

Bilal Dawood

+1 587-429-7635 | [Website](#) | [LinkedIn](#) | [Github](#) | Calgary, AB

EDUCATION

University of Calgary

Calgary, AB

BSc in Electrical Engineering, Minor in Digital Engineering — GPA: 3.64

Aug. 2019 – May 2024

Coursework and Certifications: Application Specific Processors and Accelerators, Industrial IoT, Advanced ML and NN

TECHNICAL SKILLS

Languages: Java, Python, C/C++, MATLAB, JavaScript, HTML/CSS, Assembly (ARM, MIPS), Verilog

Frameworks: React, Node.js, Flask, FastAPI, Tensorflow, PyTorch

Developer Tools: Git, Gerrit, Linux, PuTTY, MS Azure, VS Code, PyCharm, Jira

Design and Simulation: Cadence Allegro, MODELSIM, NI Multisim, PS:SE, Xilinx Vivado, Intel Quartus Prime, SIMULINK

Hardware Tools: Oscilloscope, Spectrum Analyzer, Multimeter, Solder, Power Supplies, STM MCU, Pynq Z2 FPGA, PIC MCU

Libraries: Pandas, NumPy, Matplotlib, Seaborn, Tkinter, Keras, OpenCV, Pillow, Scikit-learn

Hobbies: Soccer, Badminton, Kick Boxing, Photography, Table Tennis

EXPERIENCE

Digital Hardware Engineer (intern)

May 2022 – Aug 2023

Ericsson Canada Inc

Ottawa, ON

- Achieved 70% reduction in Thermal verification time by developing an automation tool using Python.
- Ensured accuracy by creating test cases and comparing recorded metrics manually with component datasheets.
- Showcased report writing and presentation skills by preparing user manual and presenting results to management.
- Ensured electrical functionality by verifying power rail integrity on high voltage radio boards using Power Tree and multimeter.
- Conducted board bring-up and verification by identifying and recording Flash SPI timing parameters using Oscilloscope.
- Confirmed data transfer compliance by identifying and recording Flash SPI interface timing parameters using Oscilloscope.
- Supported PCB design verification using Cadence Allegro by leveraging existing radio board schematics.
- Hands on experience with UART, JTAG, I2C and SPI with Ericsson radio boards.
- Took initiative to update and fix faulty spectrum analyzer by working directly with hardware vendor.
- Power Rail Analysis using Power Tree and measuring continuity across capacitors to ensure no shorts were created.
- Leading research on high-frequency testing equipment, targeting optimal performance and value by comparing price with datasheet specifications and testing requirements.

Android SDK/NDK Full-Stack Developer (Intern)

Feb 2023 – Aug 2023

Ericsson Canada Inc.

Ottawa, ON

- Joined the development and optimization of an Android app using JavaScript, React Native, C++, and C; managed tasks with Jira; and ensured code quality through continuous debugging processes with Gerrit and peer reviews.
- Boosted backend data management efficiency by 60% via implementing 4 new classes and optimizing log outputs (Reduced unnecessary data logging and cleaned output formatting).
- Increased UI functionality by incorporating filters.
- Reduced page load times by 90% by implementing infinite scrolling, showcasing expertise in software optimization.
- Collected and analyzed 5G performance metrics using Qualcomm Network Testing Device, contributing to app development.

LEADERSHIP EXPERIENCE

Treasurer

Aug 2020 – May 2022

IEEE UofC Student Branch Executive Council

Calgary, AB

- Managed and maintained branch accounts for professional associations.
- Prepared and submitted Annual Budget reports and Financials.
- Developed financial strategies, ensured suitable funding for events, and advised on activity cost allocation.
- Presented data in a methodical format in front of other executive council members, demonstrating analytical thinking and proactive communication skills.

Electrical Team Lead

Sept 2021 – Sept 2022

Team Zeus

Calgary, AB

- Developed comprehensive and easily comprehensible documents for modifications on an electric motorcycle.
- Collaborated with other technical teams to integrate electrical systems into the vehicle.
- Performed multiple drafting tasks and ensured synchronous data-keeping for all electrical sub-teams.
- Assisted in designing and testing Battery Management System (BMS) and Electrical Control Unit (ECU).
- Gained an understanding of principles of bike operation and learned about workshop safety practices.

