

Girish Narayanswamy

Health Sensing || ML & AI || Signal Processing || Embedded Systems

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Girish is a second year PhD Student in the **Ubiquitous Computing Lab** at the University of Washington. He is advised by Professor **Shwetak Patel**. Girish's interests lie at the intersection of on **Learning (ML/AI)**, **Signal Processing**, and **Embedded Systems** with an emphasis in **Mobile Health Sensing** and **On-Device Deep Learning**.

Education

University of Washington Seattle

PhD Electrical and Computer Engineering (ECE/CSE)

Advised by Shwetak Patel || UbiComp Lab

Sep. 2020 - Present

GPA: 4.00

University of Colorado Boulder

BS Electrical & Computer Engineering (Magna Cum Laude & Eng. Honors)

Minor Computer Science

Aug. 2014 - May 2019

GPA: 3.86

Research

Radar + Camera rPPG *Project Lead*

Aug. 2021 - Present

- Radar + camera sensor fusion to improve deep learning (Multi-Task Temporal Shift Attention Network) based heart and respiration rate detection
- Sensor fusion to reduce skin color and lighting bias for remote photoplethysmography (rPPG) measurements

MaskFlow *Project Lead*

Feb. 2021 - Present

- Project in collaboration with UW MISL Lab and Microsoft Research to gauge face-mask efficacy and breathability using commodity audio sensing
- Fully remote user study to gauge in-the-wild feasibility of parameterizing homemade face mask performance
- Recently presented work to Microsoft CSO (Eric Horvitz) as part of Pandemic Preparedness research presentation series

UroSound *ML/AI Support*

Mar. 2020 - Present

- Using commodity smart watch audio to track voiding patterns and to test for voiding dysfunction (especially in the elderly patients)
- Use of LSTM networks and Logistic Regression to determine voiding flow type

Configurable 'Pop-Socket' *Embedded Systems / Signal Processing Support*

Jan. 2021 - Present

- Pop-socket mobile add-on with button and touch gesture control
- Firmware dev and signal processing for gesture sensing

Mobile Central Venus Pressure *Computer Vision / Signal Processing Support*

Aug. 2020 - Present

- Mobile camera based rPPG mapping for central venous pressure measurement

Work Experience

UW Seattle CSE: Ubiquitous Computing Lab *Research Assistant*

Sep. 2020 - Present

- Research focused on mobile health sensing and on-device deep learning. Current research projects can be found above

UW Seattle: Signal Processing I *Teaching Assistant*

Sep. 2021 - Dec. 2021

- Taught lab sections, held office hours, graded labs / tests
- Python, Audio Processing, Computer Vision

OctoML <i>ML System Intern</i>	Jul. 2021 - Oct. 2021
<ul style="list-style-type: none"> Developed system to offload deep learning inference workload from microcontroller to custom FPGA accelerator Pipeline to interface with OctoML's uTVM ML acceleration runtime Deep Learning, FPGA, Embedded Systems, Hardware specific model optimization 	
UW Seattle: Computer Vision - Classical & Deep Methods <i>Teaching Assistant</i>	Sep. 2020 - Dec. 2020
<ul style="list-style-type: none"> Developed lab material, held office hours, graded homework / labs / projects Python, OpenCV, PyTorch, Image Processing, Deep Learning 	
CU Boulder: Hearing Research Lab <i>Research Assistant</i>	Aug. 2019 - May 2020
<ul style="list-style-type: none"> Developed tools and GUIs for use in audiology clinical studies Explored use of deep learning in predicting audio quality and perception (HASQI/HASPI) 	
Qualcomm Technologies <i>R&D Software Intern</i>	Jun. 2018 - Sep. 2018
<ul style="list-style-type: none"> Member of the 11ax Wifi PHY modeling team Built framework to package, store, and visualize simulation results 	
CU Boulder: Correll Lab <i>Undergraduate Research Assistant</i>	Oct. 2016 - Jun. 2017
<ul style="list-style-type: none"> UROP grant to color characterize novel force-proximity sensor used for a robotic claw Assisted in integration of the sensor onto a prosthetic hook 	
CU Boulder: Applications of Embedded Systems <i>Teaching Assistant</i>	Aug. 2016 - Dec. 2016
<ul style="list-style-type: none"> Developed lab material, held office hours, graded homework, labs, projects, and tests Embedded C, TI MSP432 ARM Cortex M4 mcu, Software/Hardware Debug 	
Medtronic <i>R&D Software Intern</i>	May 2016 - Aug. 2016
<ul style="list-style-type: none"> Member of the surgical device R&D software team Created audio feedback drivers for Ultrasonic Tissue Dissector 	

