TITUS HYUNKYU LEE

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EDUCATION

University of Virginia, School of Engineering and Applied Science, Charlottesville, VA ***August 2023 - Present***

B.S. in Electrical Engineering and Computer Engineering, Minor in Business.

- Major GPA: 4.0/4.0 in both Electrical and Computer Engineering, Cumulative GPA: 3.93/4.0.
- Recipient, A. James Clark Scholars Program at UVA, Clark Scholar (one of 17).
- Activities: Theta Tau Professional Engineering Fraternity, Taekwondo Club, Mechatronics and Robotics Society.

Study Abroad Program: UVA in Guatemala ***Summer 2024***

- Studied engineering and public health aspects such as power plants, infrastructure, healthcare, potable water, sanitation, environment, and education, and examined the influence of economic, political, cultural, and historical factors on these aspects.

RESEARCH EXPERIENCE

Research Intern, **DGIST - Robotics & Mechatronics Engineering,** Daegu, South Korea ***Summer 2025***

- Leading the design and fabrication of multiple waste-based triboelectric nanogenerators (TENGs) leveraging selected materials such as paper, integrating into the soles of shoes to harvest mechanical energy from walking or running, and conducting comprehensive performance testing to evaluate effectiveness for both energy harvesting and biomechanical sensing applications.
- Developing a complete IoT-enabled system by integrating the TENGs with a microcontroller and BLE module to transmit real-time gait data—including step count, footstep pressure, and stride patterns—to a mobile device, while also exploring the use of machine learning algorithms to analyze gait patterns for user identification and movement classification.

PROJECTS

Audio Analyzer PCB - Hardware ***Spring 2025***

- Built and fabricated a fully functional audio analyzer PCB to visualize music in real time operating red and green LEDs corresponding to bass and treble frequencies. Executed a signal chain including a summing amplifier, Sallen-Key low/high-pass filters (cutoffs at 650 Hz and 2 kHz), and precision peak detectors to isolate and process frequency bands.
- Integrated analog and PWM-based LED drivers using discrete components and MOSFETs to control frequency-responsive LEDs; validated dynamic brightness modulation through Multisim simulations and real-time testing with Seven Nation Army.

FIFA Scouting Recommender – Software ***Spring 2025***

- Developed a machine learning-based scouting tool using the FIFA 2024 data set (~17,000 players) to identify undervalued talent similar to elite players by combining K-Nearest Neighbors with clustering algorithms (K-Means, HDBSCAN).
- Tuned clustering parameters by iterating over K-Means cluster counts (k = 3–10) and HDBSCAN settings (min cluster size/sample), selecting the best configuration based on silhouette scores and PCA plots.

Vocal Isolation via Signal Processing – Software ***Spring 2025***

- Built a Python-based pipeline to isolate vocal tracks from mixed audio using spectral gating and harmonic-percussive source separation (HPSS), leveraging short-time Fourier transform (STFT) and librosa to analyze and manipulate time-frequency components.
- Tuned gating thresholds and source separation parameters to minimize artifacts and preserve vocal clarity; verified effectiveness through waveform comparison and spectrogram visualizations, attaining clean vocal isolation across a range of test tracks.

8-bit Central Processing Unit (CPU) - Hardware ***Fall 2024***

- Designed and constructed an 8-bit CPU in VHDL using Quartus, featuring a 5-bit address bus, 32 memory locations, R/W control signals, and an asynchronous reset. Developed a hierarchical architecture including an opcode decoder, instruction sequencer, and ALU, enabling operations such as load, store, add, subtract, and conditional branching.
- Programmed and tested assembly code to validate CPU functionality using Quartus' simulation tools and a custom testbench. Verified data integrity across all 32 memory locations and optimized the design for efficient signal timing and minimal resource utilization.

SKILLS

- Programming Languages: Python, Java, JavaScript, Bash, x86 Assembly, C, VHDL.
- Tools and Libraries: React, Git, Librosa, Scikit-learn, AutoCAD, Fusion 360, NI MultiSim, Quartus, Microsoft Office.
- Languages: English (Native), Korean (Native), Tagalog (Basic), Swahili (Basic).
- Relevant Coursework: Software Development Essentials, Microelectronics, Communications, Electronics, Signals & Systems, Machine Learning, Embedded Computer Systems, Applied Circuits, Digital Logic Design, Computer Systems and Organization, Data Structures and Algorithms, Discrete Mathematics and theory, Mathematics of Information.

OTHER EXPERIENCE

Mentor, **Computer4Kids,** Charlottesville, VA ***August 2024 - Present***

- Provided one-on-one mentoring to middle school students in STEM education and engineering, guiding through hands-on projects, fostering technical skills, and encouraging problem-solving and teamwork.

Library Circulation Assistant, **Clemons Library,** University of Virginia, Charlottesville, VA ***August 2024 - Present***

- Assisted patrons with checkouts, basic IT support, and re-shelving; worked flexible weekend and evening shifts.