Girish Narayanswamy

ML/AI || Health Sensing || Signal Processing

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Girish is a final year PhD Student at the University of Washington **Ubiquitous Computing Lab**, where he is advised by Professor **Shwetak Patel**. Girish's research focuses on novel **Learning (ML/AI)** and **Time-Series Modeling** methodologies. He is particularly interested in applications which improve **health sensing** and expand **health access**. *Note that pink denotes clickable linked-text.*

Education

University of Washington Seattle — Sept. '20 - Present
PhD Electrical & Computer Engineering
Advised by Shwetak Patel || UbiComp Lab

University of Colorado Boulder — Aug. '14 - May '19
BS Electrical & Computer Engineering (Magna Cum Laude & Eng. Honors) — *GPA: 3.86*
Minor Computer Science

Selected Projects

Influenza Onset Prediction via Wearables *(Preparing for Nature)* — Oct. '23 - Present

- In collaboration with NIH/NIAID, deployment of commodity sensors/wearables to participants of NIH influenza challenge study.
- Study participants challenged with H10N7 influenza - early results validate the use of wearables in detecting the onset of influenza like illnesses.

Wearable Sensor Foundation Models *(ICLR'25, NeurIPS'25)* — June '24 - Present

- Development of **Large Sensor Models** (LSM) – wearable health foundation models.
- **LSM-1 [8]:** First evidence of scaling in the wearable domain.
  Blog: research.google/blog/scaling-wearable-foundation-models
- **LSM-2 [UR.6]:** Improving scaling by handling fragmented data.
  Blog: research.google/blog/lsm-2-learning-from-incomplete-wearable-sensor-data
- **SensorLM [UR.5]:** Language + sensor pairwise training.
  Blog: research.google/blog/sensorlm-learning-the-language-of-wearable-sensors

BigSmall *(WACV '24)* — June '22 - Jan. '24

- Efficient multitask physiological sensing for spatially and temporally disparate signals
- Simultaneous modeling of pulse, respiration, and facial action from face video
- *Website: girishvn.github.io/BigSmall*

rPPG Toolbox *(NeurIPS '23)* — June '22 - Nov. '23

- Enables standardized and accessible remote photoplethysmography (rPPG) research
- 750+ stars, 190+ forks.
- *Repo: github.com/ubicomplab/rPPG-Toolbox*

Work Experience

UW Ubiquitous Computing Lab *Research Assistant* — Sept. '20 - Present

- Research focused on novel time-series ML/AI methods applied to health.

Google *Student Research* — June '23 - Present

- Foundation models for wearable data (LSM-1 [8], LSM-2 [UR.6], SensorLM [UR.5]).
- Audio models for respiratory sensing. Models can be found on Github / HuggingFace.

Uplinq *Machine Learning Engineer* Apr. '22 - Nov. '22

- Startup making bookkeeping and operations data accessible for small businesses
- Developed system to automate bookkeeping using deterministic and ML solutions

OctoAI *Machine Learning Systems Intern* July '21 - Oct. '21

- Developed system to offload ML inference workload from MCU to FPGA accelerator.
- Pipeline to interface with OctoAI's uTVM ML accelerator runtime.

CU Hearing Research Lab *Research Assistant* Aug. '19 - Mar. '20

- Developed tools and GUIs for use in audiology clinical studies.
- ML models to predict audio quality and perception.

Qualcomm Technologies: Wifi Team *R&D Software Intern* June '18 - Sept. '18

- Built framework to package, store, and visualize 11ax Wifi PHY simulation results

CU Correll Lab *Undergraduate Research Assistant* Oct. '16 - June '17

- UROP grant to color characterize novel force-proximity sensor used for a robotic claw
- Assisted in integration of the sensor onto a prosthetic hook

Medtronic: Surgical Devices R&D Team *R&D Software Intern* May '16 - Aug. '16

- Device drivers for Ultrasonic Tissue Dissector

Side Projects

Disease Spread in Small Population Networks Apr. '19 - May '19

- 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)

