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Akshit Agarwal

Education

Sep 2023 - Present (Graduating Dec 2024)
California Institute of Technology
MS in Electrical Engineering, *GPA: 4.0*
Coursework - Advanced Photonics and Lasers Lab, Robotics, Nanotechnology, Signals, Feedback Circuits, Medical Devices, Information Theory and Digital Comms., Physics of Measurement, GPU programming, Statistical Inference

Sep 2019 - Dec 2022
University of California San Diego
BS in Electrical Engineering with Minor in Economics, *GPA: 3.981 with Summa Cum Laude*
Academic Honors -
- Henry G. Booker Award recipient
- Tau Beta Pi Scholarship recipient for CA Psi Chapter
- Tau Beta Pi Engineering Society member (available only to students in top 12.5% of the class)
- Provost Honors for academic performance for 8 academic terms

Coursework - Analog and Digital IC Design, RF Circuit Design, Feedback Systems Design and Analysis, LTI System Analysis, Control Theory, C/C++ programming, Verilog and SystemVerilog Programming, Electromagnetism

Experience

Jun 2024 - Sep 2024
Touch Sensing Engineering Intern, Apple Inc.
- Worked on design and verification of sensors for touch screens and contributed to improvements in design flow.

Oct 2023 - Jun 2024
Graduate Researcher, CalTech Mixed-mode Integrated Circuits and Systems Lab
- Designed and simulated a transimpedance amplifier with variable gain for on-chip sensing applications.
- Integrated multiple sub-circuits through custom-designed controls and clocking circuitry.
- Created layouts for multiple sub-circuits for fabrication of an integrated on-chip solution.

Feb 2023 - Jul 2023
Research and Development Engineer, UCSD Qualcomm Institute
- Developed a novel system for signal agnostic Angle of Arrival (AoA) estimation for RF signals in the sub 6 GHz spectrum.
- Performed Ansys HFSS and MATLAB simulations for designing antenna arrays for wideband performance.
- Integrated and synchronized hardware like SDRs and control boards with host software for signal detection and AoA estimation.

Feb 2021 - Dec 2022
Undergraduate Researcher, UCSD Energy-Efficient Microsystems Lab
Wi-Fi backscatter Tag
- Designed, implemented, and validated performance of a new architecture to improve range and wake-up times of Wi-Fi backscatter systems through a discretely implemented backscatter tag.
- Optimized power and area for layout of hardware blocks like antenna arrays and sensing circuitry on a PCB.
- Utilized Verilog coding to implement functional blocks like clocking, UART and controls on CMOD FPGAs.
- Automated data collection process using Python scripts for validation and debugging, leading to a faster validation process.

Bio-Fuel Cell (BFC) Touch sensor
- Investigated the use of BFCs as a power source for health and Bluetooth applications using a custom PCB.
- Designed a minimally sized PCB integrating a COTS Boost Convertor and Bluetooth Module along with required interfacing components.
- Utilized TI BLE5 software stack for Bluetooth advertising.

Technical Skills

Programming
C C++ Python Verilog SystemVerilog MATLAB ROS CUDA

Design and Simulation

Eagle PCB Altium PCB SPICE Circuit Simulation Cadence Virtuoso and Spectre Keysight ADS Ansys HFSS SolidWorks

Projects

Nov 2022 - Dec 2022 **Operational Transconductance Amplifier (OTA) Design**

- Designed a two-stage (folded cascode with common source), differential-to-single-ended amplifier with built-in biasing circuitry using TSMC 180nm technology.
- Simulated the design in Cadence Virtuoso and achieved gain of 73dB, unity gain bandwidth of 31 Mhz and power consumption of 2.19mW.

May 2022 - Jun 2022 **Custom Carry-Increment 8-bit Adder**

- Designed a custom architecture 8-bit, variable-length carry increment adder using GPDK045 45nm technology.
- Simulated the design in Cadence Virtuoso and achieved a maximum operational frequency of 4 GHz and power consumption of 600uW.

Jan 2021 - Mar 2021 **Chromotherapy Lighting System**

- Led a team of engineering students for an IEEE project to develop a Google Home based IoT device.
- Programmed ESP32 modules to use chromotherapy principles and audio commands given by a user to dynamically adjust lighting conditions in a room to elevate user mood.

Jan 2021 - Jun 2021 **Baboons on the Move**

- Improved efficiency and accuracy for detection of moving objects in video clips and applied that to map and understand baboon movement patterns.
- Used Python image processing concepts and packages like OpenCV for implementation.

Teaching and Mentoring Experience

Mar 2021 - Dec 2022 **ECE Instructional Assistant, UCSD Jacob School of Engineering**

- Cultivated a comfortable learning environment for students for upper-division ECE course (ECE 101 – Linear Systems Fundamentals), received close to 100% recommendation over a period of six academic terms.
- Designed and graded assignments, conducted assessments and held office hours to facilitate learning.

Publications

ISSCC 2023 S.-K. Kuo, M. Dunna, H. Lu, **A. Agarwal**, D. Bharadia, P.P. Mercier, "An LTE-harvesting BLE-to-WiFi Backscattering Chip for Single-Device RFID-like Interrogation" *IEEE International Solid-State Circuits Conference 2023*

arXiv M. Dunna, S.-K. Kuo, **A. Agarwal**, P.P. Mercier, D. Bharadia, "BeamScatter: Scalable, Deployable Long-Range backscatter communication with Beam-Steering" *Cornell University arXiv*