Akshit Agarwal

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Education

Sep 2023 - Present (Graduating Dec 2024)

California Institute of Technology
MS in Electrical Engineering, *GPA: 3.9*
Coursework - Advanced Photonics and Lasers Lab, Robotics, Nanotechnology, Signals and Transforms

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

Technical Skills

Programming

C   C++   Python   Verilog   System Verilog   MATLAB   ROS

Design and Simulation

Eagle PCB   Altium   LTSpice   Cadence Virtuoso   Cadence Spectre   Keysight ADS   Ansys HFSS
SolidWorks

Research and Professional Experience

Feb 2023 - Jul 2023

Research and Development Engineer, UCSD Qualcomm Institute
Adviser: Dinesh Bharadia
○ 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
Adviser: Patrick Mercier
○ **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.

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 on moving objects in a video to detect baboon movements in video clips for understanding movement patterns.
- Used Python image processing concepts and packages like opencv to implement detection of objects.

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 System 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*