Publications Under Review

** denotes equal contribution*

[UR.6] **LSM-2: Learning from Incomplete Wearable Sensor Data**
Advances in Neural Information Processing Systems (NeurIPS '25)
Narayanswamy*, Xu*, Ayush, Spathis, Liao, Tailor, Metwally, Heydari, Zhang, Garrison, Abdel-Ghaffar, Xu, Gu, Sunshine, Poh, Liu, Althoff, Narayanan, Kohli, Malhotra, Patel, Yang, Rehg, Liu, McDuff

[UR.5] **SensorLM: Learning the Language of Wearable Sensors**
Advances in Neural Information Processing Systems (NeurIPS '25)
Zhang, Ayush, Qiao, Heydari, Narayanswamy, Xu, Metwally, Xu, Garrison, Xu, Althoff, Liu, Kohli, Zhan, Malhotra, Patel, Mascolo, Liu, McDuff, Yang

[UR.4] **RADAR: Benchmarking Language Models on Imperfect Tabular Data**
Advances in Neural Information Processing Systems (NeurIPS '25)
Gu, Zhang, Lin, Zhang, Paruchuri, Yu, Kazemi, Ayush, Heydari, Xu, Narayanswamy, Liu, Poh, Yang, Malhotra, Patel, Palangi, Xu, McDuff, Althoff, Liu

[UR.3] **The Anatomy of a Personal Health Agent**
Nature
Heydari, Gu, Srinivas, Yu, Zhang, Zhang, Paruchuri, He, Palangi, Hammerquist, Metwally, Winslow, Kim, Ayush, Yang, Narayanswamy, Xu, Garrison, Lee, Vafeiadou, Graef, Galatzer-Levy, Schenck, Barakat, Perez, Shreibati, Hernandez, Faranesh, Prieto, Heneghan, Liu, Zhan, Malhotra, Patel, Althoff, Liu, McDuff, Xu

[UR.2] **Estimating Blood Pressure with a Camera: An Exploratory Study of Ambulatory Patients with Cardiovascular Disease**
NPJ Digital Medicine
Curran, Ma, Liu, McDuff, Narayanswamy, Stergiou, Patel, Yang

[UR.1] **CapApp: Smartphone-Based Capillary Refill Time Assessment**

ACM Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT)
Park, Wu, Sarda, Narayanswamy, Strutt, Thompson, Patel, Mariakakis

Publications

** denotes equal contribution*

[9] **Autonomous collection of voiding events for sound uroflowmetries with machine learning**
Biomedical Signal Processing and Control '25
Arjona, Hernandez, Narayanswamy, Bahillo, Patel

[8] **Scaling Wearable Foundation Models**
International Conference on Learning Representations (ICLR '25)
Narayanswamy*, Liu*, Ayush, Yang, Xu, Liao, Garrison, Tailor, Sunshine, Liu, Althoff, Narayanan, Kohli, Zhan, Malhotra, Patel, Abdel-Ghaffar, McDuff

[7] **Exploring and characterizing large language models for embedded system development and debugging**
ACM Conference on Human Factors in Computing Systems Late-Breaking Work (CHI LBW '24)
Englhardt, Li, Nissanka, Zhang, Narayanswamy, Breda, Liu, Patel, Iyer

[6] **BigSmall: Efficient Multi-Task Learning for Disparate Spatial and Temporal Physiological Measurements**
IEEE/CVF Winter Conference on Applications of Computer Vision (WACV '24)
Narayanswamy, Liu, Yang, Ma, Liu, McDuff, Patel

[5] **rPPG-Toolbox: Deep Remote PPG Toolbox**
Advances in Neural Information Processing Systems (NeurIPS '23
Liu, Narayanswamy*, Paruchuri*, Zhang, Tang, Zhang, Sengupta, Patel, Wang, McDuff

[4] **Camera-Based Remote Photoplethysmography for Blood Pressure Measurement: Current Evidence, Clinical Perspectives, and Future Applications**
Connected Health and Telemedicine '23
Curran, McDuff, Liu, Narayanswamy, Ma, Patel, Yang

