

Justin Johnson Saluja

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Education

Carnegie Mellon University	<i>Pittsburgh, PA</i>
M.S. Electrical and Computer Engineering	<i>August 2020</i>
University of Florida	<i>Gainesville, FL</i>
B.S. Electrical Engineering - <i>summa cum laude</i>	<i>2013-2018</i>
Minors: Physics and Mathematics	

Relevant Coursework

Undergraduate

- **Computational Methods:** Machine Learning, Complex Analysis, Fourier Analysis, Signals & Systems
- **Physics:** Electrostatics (I), Electrodynamics (II), Quantum Mechanics, Introduction to Nano-devices
- **Engineering Systems:** Real Time DSP Applications, Microprocessor Applications, Antenna Systems, Communication Systems and Components, Radar

Skills

Programming Python, C/C++, Bash, Matlab

Design Altium Designer, HFSS, Solidworks

iOS App Development Xcode, Swift/Obj-C

Markup LaTeX, HTML, CSS

Software Development Git (& Gitlab, Github, Atlassian), CI/CD

Work Experience

Institute for Defense Analyses	<i>Alexandria, VA</i>
Research Associate	<i>April, 2019 - Present</i>
US Naval Research Laboratory	<i>Washington, D.C.</i>
Student Intern	<i>August, 2018 - April 2019</i>

Mixed Coordinate System Dynamic Estimation for Agile 3D Maneuvers

- Derived a hybrid cartesian-spherical tracking algorithm for fast moving aerial targets by Frequency Modulated Continuous Wave (FMCW) radar
- Established substantial accuracy improvement compared to previous benchmark studies found in practical 3D target tracking through Monte Carlo simulations
- Produced 3D animations and GUIs for real time error analysis and visual inspection

University of Florida	<i>Gainesville, FL</i>
Research Member	2013-2018

A Supervised Machine Learning Algorithm for Heart-rate Detection Using Doppler Motion-Sensing Radar

- Implemented a real time supervised machine learning method to accurately measure heart rate, < 4% error, even if it is weak or overwhelmed by respiratory movement using non-contact Doppler radar
- Designed and manufactured custom photoplethysmogram (PPG) & electrocardiogram (ECG) circuits for ground truth measurement and error analysis
- Developed a user friendly Python wrapper for the NI-USB DAQ series driver to sample, timestamp, and record multiple analog inputs
- Surveyed and compiled a patient database of Doppler radar samples for the scientific community
- Created Interactive GUIs for real time heart beat analysis using dynamic plotting libraries and the Qt interface

An Optimal Jamming Strategy in a Wireless Ad hoc Network

- Assessed the feasibility of a binary integer linear program (ILP) algorithm to partition a small < 50-node mobile network with desired mobility model implementation
- Coded and matured mobility models (e.g. Random Waypoint, Random Direction, Reference Point Group Mobility Models) for the performance evaluation of jammer placement and network preservation
- Built and tested autonomous robots under jammed communication environments

Empirical Verification of Theoretical Models on Performance Characteristics of Micro-Pillar Wick Structures

- Designed and manufactured support structures for passive heat spreaders
- Analyzed and compared different wick architectures, which was used to design the optimal wick for a given set of conditions

Publications

A Supervised Machine Learning Algorithm for Heart-rate Detection Using Doppler Motion-Sensing Radar J.J. Saluja, J. Casanova, and J. Lin *IEEE Journal of Electromagnetics, RF and Microwaves in Medicine and Biology (J-ERM)* [Article8741050](#)

A Supervised Learning Approach for Real Time Vital Sign Radar Harmonics Cancellation J.J. Saluja, J. Casanova, and J. Lin *IEEE International Microwave Biomedical Conference (IMBioC)*, 2018

Projects

VitalSine - Designed a real time, single-lead ECG monitor for arrhythmia detection. Started from a circuit design to fabrication and eventually launching a real time demo through an iOS application.

Prime Number Art - Coded two GPU distributed, probabilistic prime number solvers (Miller-Raben & Lucas probable prime tests) to find large digit prime numbers that form a picture from distant viewing. An elliptic curve primality proving method was used to verify the final prime number.

Unix Configuration- A body of Linux/Unix configuration files and scripts that prioritizes fast, lightweight, and asynchronous software development.

Smart Mirror - Compiled web APIs and an RSS feed to make a voice activated smart home mirror system using a small system on chip computer to display information such as weather, traffic information, a calendar and reminders.