Vincent Buff

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EDUCATION

M.S. Computer Engineering | North Carolina State University | Raleigh, NC *May 2024 – May 2026*
Accelerated Bachelor's/Master's (ABM) Program | **GPA: 3.87**

B.S. Computer Engineering | North Carolina State University | Raleigh, NC *August 2021 – May 2025*
Recurring Dean's List Award Recipient | **GPA: 3.90**

Relevant Coursework: ASIC/FPGA Design & Verification, Embedded System Architecture & Design, Advanced Computer Design, Advanced Microarchitecture, SW-HW Co-Design for Intelligent Systems, Data Structures & OOP, Complex Digital Systems & Logic Design, Circuit Analysis, Microelectronics, Linear Systems, Cloud Computing, Computer Networking

SKILLS

HARDWARE: ***MCUs/SBCs:*** Raspberry Pi 3/4B, Jetson Xavier, MSP430FR, KL25Z, ZCU102, ARM Architecture
Lab Equipment: 3D-Printers, Soldering, Oscilloscopes, Power Supplies, Logic Analyzers, CNC Mills, PCB Engravers
Radar Modules: CN0566, IWR6843AOPEVM

SOFTWARE: ***Programming:*** Python, C, C++, Bash, SystemVerilog
Development Tools & IDEs: VS Code, PyCharm, CLion, CCS, Keil, Jenkins, Git, GitHub, VMWare, Xilinx Vivado/Vitis, AWS
Collaboration & Project Management: Atlassian Tool Suite (Confluence, Jira, Bitbucket), Teams, Slack
Design & Analysis: OnShape, SolidWorks, Altium, Waveforms, QuestaSim, Wireshark

WORK EXPERIENCE

Computer Engineer Intern | Northrop Grumman | Linthicum Heights, MD *May 2025 – July 2025*

- Developing a centralized Common Config Repository for the Processing CTB team within CMAD to streamline deployment workflows and improve end-to-end system testing efficiency across multiple teams
- Contributing to a CI/CD pipeline as part of an Agile team using VMWare Horizon Client for development, while leveraging Atlassian tools like Bitbucket, Jira, and Confluence for source control, task tracking, and documentation
- Implementing a Git-based automation solution using submodules, sparse-checkout, and custom bash scripts to streamline the retrieval and execution of deployment config files through a selectable JSON-driven workflow
- Integrating ultrasonic sensors with a Raspberry Pi 4B by wiring GPIO connections and developing the data collection logic to support a real-time vehicle tracking prototype for parking overflow analysis

Embedded Engineer Intern | Murano Corporation | Durham, NC *December 2023 – August 2024*

- Researched, designed, and programmed a stationary embedded system device utilizing Python on a Linux-based platform that successfully detects and tracks a drone using a custom YOLO-based object detection model
- Performed physical wiring and GPIO connections on the Nvidia Jetson Xavier NX, including configuring GPIO settings via CLI to enable additional I2C and SPI pins for components like cameras, microphones, and thermal sensors
- Conducted and professionally documented the cross-compilation of Qt 5.15.0 for Raspberry Pi and US Navy target devices, successfully deploying and testing an example application on the latter
- Led 3D-modeling and 3D-printing operations for a multitude of designs and components for my team, including a custom testing enclosure for a new data collection PCB to ensure reliable performance

Makerspace & Lab Assistant Manager | North Carolina State University *May 2023 – August 2023*

- Collaborated with a Ph.D. candidate to develop an automated fume extractor controller system for all laboratory 3D-printers, utilizing a Raspberry Pi 4, connecting sensors to the printers, and assisting with system testing
- Maintained and recalibrated university 3D-printers to allow for dual-extrusion, fabricated a standard procedure for office nameplate engraving using a CNC router, and processed custom PCB engravings for students

ECE Summer Camp Teaching Assistant | North Carolina State University *June 2023*

- Guided high school students developing projects using Arduino hardware, C/C++ software, and a variety of sensors
- Demonstrated hands-on laboratory procedures such as soldering, 3D-printing, and circuit analysis to students
- Led tours through electrical and mechanical makerspaces, showcasing equipment such as CNC machines, PCB fabrication tools, oscilloscopes and more

Introduction to C Teaching Assistant | North Carolina State University *January 2023 – May 2023*