PROJECTS

- Automated Transit Enforcement** | *Python, Git, Software Dev, Hardware Dev, OpenCV* Sept 2023 – May 2024
- Developed a comprehensive hardware block diagram to outline the integration and use of various components.
 - Conducted research and selected hardware components based on literature review, electric ratings, and cost to select optimal components while ensuring functionality and compatability.
 - Reduced power consumption by 36% and memory utilization by 800% by implementing efficient triggers for sensors (LiDAR, GPS, camera) using a Python script on an RPi running Linux.
 - Reduced memory utilization and processing time by 800% by setting appropriate triggers through embedded designing
 - Integrated hardware components with the software server, ensuring smooth data transfer and system operation.
 - Conducted extensive testing to ensure system reliability and performance under various operational conditions.
 - Regularly shared progress with Calgary Transit, explaining tehcnical details in easy to undestand manner.
 - Achieved 95% license plate recognition accuracy using PaddleOCR and a cloud-based LPR API.
 - Optimized YOLOv8 object tracking model through pruning and quantization, achieving 93% mAP vehicle detection.
- Real-time Audio Filtering** | *C, ARM Assembly, STM MCU, Embedded Systems* Jan 2024 – May 2024
- Designed and implemented embedded real-time audio filter on the STM32F411 using C and ARM Assembly.
 - Reduced filter sampling rate by 28% and reduced program size by 13.6% by utilizing optimization techniques involving block processing and use of ARM Assembly.
 - Utilized Direct Memory Access (DMA) to efficiently load and verify audio files on MCU, ensuring accurate data extraction and processing.
 - Implemented and compared various FIR filtering techniques (Circular Buffer, Block Processing).
 - Compared performance (speed, memory usage) and verified integrity of filter using Python Notebook.
 - Implemented Loop Unrolling and utilized architecture-specific SIMD instructions to meet audio timing requirements.
- 2D Image Convolution** | *C, Python, STM MCU, ARM Cortex-M4, DSP, Embedded Systems* Jan 2024 – May 2024
- Implemented various 2D Image filtering techniques using 3x3 kernels on STM32F411 using C.
 - Loaded images to STM Microcontroller as binary file. Utilized convolution techniques to filter images.
 - Displayed expertise with memory mapping by paying close attention to data access and boundary handling for image convolution.
 - Implemented and observed the affect of various 3x3 kernels (edge filter, gaussian blur, sharpening).
 - Created Python notebook to view images by decrypting binary file.
 - Demonstrated expertise in digital signal processing and embedded systems.
- Hardware Accelerator (Pynq-Z2 FPGA)** | *C, Xilinx Vitis HLS, FPGA, Python* Jan 2024 – May 2024
- Utilized AMD Xilinx Vitis High-Level-Synthesis (HLS) to build, synthesize and debug C code.
 - Generated RTL designs and ensured proper resource utilization.
 - Implemented hardware optimization techniques to improve performance of MAC operations on FPGA.
 - Demonstrated proficiency with Loop Unrolling, Loop Fission and Pipelining optimization techniques on hardware.
 - Conducted thorough testing and validation procedures using testbenches created in C as well as through C simulation and synthesis, to ensure functionality and performance of operations.
 - Analyzed synthesis reports and utilized pragma directives to optimize loop latency, resource utilization and overall performance of hardware design.
 - Contributed to the development of optimized hardware accelerators, enhancing processing efficiency and throughput for FPGA-based applications.
 - Achieved 13%-time reduction verified by exporting IP and generating bit-files to flash bitstreams to FPGA via Python notebook.
- SolarCam** | *Embedded Systems, Solar Powered, C++* Jan 2022 – May 2022
- Developed an ESP32-microcontroller based solar powered security camera.
 - Successfully sourced and integrated electrical components including solar panels, ESP32, PIR sensor, and camera module.
 - Controlled GPIO pins using C++ to capture and save images.
 - Designed a self-sustaining power system with solar charging, battery storage, and regulated voltage.
 - Ensured adherence to relevant regulatory codes (ISO, CEC) for product quality, safety, and environmental considerations.
- Deep learning Finger Digit Classifier GUI** | *Python, Machine Learning, GUI, Data Visualization* Jan 2022 – May 2022
- Developed a finger digits classifier with fastai and a CNN, achieving a significant accuracy boost from 60% to 88%.
 - Employed data augmentation techniques to enhance real-time finger count prediction accuracy.
 - Proficiently managed image data and analyzed model performance for thorough evaluation and refinement.
 - Created a user-friendly GUI application and utilized Python libraries effectively for streamlined development and enhanced collaboration.
 - Utilized Git for version control, maintaining a clean and organized codebase.
 - Employed Seaborn and Matplotlib for data visualization, enhancing the presentation of results.

