Bilal Dawood

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EDUCATION

University of Calgary   Calgary, AB
BSc in Electrical Engineering, Minor in Digital Engineering — GPA: 3.64   *Aug. 2019 – May 2023*

EXPERIENCE

Digital Hardware Engineer (intern)   May 2022 – August 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.
- Confirmed data transfer compliance by identifying and recording Flash SPI interface timing parameters using Oscilloscope.
- Supported PCB design verification using Allegro Cadence by leveraging existing radio board schematics.
- Hands on experience with UART, JTAG, I2C and SPI with Ericsson radio boards.
- 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 – August 2023
Ericsson Canada Inc.   *Ottawa, ON*
- Enhanced backend data management by 57% for application by creating 4 new classes and off-loading 80% of the data into separate files.
- Increased UI functionality by incorporating filters.
- Optimized app performance by reducing page load times by 90% by replacing batch loading with infinite scrolling and removing redundant functions.
- Collected and analyzed 5G performance metrics by conducting technical tests using Qualcomm Network Testing Device.

PROJECTS

Automated Transit Enforcement | *Python, Git, Software Dev, Hardware Dev*   September 2023 – May 2024
- Improved transit efficiency by 13% by leading the design and implementation of an automated enforcement prototype for Calgary Transit.
- Reduced power consumption by 36% by developing a hardware proof-of-concept with Raspberry Pi and sensors (LiDAR, GPS, camera) to trigger recordings on Linux interface, which was transmitted and stored on the server.
- Realized 95% license plate recognition accuracy by utilizing PaddleOCR for text detection and leveraging a cloud-based LPR API.
- Achieved 93% mAP vehicle detection by utilizing YOLOv8 object tracking model with data collected and labeled locally.
- Designed and implemented SQLite database to store violation data and developed a graphical user interface for easy viewing and management of violations.

Optimized Real-time Audio Filtering | *C, ARM Assembly, STM MCU, Embedded Systems*   date – date
- Designed and implemented embedded real-time audio filter on the STM32F411 using C.
- 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 instructions for ARM Cortex-M4 processor.
- Implemented and compared various FIR filtering techniques (Circular Buffer, Block Processing).
- Compared performance (speed, memory usage, program size) and verified integrity of filter after implementation.
- Implemented Loop Unrolling and utilized architecture-specific SIMD instructions to meet audio timing requirements.
- Created Python notebook to verify integrity of signal after filtering.

2D Image Filtering and Convolution on MCU | *C, Python, STM MCU, ARM Cortex-M4, DSP, Embedded Systems* date – date
- 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.
- Paid 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.

Altera DE10-Lite FPGA Distance Sensor | *VHDL, Intel Quartus Prime, MODELSIM, FPGA*   date – date
- 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.

Hardware Accelerator Implementation (Pynq-Z2 FPGA) | *C, Xilinx Vitis HLS, FPGA, Python*   date – date
- 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 10%-time reduction verified by exporting IP and generating bit-files to flash bitstreams to FPGA via Python notebook.

C++ Flight Management Program | *C++, File Handling, Algorithm, Software Development*   date – date
- 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.

UnderPressure Posture Corrector | *Arduino, Embedded Systems, Agile Methodologies, Product Development*   date – date
- 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."

SolarCam | *Embedded Systems, Product Development, ENEL 400 Project*   date – date
- Developed an Arduino-based solar panel tracking system using light sensors and servo motors.
- Designed and implemented algorithms for efficient solar tracking based on real-time sensor data.
- Utilized C++ and Arduino IDE for embedded programming and control of hardware components.
- Collaborated with team members to optimize system performance and ensure reliability under varying environmental conditions.

Calgary Weather Data Visualization | *Java, GUI, Data Visualization, ENGG 233 Project*   date – date
- 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.

Point Based Graphical Zoom | *MATLAB, Graphical User Interface, Image Processing*   date – date
- 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.

Impact of Green Line LRT Research Project | *Research, Analysis, Presentation*   date – date
- 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.

Deep learning Finger Digit Classifier GUI | *Python, Machine Learning, GUI, Data Visualization*   date – date
- 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.

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TECHNICAL SKILLS

Languages: Java, Python, C/C++, MATLAB, JavaScript, HTML/CSS, Assembly (ARM, MIPS), Verilog
Frameworks: React, Node.js, Flask, Material-UI, FastAPI
Developer Tools: Git, Gerrit, Linux, PuTTy, MS Azure, VS Code, PyCharm, Jira
Design and Simulation: Cadence Allegro, MODELSIM, NI Multisim, Simulink, PS:SE, Xilinx Vivado, Intel Quartus Prime, SIMULINK
Hardware Tools: Oscilloscope, Spectrum Analyzer, Multimeter, Soldering, Power Supplies, STM MCU, Pynq Z2 FPGA, PIC MCU
Libraries: pandas, NumPy, Matplotlib