

BENJAMIN KUBWIMANA

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RESEARCH INTERESTS

Accelerated edge ML inference, Autonomous Systems, Microarchitecture, VLSI Design

EDUCATION

Georgia Institute of Technology, MS in Electrical & Computer Engineering Jan 2023 - Aug 2025

Concentration: Hardware & Software Co-design

Key areas: Microarchitectures, Optimization algorithms, VLSI Systems Design

Florida Institute of Technology, BS & MS in Mechanical Engineering Aug 2016 - Dec 2021

Minor: Computer Science

Thesis: A Machine Learning-Based Approach to Predict and Optimize the Performance of Zero Energy Buildings

Advisor: Dr. Najafi Hamidreza

SKILLS

- **Languages:** C++, CUDA, Python, JavaScript, MATLAB
- **Machine Learning:** CNN, RNN-LSTM, Regression NN, Nvidia Modulus (PINN), Bayesian networks, Genetic optimization, TensorFlow
- **Libraries, APIs & Tools:** OpenMP/MPI, OpenGL, TCP Sockets, pgmpy, Nvidia Nsight Systems & compute, Docker, Git, MySQL, SQLite, MongoDB
- **Operating Systems:** Linux, Windows, macOS, OpenBMC
- **Simulation:** Gem5, 3D-ICE, Cadence Celsius & PowerDC, COMSOL, Ansys Fluent
- **CAD & Modelling:** Synopsys HSPICE Design tools, SystemC, SolidWorks, Icepack

EXPERIENCE

NVIDIA Corp. Santa Clara, CA Dec 2022 – Present
Senior Hardware Automation Engineer

- Building software systems to accelerate hardware performance benchmarking, data collection, and database management for efficient power & thermal analytics
- Building HPL and CuBLAS-based GPU & SOC workloads used in system performance characterization
- Developing ML-based thermal models and creating system control tools with RNN-LSTM models using TensorFlow
- Leading research projects on novel fan control algorithms for optimizing energy efficiency in air-cooled server systems
- Building Power Management Processor Firmware for fan & thermal control policies, and performance monitoring
- Implemented BMC firmware using Redfish protocols for server health monitoring and power management
- Led research projects to introduce novel packaging solutions for high-power GPUs
- Performed power and thermal analysis using Cadence solvers and led design characterization with cross-functional teams

Meta Platforms, Sunnyvale, CA

Jan 2022 – Dec 2022

Hardware Engineer

- Led thermal simulation studies to evaluate AR/VR hardware performance under varying workloads and environmental conditions, achieving a high TDP in a compact form factor.
- Created software-automated stations to improve product characterization efficiency.
- Designed pre-silicon test vehicles for AR/VR hardware to streamline fast and innovative hardware designs.
- Participated in hardware bring-up, debugging, and troubleshooting investigations.

Twitter, Atlanta, GA

May 2021–Sept 2021

Hardware Engineer Intern

- Conducted research on datacenter infrastructure, developing data-driven solutions with a proposed 7% energy saving using climate- and server load-aware control systems for dynamic cooling.
- Redesigned server manifolds to maximize intake airflow, contributing to better thermal management.
- Assisted in commissioning new data center halls, ensuring seamless integration into the global network.

Sun Nuclear Corporation, Melbourne, FL

May 2019–Aug 2019

Hardware Engineering Intern

- Developed motion control circuit boards for radiation therapy devices, contributing to advancements in patient treatment technologies.
- Designed and fabricated prototype cable components for a 3D radiation scanner, enhancing device performance and reliability.
- Collaborated with the software department to upgrade radon detector programs, improving detection accuracy.

Georgia Institute of Technology, Atlanta, GA

Aug 2020–Dec 2021

- profiled advanced parallel computer architectures using open-source traces and simulators.
- Built custom simulators for multi-level cache systems evaluated on a multi-core system.
- Used Synopsis custom compiler implement a Content Addressable Memory (CAM) on a 3nm technology, achieving an optimized design for energy-delay and area product.
- Developed an inverse modeling algorithm to estimate heat flux in 3D domains using intra-media temperature sensors, applied to a generic ASIC with 10 engines and 4 thermal sensors per engine.

Florida Institute of Technology, Melbourne, FL

Aug 2020–Dec 2021

Graduate Research Assistant - Machine Learning for BEM

- Researched ML-based building energy modeling (BEM) frameworks that are faster than traditional software to advance sustainable design practices.
- Researched smart building control systems to optimize energy efficiency based on occupancy and climate data; project funded by the Florida Department of Agriculture and Consumer Services.
- Created a web-based course module on sustainable building design, enhancing educational resources in the field.

Graduate Teaching Assistant - Heat Transfer Lab

- Guided senior-level engineering students in advanced heat transfer lab experiments.
- Mentored students in performing thermal analysis and product development.
- Advised students on their capstone projects.

HONORS & AWARDS

- NSF Conference Award—ICIPE 2024, Brazil
- Florida Tech Distinguished Scholar Award, 2021
- Florida Tech Outstanding Student of the Year Academic Award, 2021
- Florida Tech Outstanding Student of the Year Academic Award, 2020
- International Baccalaureate Diploma, 2016
- Model United Nations Conference Participant, 2015
- President of Student Body at Green Hills Academy, 2015

PUBLICATIONS

1. **Kubwimana Benjamin, Qijing Huang**, “Energy and Performance Analysis of Quantized Vision-Language Models on NVIDIA AGX Orin SoC” *Pending publication at IEEE ISPASS 2025*.
2. **Kubwimana Benjamin**, “Design of 64-bit Synchronous Content-addressable Memory (CAM) on 3nm TSMC Technology”, Preprint - *Zenodo*, 28 Apr. 2024. ([Paper](#))
3. **Kubwimana Benjamin**, Najafi H., “A Novel Approach for Optimizing Building Energy Models Using Machine Learning Algorithms”, *Energies*. 2023; 16(3):1033. ([Paper](#))
4. Seyednezhad M., Najafi H., **Kubwimana Benjamin**, “Numerical and Experimental Investigation of a Thermoelectric-Based Radiant Ceiling Panel with Phase Change Material for Building Cooling Applications” *Sustainability* 13, no. 21: 11936. ([Paper](#))
5. **Kubwimana Benjamin**, Seyednezhad M., Najafi H., “Thermoelectric-Based Radiant Cooling Systems: An Experimental and Numerical Investigation of Thermal Comfort”, *Energies*. 2023; 16(19):6981. ([Paper](#))

COMMUNITY ENGAGEMENT

- Member of the Association for Computing Machinery (ACM) & IEEE
- Member of the National Society of Black Engineers (NSBE)
- Secretary of the ASHRAE Student Branch at Florida Institute of Technology
- Assistant Youth Minister at Holy Trinity Church leading teenage youth
- Music band member

VOLUNTEERING

Friends of Handicap in Rwanda

Jan 2014–Present

Development Lead

- Building a community for disabled children in Rwanda, providing education, healthcare, and sponsorship programs.
- Organized global fundraising events and managed IT systems and websites.