Mohammedali Khalaf

902-943-6636 | M.Khalaf@dal.ca | in/mohammedali-khalaf | github.com/Moe-Khalaf

EDUCATION

Dalhousie University   Halifax, NS, Canada
Bachelor of Electrical and Computer Engineering   *Sep. 2020 – Jun. 2025*

EXPERIENCE

Undergraduate Research Assistant   May 2022 – Apr. 2025
Dalhousie Underwater Communications Laboratory: Underwater Acoustics   *Halifax, NS, Canada*
- Implemented embedded C firmware on a Zynq SoC based transceiver to establish high-speed data streaming between FPGA and host-computer and enable real-time diagnostics.
- Created system-level test cases for a Zynq FPGA based ultrasound signal transceiver to ensure functional requirements, meeting 100% code coverage.
- Designed VHDL modules for an FPGA based receiver to interface with an external multi-channel ADC, enabling real time processing of signal data as part of a Magneto-Inductive communication system.
- Developed an FPGA based Acoustic signal transmitter, overseeing the entire FPGA design cycle from mathematical system modeling to VHDL implementation. Ensured compliance with NATO Janus standard.

Embedded Logic and Firmware Intern   Jan. 2024 – Aug. 2024
ASML Holding B.V.: Semiconductor Manufacturing Machines   *Veldhoven, Netherlands*
- Examined strategies to optimize the bandwidth of an FPGA-based high-speed digital communication interface, achieving a 270% bandwidth increase beyond project targets and eliminating a critical bottleneck in the data acquisition speeds of laser light generation systems.
- Defined and documented system requirements and test procedures to uncover redundancies in the existing design and usage of the interface and provide direction in identifying optimizations.
- Used mathematical models in Excel, HDL simulations, and automated test scripts to execute defined test procedures.Used Matplotlib and Pandas libraries to create data insights from tests, streamlining both the research project, and several other parallel projects regarding the same device.

Electrical Engineering Intern   Jan. 2023 – Apr. 2023
Geospectrum Technologies: Underwater Acoustics   *Halifax, NS, Canada*
- Pioneered the development of a proof-of-concept communication abstraction layer in Python, enabling the software engineering team to effortlessly interact with diverse hardware components by using simplified commands.
- Provided comprehensive documentation for key stakeholders to enhance collaboration and streamline development.

PROJECTS

Graduation Project: FPGA Based Stepped Aperture Beamformer | *Verilog, Python* Sep. 2024 – Apr. 2025
- Designed the system architecture of a beamforming multiplexer, enabling a wider field of view and 400% increase resolution for an existing Medical Ultrasound beamformer.
- Developed the Verilog HDL design for an FPGA based controller for the Multiplexer which handles all controls, digital communication, and timing aspects of the circuit.
- Utilized System Verilog simulations, logic analyzers, and oscilloscopes to verify system functionality, and drive system integration. Verification methods such as UVM and ABV were used to ensure 100% coverage.
- Created a Python based User Interface to allow for user friendly control over the device. The UI enables reconfiguring of beamforming profiles and power settings, allowing for a reconfigurable design.

AI Based Under water Adaptive Modulation | *Python, Keras, Pandas, Matplotlib*   Sep. 2023 – Dec. 2023
- Designed a proof-of-concept architecture for an underwater communication system that uses machine learning to adapt to time-varying noise interference and multi path interference by changing modulation schemes in real-time.
- Channel estimation models yielded a 90% accuracy in predicting the presence of high interference. Modulation scheme prediction models yielded a 99% accuracy.

TECHNICAL SKILLS

Languages: C, C++, VHDL, Verilog, System Verilog, Python, Tcl, MATLAB, Assembly
Programming Libraries: Keras, Sci-Kit-Learn, Pandas, NumPy, SciPy, Matplotlib, Pyserial
Communication Protocols: SPI, I2C, UART, RS-232, AXI
Software Tools: Xilinx Vivado, Altera Quartus, Lattice Diamond, LTSPICE, Ubuntu, Peta Linux, Jira, Bitbucket, Github, Confluence
Testbench Tools: Oscilloscope, Logic Analyzer, Multimeter, DC Power Supply, Function Generator