Mayank Kumar

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Objective

To be a leader in technology that touches human lives

Education

Ph.D. candidate, Electrical and computer engineering, Rice University 2015 - Present
Advised by Dr. Ashutosh Sabharwal and Dr. Ashok Veeraraghavan
MS in Electrical and Computer Engineering, Rice University Aug, 2014
GPA: 4.04/4.00
B.Tech in Electrical Engineering, IIT, Delhi May, 2010
GPA: 8.96/10.00

Scholastic Achievements

Best Ph.D. presenter award, Rice ECE (2018)
NSF award for young professionals contributing to smart and connected health (2016)
Hershel M. Rich Invention Award for developing CameraVitals (2017)
Texas Instruments Graduate Student Fellowship (2015-Present)
Audience Choice Award, Rice 90 Second Thesis Competition 2014
Best Graduate Student Poster, Rice ECE Affiliates Day 2014, 2017
NASA Space Health Challenge 2014 (2nd Prize)
Best B.Tech Project Award in IIT Delhi, 2010
Yahoo HackU Award, 2009 by Yahoo R&D
Indian National Physics Olympiad, 2006

PhD Research

PulseCam: Design, development and clinical evaluation of a new multi-sensor camera-based blood flow imaging modality

- Developed a new camera-based, non-invasive and clinically proven blood flow imaging modality that can reliably measure the micro-vascular flow of blood underneath the skin surface from only the video recording of the skin surface.
- Demonstrated the clinical utility of using PulseCam to monitor peripheral perfusion in patients during surgery and in critical care with the help of a pilot clinical study at Baylor College of Medicine (Houston, TX).
- Established that PulseCam has significantly higher sensitivity in detecting blood flow changes associated with partial blood flow occlusion compared to existing contact-based blood flow sensors.

MS Research

CameraVitals: Robust camera-based non-contact vital sign monitoring

- Developed a new algorithm (DistancePPG) to reliably measure vital signs such as heart rate, heart rate variability, and breathing rate using only a person's video.
- CameraVitals achieves clinical grade accuracy for people of varying skin tones, under diverse lighting conditions and in presence of different types of motion — scenarios where past approaches failed.
- Technology used by IBM research aging-in-place labs and integrated into their care robot platform; resulted in a highly cited research publication.

Selected publications

[J1] Mayank Kumar, James W. Suliburk, Ashok Veeraraghavan, and Ashutosh Sabharwal, "PulseCam: Design, development and clinical evaluation of a new multi-sensor, camera-based blood perfusion imaging modality." (*Under review*)

[J2] Mayank Kumar, Ashok Veeraraghavan, and Ashutosh Sabharwal, "DistancePPG: Robust non-contact vital signs monitoring using a camera," Biomed. Opt. Express 6, 1565-1588 (2015)

[C1] Mayank Kumar, James Suliburk, Ashok Veeraraghavan and Ashutosh Sabharwal, "PulseCam: High-resolution blood perfusion imaging using a camera and a pulse oximeter," 2016 38th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), Orlando, FL, 2016, pp. 3904-3909.

[C2] Peter Washington, Mayank Kumar, Anant Tibrewal, and Ashutosh Sabharwal, 'ScaleMed: A Methodology for Iterative mHealth Clinical Trials' IEEE Healthcom 2015 - SSH 2015.

[C3] M. Chowdhary, CSR Technology, USA; M. Sharma, A. Kumar, IIT, India; S. Dayal, CSR Technology, India; M. Kumar, IIT, India. Robust Attitude Estimation for Indoor Pedestrian Navigation using MEMS Sensors. ION GNSS 2012

Patents

[P1] Camera-based photoplethysmogram estimation (US Utility Patent, Nov 2015)

[P2] High resolution blood perfusion imaging using a camera and a pulse oximeter (US Utility Patent Application, May 2017)

Selected Experience

Innovator-in-Residence, Gauss Surgical Inc., Los Altos, CA. Summer 2015
Explored productization of non-contact vital sign monitoring and developed a minimum viable prototype; developed algorithm for duplicate sponge detection.

Teaching Assistant, Rice University, ECE Dept. Fall 2014
Conducted weekly review sessions for Fundamentals of Electric Engineering.

Corporate R&D Intern, Qualcomm, San Diego, CA Summer 2013
Developed new algorithm for non-linear interference cancellation (NLIC) in 4G communication systems.

Algorithm Developer, Stanford India Biodesign, AIIMS New Delhi Fall 2011
Devised novel algorithm for detecting weak (100 nV) Auditory Brainstem Response (ABR) signal in presence of 30 dB high electromagnetic noise.

Leadership Experience

Co-founder, Yantrr Electronic Systems (YES) Pvt. Ltd. 2010-2015
Developed the cloud architecture for Yantrr M2M device cloud and shaped Yantrr's strategy to become a leader in Industrial IoT and M2M space.

Technical Skills

Programming Language: Python, MATLAB, C/C++, VHDL
Development Libraries: OpenCV (Computer Vision), Scikit Learn (Machine Learning), TensorFlow and Keras (deep-learning)

References*

Dr. Ashutosh Sabharwal (Prof. Rice, ECE), Dr. Ashok Veeraraghavan (Asst. Prof. Rice, ECE), James W. Suliburk, MD, FACS (Asst. Prof. of Surgery, Baylor College of Medicine), Siddharth Satish (Founder and CEO, Gauss Surgical)
** All references are made available upon request*