Mackenzie Goodwin

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SKILLS

Languages: Python, C, C++, System Verilog, Verilog, Java, Javascript, Solidity

Tools: Verilator, Cocotb, Altium, Vivado, Cadence, Ansys HFSS, ModelSim

Experience: Network Protocols, RTL Design, Highspeed Design, Full Stack, Analog & Digital Design, PCB Design, Web Design

EXPERIENCE

Tesla Inc. — Palo Alto, CA
DOJO Senior Silicon Design Engineer — *Feb 2024 – Present*

- Worked and developed the proprietary Tesla Transport Protocol (TTP) over Layer 3 congestion-aware protocol enabling low-latency, high-throughput communication across DOJO die to die fabric in RTL
- Brought design of TTP from design phase to tape out ready in next generation DOJO Z2 in system verilog
- Designing TTP RDMA system on next generation DOJO silicon taking into consideration scaling and adopting Ultra Ethernet Consortium (UEC) standards
- Scaled data center for video clip tensorization ingest and for all reduce operations

Tesla Inc. — Palo Alto, CA
DOJO Hardware Engineering — *Jul 2022 – Feb 2024*

- Led design of custom high-density compute cluster integrating NICs to enable TTP-based communication using PCB design and FPGA design
- Brought up DOJO interface cart NIC and FZ1 (compute-die interfaces) in production, developing front- and back-end Node.js tools for hardware tracking and diagnostics, and performing signal integrity and hardware debugging
- Wrote RTL to help with usability enabling microcontroller access to internal buses as well as enabling hostless hardware control
- Designed hardware and brought up production line for high power AC to DC conversion for DOJO cabinet power rails

Tesla Inc. — Palo Alto, CA
DOJO Hardware Intern — *Aug 2021 – Dec 2021*

- Tested high-speed interface cards for mesh network and fabric communication containing 100G QSFP and high speed SERDES interfaces achieving TB/s throughput, alongside high-density power supply units
- Engineered a super capacitor hot swap controller, enabling seamless hardware insertion into a live cabinet, thus promoting operational convenience and safety
- Engineered next generation DOJO cabinet controller with wide array of IOs and infastructure controllers
- Brought up Tesla's first generated DOJO cabinet with compute nodes and power supply units
- Effectively tested and integrated a large, complex system comprising intricate harnessing, control systems, and high-power delivery, ensuring overall system coherence and performance

Tesla Inc. — Palo Alto, CA
Autopilot Hardware Intern — *Jan 2021 – May 2021*

- Built Python test suites for switch, GPS, and VRM bring-up to streamline validation workflows
- Debugged Autopilot board failures in thermally stressed environments finding hardware design issues on the board
- Performed TDR and eye diagram analysis on SGMII and 1000Base-T1 interfaces to diagnose and resolve signal integrity issues
- Validated buck converter transient/load stability

Evertz Microsystems — Burlington, ON, Canada
Systems Engineering Intern — *Sep 2017 – Aug 2018*

- Designed DDR3 buffer system in RTL with CPU to DMA for Wireshark-compatible frame dumping and debug
- Researched impedance/phase matching for 25G QSFP lanes to improve signal integrity
- Captured RGMII, SGMII, and 1000BTX schematics with optimized magnetics and termination

- Created FPGA RTL for timestamped 10Gb/s packet capture and replay
- Debugged PCB short circuits and engineered active fuse systems

University of Waterloo
Waterloo, ON, Canada
Undergraduate Research Assistant
Apr 2020 – Aug 2020
- Developed 60GHz mmWave radar measurment device for non-contact hospital patient monitoring
- Created DSP pipeline using wavelets/autocorrelation to detect breathing rates at 10m range
- Built Python/C++ client-server system for real-time offloaded processing

Kazoo Technology
Hong Kong, HK
Electronics Designer Intern
Aug 2019 – Apr 2020
- Reversed engineered stylus touch hardware and validated via simulation and prototype
- Designed analog amplifiers and touch spoofing systems with 200MSPS ADC on FPGA
- Very relavent but was their main actor in their commercial

AR Modular RF
Seattle, WA
RF Hardware Engineering Intern
Jan 2019 – Apr 2019
- Built LabView + Python-based automated RF test infrastructure, improving test speed and repeatability
- Automated MAC management and firmware flashing system for IP-enabled RF products
- Performed RF spec analysis and documented technical content for marketing

Dozr
Kitchener, ON, Canada
Fullstack Software Engineer Intern
Jan 2017 – Apr 2017
- Developed frontend React components and internal tooling using advanced state management
- Built distributed Node.js/Python crawler with intelligent throttling and parallelism

PROJECTS

All projects available at mackenzieg.tech/projects

Microplastic Detector | *Research Project (2021 – 2022)*
- Designed and built a microwave cavity resonator system to detect microplastic concentrations in water samples
- Developed signal processing algorithms to analyze resonant frequency shifts and S11 magnitude changes
- Achieved reliable detection of microplastic concentrations from 300-900 ppm with clear correlation in resonant magnitude

EDUCATION

University of Waterloo
Waterloo, Ontario, Canada
Bachelor of Science in Electrical Engineering
Sep 2016 – June 2022