Caleb Pollreis

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Education

University of Manitoba — **Winnipeg, Manitoba**
Bachelor of Science in Computer Engineering (Co-op) — *Expected Graduation Date - April 2028*

- GPA: 3.87
- Internship Availability: Jan. 2027 - Aug. 2027

Technical Skills

Programming Languages: C++, C, Python, Verilog, Java, JavaScript, R
Markup & Typesetting: HTML, CSS, Markdown, LaTeX
Embedded: STM32Cube, Raspberry Pi, FreeRTOS, Arduino, BMS and motor controller (PM100DX) interfacing
Communication Protocols: CAN, ADC, SPI, UART/USART, I2C, TCP/IP
Hardware Design: PCB Design (Altium Designer), HV & LV Wire Harnessing
Version Control & Collaboration: Git, GitHub, Bitbucket, Jira
Build & Dev Tools: Docker, CMake, GTest, LLVM, clang-tidy, cpplint
Coding Standards: Google C++ Style Guide
Machine Learning: PyTorch, ONNX, NVIDIA TensorRT, CUDA Toolkit, Netron, Dataset Synthesis
Robotics & Computer Vision: ROS2, OpenCV, Eigen, Cloudini
Cloud: AWS (EC2, S3, SageMaker)
Vehicle & Telemetry Tools: CANdb++, PCAN-View, Foxglove
Operating Systems: Linux (Ubuntu, Arch), MacOS, Windows

Experience

PTx Trimble - Perception Engineering Intern — **May 2026 – Present**
Winnipeg, Manitoba

- Trained a **ViT** student model on a **Jetson Orin** using **CLIP** as a teacher model via **knowledge distillation**, reducing model size by 33%, inference time by ∼2×, and increasing model accuracy by 15%
- Wrote a **C++** script using **Cloudini** to decompress point cloud data and decode **H.264** videos, improving simulation and playback time
- Implemented sensor status event triggers to capture **ROS** bags on fault detection, using **ROS**, **C++**, exponential backoff, and GPS algorithms
- Ran **HIL** tests to simulate sensor events and trigger edge cases, using **GTest** and **ROS2** callbacks
- Conducted CPU profiling with **perf** to identify and reduce system CPU load, recovering a full core of performance on the HIL platform

UMSAE Formula Electric - Autonomous System Lead (DSO) — **Jan. 2026 – Present**
Winnipeg, Manitoba

- Managing and supporting 10+ software members developing an autonomous software stack, ensuring alignment with the FSAE timeline and driverless ruleset, with the goal of being driverless by 2028
- Studied the FSAE driverless ruleset and FSG competition to establish compliance requirements and guide early system architecture decisions
- Secured **$30k** in sponsored hardware including LiDARs, cameras, and auxiliary sensors through targeted sponsorship outreach to bootstrap driverless development
- Architected a **C++/ROS2** monorepo targeting the **NVIDIA Jetson Orin** platform, establishing build infrastructure and project structure for the autonomous software stack
- Building a team documentation dashboard with visual aids covering sensor mounting, wire harness routing, and subsystem interfaces to accelerate cross-team knowledge transfer

MacDon Industries Ltd. - Software Developer Intern — **Jan. 2025 – Aug. 2025**
Winnipeg, Manitoba

- Designed and implemented a **computer vision** grid algorithm that uses a **deep learning** model to detect crop conditions, automate combine operations, and reduce operator workload
- Redesigned a **ROS**-based vision pipeline to support scalable multi-camera input, enabling seamless integration of variable camera angles around a combine, improving modularity and maintainability across the system
- Developed **CAN J1939** communication between a **ROS** pipeline and combine automation system to control cut height, increasing the efficiency of crop collection for farmers, using **NVIDIA Jetson** architecture
- Created a **computer vision** solution using **optical flow** to monitor fertilizer movement from a spreader
- Executed 2-week **Agile** sprints using **Jira** and **Git** to drive iterative progress, incorporate continuous feedback, and deliver reliable software on schedule

UMSAE Formula Electric - Software System Lead **Aug. 2024 – June 2026**
Winnipeg, Manitoba

- Managing and supporting 10+ software members in developing 5+ code bases for custom PCBs on our electric formula-style race car, ensuring we follow our competition timeline, using **Git** and **GitHub**
- Created a Kanban board and roadmap to track team wide issues and handle blockers, using **GitHub Projects**
- Demonstrated a deep understanding of **embedded systems** and problem-solving while guiding team members to write safe, structured, and readable code aligned with industry best practices
- Improved **CI/CD** infrastructure through test pipelines and code review to automate our software development process, using **GitHub Actions** and repository rule sets
- Developed **CAN2.0** communication between custom vehicle PCBs, Battery Management System (**BMS**), and a 3-phase motor controller, using **STM32** MCUs

UMSAE Formula Electric - Software Team Member **Sept. 2022 – Aug. 2024**
University of Manitoba *Winnipeg, Manitoba*

- Programmed **STM32** microcontrollers on custom **PCBs** that run our electric race car
- Collaborated with upperclassmen to learn how to implement industry programming practices into our projects
- Developed detailed documentation skills to reference design and decision choices on our team
- Created a **Python** script to read and process current measurements from a high current supply using an **ADC**
- Used Data Processing equipment during our Tab Testing procedure involving high current output
- Developed the ability to troubleshoot electrical systems through **PCB** schematics

UMSAE Executive Team - Web Director **June 2024 – Oct. 2025**
Winnipeg, Manitoba

- Managing our organization's website (*umsae.com*) and all software licenses used throughout the organization
- Maintaining all computing facilities in our organization

St. Ignatius School - After-School Program Leader **Sept. 2022 — Jan. 2023**
Winnipeg, Manitoba

- Led STEM and other recreational activities for students in the after-school program while promoting positive social interactions between students

Math Tutor - High School **Jan. 2020 — June 2022**
Private Tutor *Winnipeg, Manitoba*

- Devised personal assessments for students that improved their skills in mathematics while being patient and answering questions outside of tutoring time

Projects

Spectrum Analyzer

- WIP - 28-band acrylic spectrum analyzer designed to integrate with a sound system
- **FFT**-based **DSP** on an **STM32** microcontroller driving **WS2812B** LED strips via **DMA** for real-time visualization
- Custom **PCB** designed in **Altium Designer**; enclosure and mounting hardware designed in **SolidWorks**

Rocket League BOT

- WIP - Offline Rocket League bot trained using **reinforcement learning** with **RLGym** and **PyTorch**
- Custom reward shaping and training loop; leverages a mocked **Unreal Engine** environment for sample-efficient training

BMO - An Embodied AI Agent

- WIP - Local multimodal AI agent running a quantized **Qwen 3 LLM** on a **Raspberry Pi 5**
- **Whisper**-based voice input with **TTS** output; live camera feed provides real-world context cues
- Streams **STEAM** games over a local network to use BMO as a gaming console

Personal Website

- WIP - Personal portfolio site showcasing engineering projects and linking to GitHub and LinkedIn

NAS Storage System

- Built a **NAS** using commodity hardware with **RAID** configuration for data redundancy
- Deployed **Jellyfin** media server to host and stream family photos and videos with local and remote access

FPGA Calculator

- Designed a multi-operation calculator in **Verilog** on a **DE-10 Standard FPGA** board
- Implemented a **7-segment display** driver and arithmetic logic **state machine**

Awards and Achievements

- Ron and Dorothy Britton Design Engineering Bursary (2x)
- W.J. Christie Memorial Bursary in Engineering
- Guertin Centennial Scholarship
- University of Manitoba Student Union Bursary
- Attended AWS Cloud Practitioner Workshop (professional development)