[3] **Camera-based remote photoplethysmography to predict blood pressure in clinic patients with cardiovascular disease**
Journal of Hypertension '23
Curran, Liu, Mcduff, Ma, Narayanswamy, Patel, Yang

[2] **CapApp: Smartphone Based Capillary Refill Index Assessment in Healthy Children**
Frontiers in Biomedical Devices '23
Strutt, Narayanswamy, Park, Sarda, Wu, Thompson, Harvey, Hedstrom, Kodet, Patel, Mariakakis

[1] **Automatic Classification of Audio Uroflowmetry with a Smartwatch**
International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC '22)
Narayanswamy, Arjona, Diez, Bahillo, Patel

Teaching and Mentorship

UbiComp Lab *Research Mentor* June '22 - Present

- Kanav Arora (Efficient models for wearable data)
- Liam Bakar (AI assisted food tracking)
- Dilini Nissanka (AI assisted food tracking)
- Nancy (Yujia) Liu (now PhD student at UCSD)
- Jack (Chengqian) Ma (now ML researcher at SenseTime)

Graduate Application Support Program *Mentor* Jun. '22 - Present

- Providing application feedback to applicants from under represented backgrounds

GIX: Access Computing Summer Program *Research Mentor* June '22 - Sept. '22
- Program coordinated by University of Washington / Tsinghua University / Microsoft
- Mentored MS student on ML methods for domain adaptation of wearable data

Signal Processing I *Teaching Assistant* Sept. '21 - Dec. '21
- Audio Processing, Computer Vision, Filter Design

Ubiquitous Computing Seminar *Instructor* Jan. '21 - Mar. '21
- Developed seminar format, organized participation and speakers

Computer Vision - Classical & Deep Methods *Teaching Assistant* Sept. '20 - Dec. '20
- OpenCV, PyTorch, Image Processing, Deep Learning

Applications of Embedded Systems *Teaching Assistant* Aug. '16 - Dec. '16
- Embedded C, TI MSP432 ARM Cortex M4 MCU, software / hardware Debug

Organizing and Service

Time-Series For Health: NeurIPS '25 *Workshop Organizer* June '25 - Dec. '25
- Organized reviewing, invited speakers, and workshop event.
- 120+ workshop paper submissions, 230+ reviewers
- timeseries4health.github.io

Reviewing *Workshop Organizer* June '25 - Dec. '25
- NeurIPS, CHI, IMWUT, Journal of Biomedical and Health Informatics, Nature Scientific Reports, ACM COMPASS '22 Posters TCP

Selected Skills

Domain Expertise AI / ML, Self-Supervised Learning, Generative Pre-Training, Foundation Models, Signal Processing, Computer Vision, Time-Series Models, Audio Models, Health Sensing, Embedded Systems

Languages Python, C / C++, MATLAB

Frameworks / Libraries / Version Control PyTorch, Jax, Tensorflow, Scikit-Learn, Pandas, Numpy, Git

Platforms Linux / Unix, ARM-Based MCUs, Android

EE Bench-top Skills PCB Design, SMT / Through-Hole Soldering, Oscilloscope, Function Generator, Logic Analyzer, Multimeter, Hardware Debugging

Mathematics Calc. I / II / III, Differential Eqs., Linear Algebra, Discrete Math, Probability, Matrix Methods

Other

Awards and Honors
- Engineering Honors Program (CU Boulder)
- Latin (Magna Cum Laude) and Departmental Honors
- ECE Outstanding Colleague Award (CU Boulder)
- Dean's List (CU Boulder): All semesters (Fall '14 - Spring '19)
- Ugrad Scholarships: Intel Merit, BOLD, Engineering Differential, Sewall Esteemed, UROP Individual Grant

Extracurricular Activities
- Boulder Lotus ('21): One of the nation's top 15 club ultimate frisbee teams
- University of Colorado Mamabird ('14 - '19): One of the nation's top 5 collegiate ultimate frisbee teams
- Fairview HS Ultimate Frisbee Coach ('19 - '20)
- Shotokan Karate: First degree black belt and instructor at International Martial Arts Association
- Interests: Photography (ig: gvn_photos), Drawing, Hiking, Camping, Skiing