Yagi-Uda Antenna Design <i>Antenna Design, Signal Processing, Documentation</i>	March 2022 – May 2022
<ul style="list-style-type: none"> Designed a Yagi-Uda antenna using copper wires and a split coaxial cable. Ensured optimal signal reception by achieving a power transfer of -20dB, indicating that 1% of power was reflected. Conducted experiments to measure the performance of the antenna under different conditions (materials, orientations). Used RTL-SDR USB radio devices and software to measure and analyze signal outputs. Identified and resolved issues during the design and testing phases of the antenna project, such as signal interference. Ensured precision in component measurements and soldering to achieve desired signal reception and circuit performance. Documented the design, methodology, results, and analysis of the projects in detailed reports. Tested the antenna with various materials between the transmitting and receiving antennas, demonstrating robustness and adaptability to different environmental conditions. Used RTL-SDR USB for receiving and demodulating audio signals, and measuring signal outputs under various conditions 	
AM Receiver System Desing <i>Circuit Design and Analysis, Multisim, Simulation</i>	Oct 2021 – Dec 2021
<ul style="list-style-type: none"> Designed and implemented an AM receiver system. Developed active filter and base-band amplifier circuits. Used parametric sweeps and AC analysis to optimize circuit performance. Analyzed signals at different points in the AM receiver circuit to ensure proper reception and demodulation. Used simulation software (NI Multisim) to verify theoretical calculations and optimize circuit designs. Documented the design, methodology, results, and analysis of the projects in detailed reports. Utilized for DC and AC analysis, including tools like Multisim or similar simulation platforms for parametric sweeps and small-signal analysis. 	
Altera DE10-Lite Distance Sensor <i>VHDL, Intel Quartus Prime, MODELSIM, FPGA</i>	Sept 2021 – Dec 2021
<ul style="list-style-type: none"> Implemented voltage-to-distance conversion in VHDL using Intel Quartus Prime. Design and implementation met timing requirements for digital signal processing. Created testbenches to conduct tests and simulate digital signals and switch gates to be verified using MODELSIM. Configured DE10 display for distance/voltage based on switch state. Demonstrated proficiency in FPGA programming, sensor integration, and VHDL, highlighting skills in hardware design and testing. Generated RTL schematic to view flow of bits. 	
Point Based Graphical Zoom <i>MATLAB, Graphical User Interface, Image Processing</i>	July 2021 – July 2021
<ul style="list-style-type: none"> Used MATLAB to create a graphical point-based zoom function. The function generated a bounding box and produced a new figure based on any two points on a MATLAB-produced graph. 	
UnderPressure Posture Corrector <i>C++, Embedded Systems, Agile, Product Development</i>	Jan 2021 – May 2021
<ul style="list-style-type: none"> Developed an Arduino-based posture corrector using an Arduino Nano, resistive strips, and a speaker. Applied voltage dividers and utilized C++ and Arduino IDE for embedded programming. Implemented Agile project management methodologies (sprint and scrum) for efficient development. Received awards for "Most Innovative Product," "Best Marketing," and "Best Use of Humor." 	
DFF Synchronous Sequential Circuit <i>Simulation, Analysis, Digital logic Design</i>	Nov 2020 – Dec 2020
<ul style="list-style-type: none"> Implemented d-latches and d-flip-flops using Quartus for simulation and verification. Designed a synchronous detector circuit, creating state transition diagrams and K-maps to define behavior. Developed a clock divider to manage timing requirements within digital circuits. Utilized Intel Quartus Prime for designing, simulating and verifying digital circuits. Utilized K-maps to simplify logic desing. Ensured accurate operation of digital components, with the synchronous detector circuit correctly identifying the binary sequences Simplified logical expressions from K-maps to enhance circuit efficiency, demonstrating advanced problem-solving skills. 	
C++ Flight Management Program <i>C++, File Handling, Algorithm, Software Development</i>	June 2020 – July 2020
<ul style="list-style-type: none"> Developed and implemented a Flight Management Program in C++, incorporating classes for Flight, Passenger, and Seat. Utilized file handling to read and process flight information from a text file, showcasing proficiency in data input/output operations. Implemented functionalities such as displaying seat maps, managing passenger information, adding/removing passengers, and saving data to enhance the program's usability. Applied the Selection Sort algorithm for efficient organization of passenger data based on seat locations, demonstrating algorithmic problem-solving skills. 	
Impact of Green Line LRT Research Project <i>Research, Analysis, Presentation</i>	July 2020 – Aug 2020
<ul style="list-style-type: none"> Researched and wrote a report on the impact of the Green Line LRT and its stations on stakeholders. Analyzed stakeholders, including the public, residents near the station, taxpayers, and Calgary Transit employees. Considered financial restrictions and proposed solutions to potential problems. Gave a professional and technical presentation summarizing findings. 	
Calgary Weather Data Visualization <i>Java, GUI, Data Visualization</i>	Nov 2019 – Dec 2019
<ul style="list-style-type: none"> Implemented a GUI and user-interactive program using Java-based Language Processing. Displayed daily average minimum and maximum temperature data for the last 30 years in Calgary. Enabled user flexibility in selecting data for specific months and displaying maximum or minimum temperatures. 	

