

Gabriel Chan

Machine Learning | Biomedical AI

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SUMMARY

Machine learning practitioner with a biomedical foundation: physiology and pharmacology, then biomedical engineering, including graduate coursework taking a regulated Class III medical device through concept and risk analysis, now computer science at Penn. Built a clinical MRI diagnostic pipeline at the Krembil Brain Institute; independently implements deep learning architectures from scratch in PyTorch. Brings domain fluency to work on real healthcare data, not just benchmarks.

RESEARCH & EXPERIENCE

Machine Learning Research Assistant — Krembil Brain Institute, Toronto Western Hospital Apr 2025 – Aug 2025

- Built an end-to-end Python pipeline to diagnose Parkinson's disease from brain MRI, automating preprocessing, segmentation and radiomics feature extraction (PyRadiomics).
- Raised diagnostic accuracy from ~55% to 85% by correcting class imbalance, applying L1 feature selection and regularization, and benchmarking Logistic Regression, Random Forest and XGBoost.
- Identified heavily redundant radiomics features (e.g., entropy measures) through correlation and importance analysis, informing which features the final model kept.

Biomedical Device Development Project — University of Toronto (MEng) Jan 2025 – Apr 2025

- In a team of 6, took a hypothetical Class III, MRI-guided brain tumour ablation device through concept and planning under ISO 13485, contributing to design inputs, verification testing, and risk/hazard analysis workstreams.
- Contributed to 240+ design inputs (electrical, software, mechanical, safety, UI, manufacturing, packaging) and a ~200-test verification plan, with traceability matrices linking each to market requirements and hazards.
- Contributed to an ISO 14971 risk analysis of 60+ hazards — scoring severity and probability, defining 96 mitigations, and re-scoring residual risk against an internal risk policy.

Author & Publisher — Human Body Anatomy for Kids (Ages 6-10) Nov 2021 – Present

Self-published as Gavin Walton • Toronto, ON

- Wrote, published, and sold 600+ copies of a children's anatomy book across ebook, paperback, and audiobook formats (audiobook the top seller), translating complex physiology concepts for young readers.
- Ran production end-to-end, coordinating editors, narrators, and publishers through the physical print and audio release process.
- Designed interactive learning elements, quizzes, and activities to solidify biology retention for the target demographic.

MACHINE LEARNING PROJECTS

Parameter-Efficient Fine-Tuning for Biomedical NLP — PyTorch, Hugging Face Jul 2026 – Aug 2026

- Implemented LoRA from scratch to fine-tune RoBERTa-base on PubMed-RCT (177K sentences), landing within 2.8–5.3 accuracy points of full fine-tuning while training only 0.6–2.3% of parameters.
- Cut model checkpoint size up to 170x (2.8 MB vs. 475.5 MB) and profiled peak GPU memory across every configuration to map the accuracy–efficiency trade-off.
- Debugged a model-collapse failure at rank ≥ 16 , tracing it to an alpha-scaling heuristic that grew with rank and destabilized gradients.

CNN Architecture Study — Keras, TensorFlow Jun 2026

- Benchmarked 8 CNN architectures on Intel Image Classification, isolating the effect of batch norm, residual connections, depthwise-separable convolutions and transfer learning.
- Fine-tuned transfer learning reached 91.0% accuracy vs. an 85.6% baseline; showed that added complexity without enough depth or regularization underperformed a plain CNN.
- Traced unstable validation metrics to Keras's default batch-norm momentum (0.99); lowering it to 0.9 stabilized every batch-norm model.

TECHNICAL SKILLS

Languages: Python, Java, R

ML/DL Frameworks: PyTorch, TensorFlow/Keras, Hugging Face Transformers, scikit-learn

Biomedical: MRI analysis, radiomics (PyRadiomics), biomedical literature review, physiology & pharmacology

Regulated Environments: ISO 13485, ISO 14971, IEC 62304, design controls, verification and validation

Tools: Git/GitHub, Hugging Face Hub, Google Colab, Jupyter

EDUCATION

University of Pennsylvania — MCIT (Computer Science) Sep 2025 – Present

University of Toronto — Master of Engineering, Biomedical Engineering Sep 2024 – Aug 2025

Western University — BMSc, Honours Specialization in Physiology & Pharmacology Sep 2020 – Jun 2024