

Joel Tsuchitori

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Education

University of British Columbia

Bachelor of Applied Science in Engineering Physics

Expected May 2025

Vancouver, BC

Experience

Murphy Lab | Python, PyTorch, KiCad, OnShape, Linux, Machine Learning

May 2023 – Jan 2024

Neuroscience Lab Assistant Intern

Vancouver, BC

- Using Pytorch based Neural Networks for decoding Optogenetic signals into behavior videos.
- Extended and Improved state of the art neural network embedding techniques to work with widefield Mesoscope data.
- Designed and constructed experiment setups for researching social interaction and strokes in mice using laser cutting, 3d printing, and machining.
- Routed circuits and created PCB for circuits to drive Optogenetic imaging systems and camera arrays for 3d reconstruction.
- Investigated using transformer based neural networks for creating interpretable neural embeddings.

NRC Herzberg: CCAT | Xilinx Vivado, Matlab, Simulink, Linux, Signal Processing

Jan 2022 – May 2022

Astronomy Instrumentation Design Intern

Victoria, BC

- Designed a novel method of tone generation for superconducting Kinetic Inductance Detector Readout reducing memory by 99% compared to existing techniques.
- Optimized readout architecture significantly reducing resource utilization compared to previous generation readout systems.
- Designed and implemented gateway designs using Simulink and Vivado for the Xilinx RFSOC and verified their behavior in the lab on FPGAs.
- Reviewed existing literature for potential improvements to readout design and tested and evaluated new potential gateway designs, creating research documentation for future work to be based off of.

Sailbots Design Team | Skills: Python, Matlab, Docker, ROS

Sep. 2020 – Jan 2023

Controls Team Software Lead

Vancouver, BC

- Designed and Implemented a novel control system for an autonomous ocean-going sailboat using Python and ROS, building upon existing research in the field.
- Coordinated live testing of the boat, implementing solutions on the fly and generating useful feedback to improve the control system.
- Organized and held sub-team meetings interviewed potential team members for recruitment.

Projects

Digital AI Clone Capstone Project | PyTorch, Python, Machine Learning, Generative AI

- Developed an Unconditional Audio Diffusion model building off of SOTA work in Diffusion
- Working towards developing a Multimodal diffusion based agent trained off of data collected from Minecraft.

Silicon Photonics Fabry Perot Cavity | Silicon Photonics, Lumerical, Matlab, Simulation, KLayout

- Designed a Fabry Perot Cavity with Bragg Grating mirrors to maximize Q factor of the transmission spectrum at a target wavelength
- Layed out the Designs in KLayout to be manufactured with Electron Beam Lithography and tested

Engineering Physics Robotics Competition | Arduino Code, Prototyping, CAD, Soldering, Circuit Design, Control theory

- Designed and built a robot using an STM-32 microcontroller to compete against other students in the program.

- Implemented an IMU based navigation system which used PID controllers and sensor filtering successfully navigate the competition course.
- Used signal processing knowledge to design a digital signal processing algorithm which could differentiate and track IR beacons of different frequencies.
- Analyzed different motor options and drive configurations for a drivetrain using CAD, documentation, and testing, before ultimately desinging and building the robot drivetrain.

GPT-3 Based Letter Writing Assistant | *Python, Bash, Linux, AI, GPT-3*

- Designed a Python based letter writing assistant using OpenAI's GPT-3 API.
- Implemented a simple command line interface for the program to allow for prompting and editing the AI output.

Technical Skills

Programming Languages: Python, C, Matlab, Bash, Rust, Java

Software & Tools: PyTorch, Anaconda, Slurm, Solidworks, ROS, Matlab, Simulink, Linux (Arch, Ubuntu), Excel, KiCad, Onshape

Hardware & Prototyping: CAD, Soldering, Circuit Design, PCB fabrication & SMD component Soldering, 3d Printing, Laser Cutting, Waterjet Cutting, Metalworking (Mill & Lathe)

Concepts: Digital Signal Processing, Control Theory, Machine Learning, Diffusion, Generative AI, Neural Networks, Hardware Prototyping, Circuit Design, API, Research, FPGA Development, Robotics