Adnan Al Armouti

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Education

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

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

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 Transactions on Graphics (TOG), 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., **Armouti, A.** 2021. "Systems and Methods for Measuring Vital Signs Using Multimodal Health Sensing Platforms," Int'l Application PCT/US19/22532, filed June 16, 2021.

Kadambi, A., Jalilian, L., Abari, O., Cannesson, M., Kita, A., Chari, P., **Armouti, A.** 2021. "MMHEALTH: Multimodal Health Sensing Platform," US Provisional Application 63/177,229, filed April 20, 2021.

Presentations

Blending Camera and 77 GHz Radar Sensing for Equitable, Robust Plethysmography. [Co-presented]. ACM Special Interest Group on Graphics, Social Impact Session, 2020 (SIGGRAPH '22).

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

Research Experience

UCLA Visual Machines Group with Prof. Achuta Kadambi — September 2020-Present
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).
- 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.
- Developed an open-sourced Python multimodal data processing library for our deep learning (DL) pipelines.
- Co-developed DL algorithms in PyTorch including CNNs and Vision Transformers to estimate the subject's vital signs from their perceived physical state, including photoplethysmography (PPG), the skin color changes due to pulsatile blood flow; physiological respiration; blood oxygenation (SpO2) via ratio-of-ratios (ROR) method; and mechanical respiratory effort.
- Implemented prior "baseline" methods from existing literature for comparison against ours.
- Other paper contributions include: co-wrote the IRB and safety compliance amendments, led our data collection, and designed our paper's figures via Inkscape, Photoshop and Illustrator.

UCLA Health with Dr. Ashley Kita — April 2021-Present
Working on *Contactless Sleep Apnea and Hypopnea Detection* as the lead researcher and first author.

- Developing DL implicit neural representation model to estimate SpO2 remotely via PPG and ROR intermediate supervision, with application in hypopnea event 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.

Employment Experience

UCLA Health June 2022-September 2022
Summer Research Intern

- Built data acquisition sensor stack using triple NIR based camera system, using active illumination at 940nm, 850nm and 766nm, with additional FLIR Boson 640 Radiometric camera and TI AWR1443BOOST RF sensor.
- Implemented custom serial code in C++ to trigger Arduino-based barker code signal to synchronize our PC's time stamps with the PC in the control room, used to collect the polysomnography (PSG) ground truth data.
- Designed custom PCB to protect our PC when barker code signal is transmitted.
- Designed software-triggered hardware system to reset RF device, automating longer periods of data collection at the UCLA Health Sleep Disorders Clinic.

California NanoSystems Institute June 2020-September 2020
Summer Research Intern

- Used open source DeepLebCut ResNet CNN to create real-time marker-less pose estimation system for mice subjected to neuro-stimuli by electrodes, for behaviorally-triggered "closed-loop" brain-machine interface
- 1/10th the cost of an NDI Polaris Vega system, gold standard for Parkinson's Disease research.

Other Experience

UCLA ECE, *Teaching Assistant, Upcoming* January 2023-March 2023
UCLA CS, *Teaching Assistant, Upcoming* April 2023-June 2023

Awards

2022 UCLA ECE VMG GSR Scholarship – $1,000
2022 UCLA ECE SIGGRAPH 2022 Vancouver Travel Grant – $1,500
2022 UCLA ECE CVPR 2022 New Orleans Travel Grant – $1,500
2022 UCLA ECE ICCP 2022 Pasadena Travel Grant – $500
2021 UCLA ECE Dean's Honors List
2021 NSF REU Fellowship – $7,500
2020 Intel URP Fellowship – $1,250
2020 SRC URP Fellowship – $1,250
2020 UCLA ECE Dean's Honors List

Community Involvement

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

References

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

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

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