

Robert (Robby) Nelson

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EDUCATION

Georgia Institute of Technology, B.S. Electrical Engineering (GPA: 3.78/4.0)

May 2022

- Relevant Coursework: Optics, Optical Microscopy, Medical Imaging Systems, Electromagnetics, Quantum Mechanics, DSP, Microelectronics Data Structures and Algorithms, AI, Engineering Computation, Computer Architecture

RESEARCH EXPERIENCE

Optical Imaging and Spectroscopy Lab (Advisor: Dr. Francisco Robles)

April 2021 – Present

- Leader of a project to develop Multispectral Deep UV Microscopy for the label-free biomolecular analysis of prostate stromal tissue. Imaged multiple radical prostatectomy histology slides at six wavelengths and analyzed the multispectral image data using Principal Components Analysis to compare the smooth muscle architecture in healthy tissue versus aggressive cancer. Collaborated with a Pathologist from Emory University to evaluate findings and solicit feedback. Submitted a first-author poster abstract to the United States and Canadian Academy of Pathology (USCAP) Annual Meeting in 2023.
- Conducted a full literature review of the biology of prostate cancer reactive stroma and successfully learned how to determine the Gleason Grade and other histologic features of prostate cancer by creating annotations on digital pathology images and seeking feedback on their accuracy from field experts.
- Simulated multiple autofocus figures of merit for the future development of a MATLAB-based autofocus system for a UV Microscopy setup and devised an algorithm for focus identification. Captured Z stack images of prostate histology slides and empirically characterized the accuracy of the identified focusing strategies.
- Independently trained two students on the operation of the lab's UV Microscopy System.

Georgia Tech Systems Research Lab (Advisor: Dr. Fumin Zhang)

January 2019 – April 2021

- Co-Author for a paper accepted to the 2021 American Control Conference in New Orleans, LA presenting a novel Derivative-Free Multi-Agent Tracking strategy. Personally responsible for writing and testing MATLAB code for the Georgia Tech Robotarium robots to execute the tracking strategy using 3 agents. Wrote the experimental results section for the paper to document the Robotarium experiment successfully confirming the theoretical predictions of the control strategy mathematics.
- Worked to implement MATLAB code for multi-agent 2D source seeking algorithms on physical GT-MAB blimps using Xbee modules and OptiTrack cameras.

PUBLICATIONS

S. Al-Abri, T. X. Lin, R. S. Nelson and F. Zhang, "A Derivative-free Distributed Optimization Algorithm with Applications in Multi-Agent Target Tracking," 2021 American Control Conference (ACC), 2021, pp. 3844-3849, doi: 10.23919/ACC50511.2021.9483125.

TEACHING EXPERIENCE

Microelectronics Teaching Assistant (ECE 3043)

January 2021 – May 2021

- Gave checkoffs and assisted students with circuit construction and design as an Open Lab TA in ECE 3043 (Microelectronics Lab) as they worked through lab procedures on filters, opamps, and transistor amplifiers
- Responsible for explaining elementary circuit concepts, benchtop equipment operation, and Microelectronics concepts such as Diodes, BJT's, MOSFET's, and their associated amplifiers

INDUSTRY EXPERIENCE

Tesla Motors, Battery Management System Embedded Firmware Intern

May 2021 – August 2021

- Decreased idle time in factory assembly lines by writing a C++ firmware routine to heat battery packs on Tesla vehicles to supercharge temperatures before charging is started
- Improved battery pack heating performance of customer vehicles by implementing a Binary Search Algorithm in C++ to improve the location of the optimal discharge, regeneration, and AC charging heating temperatures
- Characterized the high voltage precharge circuit and high voltage interlock circuit on the Tesla Semi Truck and wrote a routine in C++ to ensure correct hardware functionality off the assembly line. Debugged and tested the routine with Vector CANape and PCAN.

- Debugged chassis-charger electrical isolation check errors on Chinese GB Chargers by analyzing CAN traces in Vector CANape and pinpointed code where the check was failing. Supplied custom firmware builds to China Service Engineering team to support further testing.

Tesla Motors, Low Voltage Systems Validation Intern

May 2020 – August 2020

- Created a hardware and software setup to validate audio functionality of the Tesla Premium Audio Amplifier. Wrote Python code that utilized Unix audio utilities to send signals on car audio channels. Created a hardware configuration with Multiplexers, Transformers, and other components to select the correct audio channel and analyze the signal with Fast Fourier Transforms in Python.
- Worked to create key components for an outdated Python library to simulate touch commands on the Tesla Model S and Model 3 Center Displays, enabling engineers to quickly develop new Firmware and validate legally required capabilities such as the emergency call button.
- Wrote software to identify critical firmware bugs including backup camera failures and incorrect vehicle process restarts

NCR Corporation, Software & Electrical Intern

May 2019 – August 2019

- Designed and built robotic device and 2 layer PCB using Cadence Allegro to automate keypad button presses on EMV capable fuel payment terminal
- Implemented remote controlled test harness using Raspberry Pi, Python, and Bottle

EXTRACURRICULAR ACTIVITIES

GT Solar Racing, Batteries Team

January 2019 – May 2019, August 2020 – December 2021

- Improved C/C++ microcontroller code to reduce time to detect communication failures in battery monitoring electronics
- Responsible for the design and layout in Autodesk EAGLE of a PCB to safely monitor current and chain together Battery Cells during testing

Hive Makerspace Peer Instructor

May 2019 – May 2021

- Facilitated the creation of multidisciplinary student projects by instructing on the use of soldering, arduinos, benchtop electronics equipment, laser cutters, plasma cutters, and woodshop tools

GT Ramblin' Raas Dance Team

August 2018 – May 2022

- Production chair from August 2019 – May 2021

APPLICABLE SKILLS

Software: MATLAB, Python, C/C++, Git, UNIX Systems

Hardware: Basic Optics Table Setups, Oscilloscopes/Benchtop Tools, PCB Design (Autodesk EAGLE), Keysight ADS, SPICE Coding, Analog Circuitry, Surface Mount Soldering