Projects

Disease Spread in Small Population Networks	Apr. 2019 - May 2019
<ul style="list-style-type: none"> Graph analysis to test similarity of sampled-co-presence and face-to-face networks Applied to disease spread and vaccination in small population graphs (100-500 nodes) 	
Melanoma Detection Application	Apr. 2019 - May 2019
<ul style="list-style-type: none"> Mobile application to detect melanoma given a skin-growth image 80% accuracy using decision tree model. Improved to 90% with use of shallow NN 	
Configurable Human Interface Device (Senior Design Project)	Aug. 2017 - May 2018
<ul style="list-style-type: none"> Configurable controller intended to improve disability technology access Touchscreen, buttons, joystick, Bluetooth, ARM m4 MCU, IMU PCB design, firmware and application development, rapid prototyping, component selection, requirement setting 	
Audio Genre Classifier	Apr. 2017 - May 2017
<ul style="list-style-type: none"> Statistically analyzed parameters derived from tracks using signal processing Classification was improved by using a pre-built Matlab support vector machine 	

Selected Skills and Coursework

Programming Skills Python, C, C++, MATLAB, Java (working knowledge), ML/AI (PyTorch, Tensor Flow, scikit-learn), Computer Vision (OpenCV), ARM microcontrollers, Firmware development, UART, I2C, SPI, Unix, Linux, GitHub, Debugging

Electrical Eng. Skills PCB Design, SMT/Through-Hole Soldering, Oscilloscope, Function Generator, Logic Analyzer, Multimeter, Hardware Debugging

Programming Courses Neural Nets & Deep Learning (grad), Machine Learning (grad), Artificial Intelligence (grad), High Dimensional Dataset Analysis (grad), Principles of Embedded Software (grad), Data Structures, Algorithms, Operating Systems, C Programming, Computer Organization, Applications of Embedded Systems
Electrical Eng. Courses Digital Signal Processing (grad), PCB Design (grad), Linear Systems, Circuits as Systems, Digital Logic, Electromagnetic Fields and Waves
Mathematics Courses Calc. I/II/III, Differential Eqs., Linear Algebra, Discrete Math, Probability, Matrix Methods
Other Entrepreneurship (grad)

Honors, Leadership, and Extracurriculars

UbiComp Lab Ugrad & HS Co-Chair, K-12 Outreach Co-organizing lab's outreach programs
UbiComp Lab Research Paper Co-Manager: Co-managing lab's Zotero paper repository
UbiComp Lab Workshop/Tutorials/Deep Dives Co-organizer: Organizing presentations in the lab
UW Graduate Application Support Programs (GASP) Mentor: Holding office hours and providing application feedback to help students (primarily from under-served communities) applying to graduate programs

Engineering Honors Program: Selective residence program based of applicant's academics/extracurriculars
Outstanding Colleague Award: Presented by department of Electrical and Computer Engineering at CU Boulder
UROP Individual Grant: Grant to research and color characterize force-proximity sensor for smart prosthetics
CU Dean's List: All semesters (Fall 2014 - Spring 2019)
Ugrad Scholarships: Intel Merit, BOLD, Engineering Differential, Sewall Esteemed

Boulder Lotus: One of the nation's top 15 club-level ultimate frisbee teams
University of Colorado Mamabird: One of the nation's top 5 collegiate ultimate frisbee teams
Fairview HS Ultimate Frisbee Coach: Head coached 2019 - 2020 Fairview HS ultimate frisbee team
Shotokan Karate: Shodan (first degree black belt), Senpai (instructor) at International Martial Arts Association
Interests: Photography (ig: gvn_photos), Hiking, Camping, Skiing, Board/Card Games, Reading