- Assisted students with C programming, covering concepts like pointers, memory management, and data structures
- Provided support for debugging and code optimization, ensuring best practices and efficient algorithms
- Graded assignments, projects, and exams, evaluating C proficiency, program design, and course adherence

PROJECTS

FPGA-Based Early-Exit Inference Accelerator *April 2026 – May 2026*

- Deployed a PyTorch-trained ResNet-18 to the Xilinx ZCU102 FPGA's DPU using the Vitis AI toolchain, building an end-to-end pipeline through INT8 quantization, model compilation, and PetaLinux board deployment
- Authored a multi-output C++ inference harness using VART runtime to extract per-exit confidence data across four early-exit branches, collecting a validated dataset of 5,000 CIFAR-10 inferences for offline analysis
- Characterized per-exit DPU throughput by compiling four truncated sub-models, demonstrating up to 5.77× theoretical speedup over the full ResNet-18 baseline through confidence-based early termination

Microprocessor Architecture: OoO Processor Simulator December 2025

- Designed a cycle-accurate simulator of a superscalar, out-of-order processor in C++, modeling dynamic instruction scheduling with a configurable issue queue, reorder buffer, and superscalar width using real instruction traces
- Built full pipeline control and dataflow logic across all out-of-order stages, including register renaming, oldest-first issue logic, wakeup-select logic, in-order retirement, and multi-cycle functional execution
- Generated detailed per-instruction timing traces and performance metrics matching strict validation outputs, helping to analyze IPC sensitivity to issue queue size, reorder buffer size, and superscalar width

FPGA/ASIC Design with Verilog: CNN Pipeline *October 2025 – December 2025*

- Implemented a CNN hardware pipeline in SystemVerilog, performing a 4x4 convolution, LeakyReLU activation, and 2x2 average pooling on a 1024x1024 image, with all kernel, input, and output data accessed directly from DRAM
- Architected memory-efficient sliding window buffers and FSM-based DRAM controllers, enabling continuous dataflow from input DRAM to output DRAM while avoiding full-frame buffering and maintaining correct burst alignment
- Verified and synthesized a timing-clean design, achieving 16.0 ns clock period, passing all functional tests with no inferred latches and meeting project performance constraints

Senior Design: Joystick Controlled Radar Beamformer *August 2024 – May 2025*

- Worked with Analog Devices, Inc. to design a joystick-controlled interface for the CN0566 phased array beamformer system, serving as a real-time demonstration tool to enhance customer engagement at industry trade shows
- Led hardware integration efforts by interfacing ADAR1000 beamforming ICs with the HB100 signal generator, enabling precise real-time control of phase and gain adjustments for each array element based on joystick input
- Managed all Raspberry Pi 4 system integration tasks, including environment setup, dependency management, library versioning, directory structure, and device calibration to ensure stable operation and a smooth development process

Embedded System Architecture: Shields Up! *December 2024*

- Modified a given C program running on the FRDM-KL25Z development board utilizing the RTXv5 real-time operating system to enhance fault tolerance and real-time performance
- Applied fault-handling techniques, including a hardfault handler function, watchdog timer thread, and scrubbing mechanisms, to enhance performance, ensure system reliability, and improve error detection capabilities
- Enhanced the program to synchronize system processes, including rendering waveforms properly on the LCD screen, by leveraging RTOS mechanisms like event flags and non-RTOS approaches such as a state machine

Embedded System Design: Robotic Car *January 2024 – May 2024*

- Designed and programmed a functional robotic vehicle in C on an MSP430FR microcontroller, using IR sensors for autonomous black-line course following and a Wi-Fi IoT module with ring array logic to process user commands
- Integrated and soldered key hardware components, including the DAC, ADC, power module, servos, Wi-Fi enabled IoT module, and LCD screen, ensuring seamless communication with the FRAM dev board
- Utilized UART-based debugging with Termite, alongside various AD2 tools, such as the oscilloscope, logic analyzer, waveform generator features to test and validate system behavior

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COMMUNITY INVOLVEMENT

President | Pi Kappa Phi Fraternity | North Carolina State University *November 2022 – November 2023*

- Led and managed the largest fraternity in North Carolina, overseeing a six-figure semesterly budget
- Fostered an open-dialogue environment that promoted deeper connections and a healthier brotherhood, while strengthening an inclusive culture aligned with personal and Pi Kappa Phi National core values
- Awarded Greek Village Community of the Year and Outstanding Leadership Development