **Microsoft SQL Server**, optimizing query execution and data loading to reduce filtering time by **56%**.
- Streamlined API workflows by deduplicating requests and introducing server-side caching backed by **Azure Blob Storage**, cutting network load by **50%+** and significantly lowering infrastructure costs.
- Automated large-scale data ingestion through multithreaded **Azure WebJobs**, parallelizing third-party API processing to reduce end-to-end execution time by **83%** and stabilize sub **0.5s** page loads.

Machine Learning Intern

Jun 2024 – Aug 2024

NanoInsights, Beijing, China

Web: <https://www.naxi-tech.com/>

- Supported and monitored training of **GAN-based super-resolution models** for electron microscopy using **Python** and **PyTorch**, analyzing loss convergence, tuning training hyperparameters, and validating reconstruction quality.
- Independently implemented and trained smaller **CNN-based super-resolution models (U-Net, RCAN)** based on existing literature, completing end-to-end training and result analysis.
- Developed automated **data preprocessing pipelines** for segmentation, normalization, augmentation, and dataset organization, improving data quality and training stability.

Projects

SEO AI Agent *Link:* github.com/PPAT132/SEOAgent

Jun 2025 – Sep 2025

- Developed a full-stack **SEO optimization agent** using **FastAPI**, **Gemini API**, and **Docker**, enabling automated **HTML auditing**, **metadata analysis**, and **SEO rule enforcement**.
- Designed a structured **agent pipeline** that orchestrates data fetching, analysis, patch generation, and validation.
- Achieved **SEO scores above 90** on Lighthouse audits with an average time of **30 seconds per page**.

LACS Compiler *Link:* <https://lacscompiler.netlify.app>

Sep 2025 – Dec 2025

- Built an end-to-end compiler translating **LACS** (a **Scala-like imperative language**) into executable **MIPS**.
- Implemented a full compiler frontend, including a **DFA-based maximal-munch scanner**, a **CYK parser** for context-free grammars, and **static type checking** with support for **functions**, **closures**, and **lexical scoping**.
- Implemented compiler **lowering and code generation passes** to translate typed programs into low-level assembly, handling control flow, stack frame layout, nested function/closure and their calls.
- Engineered a runtime system with explicit **stack and heap memory management**, **closure environments**, a **copying garbage collector**, and **tail-call optimization**.

AGE GameEngine

Oct 2025 – Dec 2025

- Designed and implemented a reusable **C++ ASCII game engine** following a clean **MVC architecture**.
- Built an extensible **object-oriented engine framework** using abstract interfaces, inheritance, and composition, applying **design patterns** and **RAII** for safe memory management.
- Engineered a core **entity and physics system** supporting collision detection, fixed-point **sub-pixel movement**, a camera-based world view, and **infinite maps with procedural generation**.
- Validated engine functionality and extensibility by developing multiple demo games on top of the engine.
- Implemented a **reinforcement learning agent** that autonomously plays a **Mario-like game** built on the engine.

Skills

- **Programming Languages:** Java, Python, C, C++, C#, JavaScript, TypeScript, Racket, Scala
- **Frameworks/Backend:** React, Razor, ASP.NET Core, Node.js, Flask
- **Machine Learning:** PyTorch, TensorFlow, CNN, RL, data preprocessing, supervised training, AI agent
- **Tools/Systems:** Docker, Azure, SQL, Linux, AWS