AWARDS

Jason Lang Scholarship(2020, 2021, 2023), **Dean's List**(2020, 2021, 2024)

KEY COURSES

Electrical Engineering:

Digital Circuits: Number systems, Boolean algebra, combinational and sequential circuits, counters, registers, and memory arrays.

Digital Systems Design: Digital system design and testing, programmable technology, CAD tools, and design for testability.

Digital Electronic Circuits: MOS transistor fundamentals, MOS logic gates, memory, and integrated circuit design.

Analog Electronic Circuits: BJT amplifiers, operational amplifier circuits, power amplifiers.

Circuits II: Laplace transforms, transfer functions, filter theory, transient responses, two-port circuits.

Electromagnetic Waves and Applications: Wave propagation, transmission line theory, scattering parameters, waveguides.

Power Systems Analysis: Power flow studies, stability, load frequency control, voltage control, power generation economics.

Electrical Engineering Energy Systems: Power generation, transmission, distribution, three-phase systems, power flow analysis.

Electronic Devices and Materials: Semiconductors, diodes, BJTs, MOSFETs, material properties.

Software Engineering:

Advanced Software Design and Development: Software modelling and design, object-oriented design, concurrent and database programming, systems integration.

Advanced Applied AI and ML: Data extraction and visualization, learning algorithms, neural network architectures.

Industrial IoT Systems and Data Analytics: IIoT fundamentals, digital frameworks, data analytics.

Cyber-Physical Systems Engineering: Design, reliability, performance, security of cyber-physical systems, FSM design.

Computer Organisation: CPU, memory, instruction sets, assembly language, virtual memory, I/O devices.

Application Specific Processors and Accelerators: RISC, CISC, application-specific processors, hardware/software optimization, hardware-software co-design.

Telecommunications:

Signals and Transforms: Continuous and discrete-time signals, Fourier and Z-transforms, sampling theory.

Communications Systems and Networks: Analog and digital communications, network protocol architectures, data/network security, performance analysis.

Control Systems:

Control Systems I: Dynamic systems modeling, feedback control, transient and steady-state analysis, frequency response, compensation design.