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Mackenzie Goodwin

Hardware / Firmware Engineering

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I'm extremely driven to be the best in my field and aim to be a "full stack" engineer mastering hardware, firmware and software. "A leader is only as good as their team" is a mindset I bring to my team and everyone around me.

Technical Experience

Dojo Hardware Engineering Intern **07/2021 — 01/2022**
Tesla *California*

- Lead design and integration of daughter card architecture for complexity offloading and improve fault tolerance
- Developed safety systems and hot-swap circuitry for extremely-high power density applications of 200kW+
- Took ownership of multiple boards, bringing up, validating and integrating managing mechanical and system integration
- Designed and implemented FPGA RTL for I2C peripheral to pull telemetry data from VRMs

Autopilot Hardware Engineering Intern **01/2021 — 04/2021**
Tesla *California*

- Wrote hardware validation testing suites for the team including Ethernet Switch, GPS, VRM bringup in Python to reduce repetitive tasks and build software infrastructure
- Discovered, root caused and implemented a solution to reliability issues on AutoPilot board in temperature varying environments
- Performed time-domain reflectometry on SGMII and 1000Base-T1 signal paths to verify signal integrity and performed eye-diagram analysis for intersymbol distortion
- Validated multi-phase buck converter load transient step response and open-loop phase response; meeting requirements

Electronics Designer and Innovator Intern **08/2019 — 04/2020**
Kazoo Technology *Hong Kong*

- Reversed engineered capacitive touch screen stylus hardware to adapt technology to special usecase
- Design discrete and integrated analog amplifier and digitally controlled filters using LTSpice simulations and built and tested prototypes
- Design and packaged manufacturable products for consumer use
- Designed 200MSP/s ADC with FPGA dev-board in Altium including touch screen protocol detection and spoofing for touch screen stylus testing

Systems Engineering Intern **08/2017 — 04/2018**
Evertz Microsystems *Toronto*

- Developed FPGA firmware for capturing and replaying 10GB/s fibre optic IP packets with realtime hardware timestamping
- Improved SDRAM data packing density by 50% using intelligent circular buffering and memory pre-caching
- Debugged hardware short on high density PCB and designed improved active fusing system

Projects

Microplastic Detection for Microbiologists **2020 — 2022**

- Device to help microbiologists detect microplastic pollution in an ecosystem
- Designed 6GHz cavity resonator for detecting changes in dielectric properties of microplastic suspended in microfluids
- Simulated RF structures in Ansys HFSS with optimization; tested the device using VNA

Fulltime Research for mmWave Radar Vital Sign Detection **2020 — 2021**

- Developed 60GHz mmWave Radar system for detecting breathing rate from a distance to aid nurses with highly infectious patients
- Designed algorithm using Matlab with wavelet transformation and auto-correlation to detect breath rate at up to 10 meters
- Implemented client-server architecture in Python and C++ to offload processing in realtime

Skills

Languages	Python, Bash, C, C++, Verilog, TCL, Java, Javascript, Solidity
Tools	Altium, Vivado, Cadence, Ansys HFSS, ModelSim
Specialties	Analog & Digital Design, RF Design, Highspeed Design, RTL Design

Education

Bachelor of Electrical Engineering, *University of Waterloo* 2016 — 2022