Freda Appiagyei

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SUMMARY

Analog and mixed-signal design engineer with experience in low-power circuit design, simulation, and verification using Cadence Virtuoso, Spectre, and MATLAB. Worked across multiple CMOS process nodes, with tapeout experience on one. Interested in developing circuits and systems that enable sensing and intelligent hardware solutions.

EDUCATION

Cornell University, Ithaca, NY, USA — Aug. 2023–Aug. 2025
Master of Science in Electrical and Computer Engineering | GPA: 3.50
Relevant Coursework: Analog Integrated Circuit Design, Advanced Analog VLSI Circuit Design, Digital VLSI, Advanced High-Speed and RF Integrated Circuits, AI for Engineering Managers

Kwame Nkrumah University of Science and Technology, Kumasi, Ghana — Nov. 2018–Nov. 2022
Bachelor of Science in Electrical and Electronics Engineering | GPA: 3.97
Relevant Coursework: Microprocessors, Semiconductor Devices, Power Electronics, Linear Electronics, Digital Computer Design, Digital & Classical Control Systems, Electrical Instrumentation and Measurement

SKILLS

- **Design & Verification Tools:** Cadence Virtuoso (ADE-XL/Assembler), Spectre, LTSpice, Calibre (DRC/LVS/ERC), EMX, Ansys HFSS, KLayout, Altium, KiCad, ModelSim, Xcelium, Logisim, Verilog, VHDL, RTL, UVM, HSPICE
- **Hardware & Test**: FPGA, Arduino, Xilinx ISE; Keithley instruments (SMU, switch matrices, SCPI automation); signal generators, spectrum analyzers, oscilloscopes, multimeters, mixed-signal validation, PCB design, Digital logic design
- **Programming & Scripting**: Python (PyVISA, gdspy, NumPy, Matplotlib, Pandas), MATLAB, C, C++, Perl (basic), Shell scripting; Git version control
- **Physical Design & Analysis**: Parasitic extraction, timing analysis, noise, antenna effects, Electromigration (EM), IR drop
- **Modeling & Simulation**: Circuit-based and behavioral modeling of sensors (e.g., ISFETs, temperature diodes, PTAT)
- **Algorithms & Computing:** Data structures and algorithms, GDS based routing and placement heuristics

WORK EXPERIENCE

Part-Time Analog & Mixed-Signal Design Engineer — Started Sept. 2025
Xallent Inc, Albany, NY, USA

- Developing Python-based scripts to automate aspects of analog/mixed-signal layout design and verification workflows.
- Automated GPIB-controlled test measurements using Python (PyVISA) for instrument control and data acquisition.
- Create interposer layouts using *Cadence* and *KLayout*, delivering GDS files for reticle manufacturing and tapeout.
- Design PCBs that interface interposers with MEMS probes to ensure signal integrity and system reliability.
- Collaborate in design reviews to define requirements and recommend improvements for optimized chip performance.

Graduate Research Assistant — Jan. 2024–Dec. 2024
Apsel Lab — High-Performance Analog and Mixed-Signal ICs & Systems, Cornell University, Ithaca, NY, USA

- Designed and simulated several classic analog building blocks, including current mirrors, differential amplifiers, comparators, and bandgap references, to support mixed-signal IC development.
- Modeled ISFETs in Cadence to evaluate silicon-based sensors and actuators for microrobotic biomedical applications.
- Optimized biologically inspired movement for a taped-out microrobot using *Python* and *MATLAB*, refining a random search algorithm to increase target-finding success rate by over 30%.

Electrical Engineering Intern — Sept. 2021–Nov. 2021
Electricity Company of Ghana, Kumasi, Ghana

- Conducted hourly load data collection and analysis to identify demand patterns, providing insights that supported customer demand forecasting and distribution planning.
- Assisted in transformer diagnostics and substation maintenance, including insulation resistance testing, fault isolation, and component replacements, contributing to improved reliability and reduced downtime.

PROJECTS

LC Voltage-Controlled Oscillator for Nitrogen Vacancy Quantum Sensing — May 2025

- Co-designed a 2.7 - 8.5 GHz LC VCO with 110% tuning range in *Cadence Virtuoso/Spectre* and *EMX*.

- Achieved –80 to –120 dBc/Hz phase noise @1 MHz offset while delivering 5 mA to the resonator coil at 860 μW, enabling stable RF signals for high-sensitivity spin resonance detection.

Sub-Microwatt 5-Bit Dual-Slope ADC for Microrobotic Temperature Sensing Dec. 2024

- Designed and taped out a sub-μW dual-slope ADC (60×50 μm^2, 180 nm CMOS) with a bufferless sensing interface using a non-feedback integrator front end for diode-based temperature sensing.
- Derived two voltage references from a single sub-bandgap core by leveraging input-path temperature effects.
- Designed FSM in *Verilog* and completed mixed-signal simulations flow in *Cadence Virtuoso* running with *Xcelium*.

Design and Optimization of a 16-Bit Full Adder Architecture May 2024

- Explored and designed CMOS and pass-transistor XOR-based full adders, building complete 16-bit architectures.
- Optimized critical-path delay, area, power, voltage–delay trade-offs, and synchronized input arrival via buffering.
- Generated *Verilog*-based test vectors covering nearly all input conditions, including worst-case scenarios and late-arriving input signals, ensuring robust functionality.

8-Bit Microprocessor May 2021

- Led a team of six to design and simulate a fully functional 8-bit microprocessor in *LOGISIM*, successfully implementing ALU operations, instruction execution, and memory access with zero functional errors.
- Coordinated component integration and task allocation, delivering a fully verified system ahead of project deadlines.

TRAINING/PROFESSIONAL DEVELOPMENT

Cleanroom Training, Cornell Nanoscale Facility Mar. 2025

- Completed general lab safety and laser safety training for semiconductor fabrication environments.
- Trained in cleanroom protocols and safe handling of sensitive equipment, supporting practical circuit and device fabrication.

VOLUNTEERING & OUTREACH

Volunteer Mentor, Splash at Cornell Nov. 2024

- Facilitated interactive STEM learning for grades 7–12 through hands-on activities that fostered student engagement.

Prospective Ph.D. Student Host, Cornell Electrical and Computer Engineering Department Mar. 2024

- Provided campus tours and program guidance to prospective students, offering mentorship and answering academic questions to support their decision-making.

Mentor, Cygnus STEM Bootcamp 2019, KNUST College of Engineering Innovation Centre July 2019

- Mentored young women in STEM through hands-on activities and encouraged participants to explore STEM careers.

PROFESSIONAL AFFILIATIONS

- *Member*, **Institute of Electrical and Electronics Engineers** (IEEE)
- *Member*, **Society of Women Engineers** (SWE)
- *Member*, **National Society of Black Engineers** (NSBE)
- *Member*, **Women in Electronics** (WE) United