Lucas Lau

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Education

University of Waterloo — Waterloo, ON

Bachelor of Applied Science (BASc) in Biomedical Engineering — GPA: 3.7 — *Sep 2025 – Apr 2030*

Coursework: Biomedical Design, Data Structures & Algorithms, Digital Computation, Linear Algebra, Materials Science

Technical Skills

Design & CAD: SolidWorks, Onshape, engineering drawings & GD&T, tolerance stack-up analysis, test fixture & jig design, DFM/DFA, 3D printing, machining & rapid prototyping

Medical Device & QMS: V&V protocols & reports, accelerated aging (ASTM F1980), sterilization & shelf-life testing, design controls, DHF/DMR, risk management (ISO 14971), ISO 13485

Software & Tools: Python, C++, MATLAB, NumPy, Pandas, OpenCV, Git, Arduino, MS Office (Word, Excel)

Additional: Embedded Systems, Signal Processing, Computer Vision, Circuit Design, Full-Stack (TypeScript, React)

Experience

Systems Engineering Co-op — May 2026 – Aug 2026

Intellijoint Surgical — *Waterloo, ON*

- Achieved **<3 mm / <3°** surgical instrument accuracy by designing optical-navigation assemblies in **Onshape**
- Cut surgical-field footprint **60%** by designing a **pin-fastened bone mount** and reaming tool
- Sped up marker verification **40%** by designing and **3D-printing** custom test fixtures and jigs
- Released **9 engineering drawings** with **GD&T** to enable external fabrication of machined components
- Caught **7 design defects** by coding **Python/MATLAB** tools to analyze bench-test data
- Validated accuracy specs by writing and executing **8 V&V protocols** and **5 engineering test reports**
- Established shelf life via **ASTM F1980 accelerated aging** of non-sterile, sterile, 1-yr, and 2-yr marker groups

Projects

Optical 6-DOF Pose Tracker | *Python, OpenCV, ArUco, NumPy/SciPy* — GitHub

- Built a real-time **6-DOF optical pose tracker** for surgical-style tools in **Python/OpenCV**
- Achieved pose robust to **partial occlusion** by fusing **multi-marker rigid bodies** via least-squares PnP
- Enabled tip tracking via **pivot calibration** and a reference frame; accuracy **1.2 mm RMS**

Arduino Pulse Oximeter | *Embedded Design, C++, Signal Processing*

- Measured **SpO2 and heart rate** by building an Arduino **medical device** interfacing a sensor in **C++**
- Ensured accurate readings by adding **signal-processing** filters and a real-time web dashboard
- Validated accuracy by **benchmarking readings** against a commercial pulse oximeter

Volleyball Jump Detection Tool | *Python, OpenCV, MediaPipe* — GitHub

- Analyzed athlete performance by building an **optical tracking system** in OpenCV at **30+ FPS**
- Reduced false positives **from 15% to 3%** by developing calibration and smoothing algorithms
- Replaced manual frame-by-frame review by **automating jump-height measurement** from video

CatanConnect — Assistive Device | *Biomedical Design, Prototyping*

- Cut unintended piece movement for users with tremors by prototyping a **magnetic stabilization system**
- Grounded the design in **user research** and documented it across two technical design reports

Leadership & Extracurriculars

National Level Ultimate Frisbee Athlete — Apr 2022 – Present

Elites Ultimate / University of Waterloo — *Toronto, ON*

- **Captained** Toronto's National Junior team to **five** National Championship qualifications (2021–2026)
- Competed as a Waterloo **Varsity Athlete** and a **Team Canada U-20** World Juniors tryout invitee (2025)

Founder — Ultimate Frisbee Non-Profit — Nov 2023 – Apr 2025

Pookie Bears Ultimate Team — *Toronto, ON*

- **Founded** Toronto's first non-profit Junior Indoor Ultimate team, managing bookings and registration
- Led the competitive team to a **second-place finish at Indoor Nationals**