# Adnan Al Armouti

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## Education

**Cornell University**, Ithaca, NY, USA — August 2023-Present
Doctor of Philosophy, Computer Science

**University of California, Los Angeles**, Los Angeles, CA, USA — September 2021-June 2023
Master of Science, Electrical and Computer Engineering — Graduation: June 2023
GPA: overall 4.0/4.0

**University of California, Los Angeles**, Los Angeles, CA, USA — September 2017-June 2021
Bachelor of Science, Electrical Engineering and Economics (Double) — Graduation: June 2021

## Publications

Vilesov, A., Chari, P., **Armouti, A.**, Harish, A.B., Kulkarni, K., Deoghare, A., Jalilian, L. and Kadambi, A., 2022. Blending camera and 77 GHz radar sensing for equitable, robust plethysmography. *ACM Trans. Graph.(SIGGRAPH)*, *41*(4), pp.1-14.

## Patents

Kadambi, A., Jalilian, L., Chari, P., Talegaonkar, C., Karinca, D, Cannesson, M., Kabra, K., Salehi-Abari, O., Kita, A., and **Armouti, A.**, The Regents of the University of California, 2023. *Systems and Methods for Measuring Vital Signs Using Multimodal Health Sensing Platforms*. U.S. Patent 0,233,091.

## Research Experience

**Wireless Sensing Lab** with Prof. Rajalakshmi Nandakumar — August 2023-Present
Currently working on camera-radar fusion for autonomous and health systems.

**UCLA Visual Machines Group** with Prof. Achuta Kadambi — September 2020-June 2023
Worked on *equitable robust plethysmography* as co-first author.

- Led a successful $1M DARPA grant proposal to fund research projects in contactless equitable health sensing and mobile health (mHealth).
- Open-sourced Python multimodal data processing library for our deep learning (DL) pipelines.
- Developed PyTorch DL models including CNNs and Vision Transformers to estimate a patient's vital signs contactlessly via camera-radar fusion, including photoplethysmography (PPG), the skin color changes due to pulsatile blood flow; physiological respiration; blood oxygenation (SpO2) via ratio-of-ratios (ROR) method; and respiratory effort of the chest.
- Co-implemented a neural implicit decomposition framework for robust out-of-distribution photoplethysmography with state of the art results on patients with medical arrythmia conditions such as atrial fibrillation, and patients in optically challenging environments such as low light, partial occlusions, and double pane reflections.
- Co-built pulse transit time pipelines to estimate blood pressure, via radar and RGB data.
- Implemented prior "baseline" methods from existing literature for comparison against ours.
- Co-wrote the IRB and safety compliance amendments, and led our data collection.
- Designed paper figures via Inkscape, Photoshop and Illustrator.

## Employment Experience

**UCLA Health** with Dr. Ashley Kita — June 2022-September 2022
Summer Research Intern - Working on *Contactless Sleep Apnea Detection* as the first author.

- Built data acquisition multimodal imaging and radar stack using triple NIR based FLIR Grasshopper3 camera system, with active illumination at 940nm, 850nm and 766nm, a FLIR Boson 640 Radiometric camera and TI AWR1443BOOST RF sensor.
- Developed multimodal fusion models for robust radar-thermal respiratory waveform detection and radar-NIR cardiac waveform detection
- Developed Vision Transformer models for contactless estimation of respiratory rate and effort via long-wave infra-red and mmWave sensors, with application in apnea event detection.
- Developing anomaly detection models that classify apnea and hypopnea events from vital sign time-series data; currently working with contact-based gold-standard signals to verify automation feasibility.
- Developing causal inference pipelines to predict event onset, with plans to extend this to sepsis, arrhythmia, atrial fibrillation, and other diseases.

**UCLA Visual Machines Group** June 2021-September 2021
Summer Research Intern

- Designed, sourced, and built a multimodal sensing system that senses in the visible, near infra-red, long wave infra-red and millimeter-wave (mmWave) radio bands.
- Built GPIO hardware-triggered system, enabling microsecond-level synchronized exposure.
- Co-built an open-sourced C++ multithreaded data acquisition codebase for our sensor stack.

Other Experience

Cornell Tech, CS 5785: Applied Machine Learning, *Teaching Assistant* August 2023-Present

Awards

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| 2023 UCLA ECE Outstanding Master of Science Student Award | June 2023 |
| 2023 UCLA ECE Distinguished Master's Thesis Research Award | May 2023 |
| 2023 UCLA ECE SIGGRAPH 2023 Los Angeles Travel Grant – $500 | April 2023 |
| 2022 UCLA ECE SIGGRAPH 2022 Vancouver Travel Grant – $1,500 | August 2022 |
| 2022 UCLA ECE ICCP 2022 Pasadena Travel Grant – $500 | July 2022 |
| 2022 UCLA ECE CVPR 2022 New Orleans Travel Grant – $1,500 | June 2022 |
| 2022 UCLA ECE VMG GSR Scholarship – $1,000 | January 2022 |
| 2021 NSF REU Fellowship – $7,500 | June 2021 |
| 2021 UCLA ECE Dean's Honors List | March 2021 |
| 2020 Intel URP Scholarship – $1,250 | September 2020 |
| 2020 SRC URP Scholarship – $1,250 | June 2020 |
| 2020 UCLA ECE Dean's Honors List | June 2020 |

Community Involvement

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| UCLA ECE VMG Mentoring Program, *Mentor* | September 2022-June 2023 |
| UCLA ACM AI Undergraduate Research Program, *Research Mentor* | September 2022-June 2023 |
| IEEE, *Student Member* | May 2022-Present |
| ACM, *Student Member* | May 2022-Present |

Student Collaborations

Pradyumna Chari (UCLA, PhD Student)
Alexander Vilesov (UCLA, PhD Student)
Anirudh Bindiganavale Harish (Rice University, PhD Student)
Jianchong Ma (Stanford University, MS Student)
Kai Del Regno (UCLA, MS Student)
Rui Ma (Columbia University, MS Student)

Presentations

*Computational Imaging: Single Image Dehazing and Contactless Health Sensing.* UCLA ACM AI Undergraduate Research Forum, October 20 2022.

*Blending Camera and 77 GHz Radar Sensing for Equitable, Robust Plethysmography.* [Co-presented]. ACM Special Interest Group on Graphics, Computational Photography Roundtable Session, August 08 2022 (SIGGRAPH '22).

*Blending Camera and 77 GHz Radar Sensing for Equitable, Robust Plethysmography.* [Poster]. IEEE International Conference on Computational Photography, August 01 2022 (ICCP '22).

References

**Prof. Achuta Kadambi**
Assistant Professor of Electrical and Computer Engineering & Computer Science at UCLA, **Email:** achuta@ee.ucla.edu

**Dr. Laleh Jalilian**
Clinical Assistant Professor of Anesthesiology & Perioperative Medicine at UCLA David Geffen School of Medicine, **Email:** ljalilian@mednet.ucla.edu

**Dr. Ashley Kita**
Assistant Professor-in-Residence of Head & Neck Surgery at UCLA Health, **Email:** akita@mednet.ucla.edu