

# Ty Mabee

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## EDUCATION

**Honours Bachelor of Science Degree in Computer Science**

Sept 2022 – Oct 2026

Brock University, St. Catharines, ON

## TECHNICAL SKILLS

**Languages:** Python, SQL, C, C++, Java, JavaScript/TypeScript, Swift

**Algorithms & Systems:** data structures, algorithm design and complexity, object-oriented and modular design, concurrency, distributed systems, information retrieval, networking, relational data modeling

**Development Platforms:** Unix/Linux, SwiftUI/iOS, REST APIs, Cloudflare Workers, Microsoft Graph, D1/SQLite, Docker, ONNX, TensorRT, CUDA

**Parallel & Machine Learning:** OpenMP, MPI, PyTorch, TensorFlow, scikit-learn, OpenCV, model training/evaluation, edge inference, performance profiling

**AI-Assisted Development:** OpenAI Codex, Claude, agentic/tool-driven workflows, prompt and context design, human-in-the-loop validation, AI-assisted testing, debugging, and documentation

**Quality & Security:** Git/GitHub, code review, CI/CD, unit/integration/regression testing, staged deployments, structured logging, root-cause analysis, OAuth, JWT, RBAC, rate limiting

## WORK EXPERIENCE

**AI Workflow Research and Compliance Analyst**

July 2026 – Current

Rob Cagnin Mortgage Broker, Burlington, ON

- Owned the design and delivery of four production workflow and data pipelines for mortgage document intake, email drafting, commitment monitoring, and anniversary reporting, integrating TypeScript/JavaScript, Cloudflare Workers, Microsoft Graph, SharePoint, Outlook, Finmo, and Zoho.
- Reduced recurring manual work by approximately 4.5 hours per week (230+ hours annually) through scheduled processing, schema validation, exception tracking, and human-in-the-loop review controls.
- Applied full-lifecycle engineering practices across modular services, REST contracts, Git-based source control, regression testing, staged user acceptance testing, structured logging, and failure monitoring; diagnosed OAuth, schema, parsing, duplicate-run, and request-limit defects.

**Machine Learning Co-op**

Jan 2024 – Aug 2024

Bornea Dynamics, St. Catharines, ON

- Owned an end-to-end computer vision workflow in Python (data preparation → training → evaluation → deployment), working with 25 classes and 43,088 small-object annotations.
- Drove model improvements through structured experimentation and ablation-style tuning (resolution scaling, augmentation strategy, learning-rate and head changes), running 30+ training iterations per model to improve small-object detection.
- Deployed an optimized edge-ready model by exporting to ONNX and building a TensorRT FP16 engine, achieving a major inference speedup from 127.8 ms (ONNX) to 1.5 ms (TensorRT) while maintaining accuracy.
- Reported final validation results clearly and consistently using standard metrics, reaching Precision 0.844, Recall 0.419, mAP50 0.578, mAP50-95 0.376 on a holdout set (10 images, 3,604 instances), and evaluated INT8 trade-offs (accuracy drop) to justify FP16 for reliability.

## **Co-Founder, Tech Lead**

Sept 2025 – Current

RentSwipe, St. Catharines, ON

- Built and shipped an end-to-end iOS + serverless platform (SwiftUI app + Cloudflare Workers), focusing on performance-aware architecture, clean interfaces, and fast iteration through staged deployments.
- Engineered a production auth + API layer (JWT sessions, role-based access control) with consistent request/response contracts and centralized error handling to improve reliability and code quality.
- Designed and operated an SQL-backed persistence layer in Cloudflare D1 (SQLite): schemas, indexed queries, and server endpoints for high-traffic objects (users, listings, applications, messages) with predictable latency).
- Implemented a trust-and-safety minded messaging system with abuse-resistant controls (block/report workflows, basic content enforcement, rate limiting), aligning UX and backend policies for App Store compliance.

## **PROJECTS**

### **Code Similarity Detection Platform – Software Engineering**

Jan 2026 – April 2026

Brock University, Ontario

- Developed the C/C++ similarity engine using tokenization, normalization, template subtraction, fingerprinting, and Greedy String Tiling to detect structurally similar code submissions.
- Built automated test workflows and complex multi-file datasets, then integrated the engine with asynchronous analysis, anonymized reporting, and side-by-side comparison features.
- Coordinated development priorities, integration dependencies, and team deliverables, contributing to a 3rd-place finish among 40 groups in the course's competitive evaluation.

### **Fast 2D Convolution via FFT – Parallel Computing**

Sept 2025 – Dec 2025

Brock University, Ontario

- Implemented FFT-based 2D convolution for Gaussian blur on PGM images (algorithm + performance-focused design).
- Parallelized with OpenMP and benchmarked 1/2/4/8 threads (up to ~2.38x speedup on 512 x 512).
- Built an MPI row-decomposition version with halo exchanges; compared compute vs communication bottlenecks using speedup/efficiency/overhead metrics.

### **Customer Churn Classification Pipeline – Neural Networks**

Sept 2024 – Dec 2024

Brock University, Ontario

- Built an end-to-end churn model pipeline (preprocessing → train/test → DecisionTreeClassifier).
- Evaluated with accuracy/precision/recall and visualized decision rules using plot\_tree for interpretable insights.

## **ADDITIONAL EXPERIENCE**

### **Supervising Instructor Guard**

June 2022 – June 2025

Norfolk County, Ontario

- Maintained a safe aquatic environment through continuous monitoring, rule enforcement, and rapid incident response.
- Communicated clearly under pressure while coordinating with staff to ensure smooth, reliable facility operations.