Akash Deep Singh

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Education

University of California, Los Angeles (UCLA) — Los Angeles, CA
Ph.D. (& MS) in Electrical and Computer Engineering, 3.975/4.0 — *Sep. 2018 – Present*

IIIT-Delhi — New Delhi, India
B.Tech in Electronics and Communication Engineering, 8.81/10 — *Aug. 2014 – May 2018*

Research Interests

Multi-modal Fusion, Human-computer Interaction, RF Sensing, Computer Vision, mmWave

I design and build hardware and software frameworks that allow agents (humans and machines) to better perceive their environments. My Ph.D. research aims to combine radio-frequency (RF) sensing with vision to create richer, robust and ubiquitous sensing paradigms. Through my thesis, I aim to bridge the gap between RF sensing hardware and machine learning frameworks in the Internet of Things.

Experience

Applied Scientist Intern — June 2022 – September 2022
Amazon — *Seattle, WA*
- Developed ML models to detect fraud from user behavior patterns (mouse, keyboard gestures) and browsing data for the Buyer Risk Prevention (BRP) Team. Improved the performance of the production model by 6.96%.
- ML Stack: Temporal models such as LSTMs, multi-modal fusion, gradient boosting, and temporal self-attention
- Tech Stack: Python, PyTorch, Scikit-learn

Research Intern — June 2021 – August 2021
Nokia Bell Labs — *Virtual*
- Developed a self-supervised framework for extracting features from RF+camera data using contrastive learning. The framework outperformed its supervised counterpart on downstream tasks even with less training data – accepted at IEEE ICC 2022.
- ML Stack: Self-supervised learning, contrastive learning, CNNs, multi-modal fusion, and self-attention
- Tech Stack: Python, PyTorch, Scikit-learn

Graduate Student Reseacher — Sep. 2018 – Present
University of California, Los Angeles — *Los Angeles, CA*
- Developed a framework to detect, identify and localize hidden wireless sensors such as cameras, motion sensors and RF sensors in a space.
- Developed a framework for Human Activity Recognition (HAR) using mmWave radar.
- Exploring ways to fuse sensors such as camera and radar for richer understanding of scenes.

Selected Publications (Google Scholar)

Top tier venues – USENIX Security, ACM SenSys, ACM TOPS, IEEE ICC, IEEE RadarCon, JAMIA

- **I Always Feel Like Somebody's Sensing Me! A Framework to Detect, Identify, and Localize Clandestine Wireless Sensors** - USENIX Security 2021 **[Acceptance Rate 16%]**
- **Dense Depth Estimation via the Fusion of mmWave Radar Point Cloud with a Camera Image** - (Under Review)
- **RadHAR: Human Activity Recognition from Point Clouds Generated through a Millimeter-wave Radar** - mmNets 2019 (MobiCom 2019)
- **UWHear: through-wall extraction and separation of audio vibrations using wireless signals** - ACM SenSys 2020 **[Acceptance Rate 20%]**
- **On collaborative reinforcement learning to optimize the redistribution of critical medical supplies throughout the COVID-19 pandemic** - Journal of the American Medical Informatics Association **[Impact Factor 4.11]**
- **InkFiltration: Using Inkjet Printers for Acoustic Data Exfiltration From Air-Gapped Networks** - ACM Transactions on Privacy and Security **[Impact Factor 1.91]**
- **Self-Supervised Radio-Visual Representation Learning for 6G Sensing** - IEEE International Conference on Communications (ICC) 2022

Projects

Reinforcement Learning based redistribution of supplies during the COVID-19 pandemic 2020-21
Under the supervision of ***Dr. Mihaela Van der Schaar*** *Los Angeles, CA*

- Designed and developed a reinforcement learning agent that can facilitate near-optimal collaborative exchange of equipment between states in real-time to bolster the public health response to future diseases.
- Published in Journal of the American Medical Informatics Association (JAMIA) – IF 4.11.

Smart MarketPlace (Selected among the top 6 projects in IoT course) 2017-18
Under the supervision of ***Dr. Juhi Ranjan*** *New Delhi, India*

- Created a smart marketplace that automatically adds the items picked by a customers to their cart and presents the bill during checkout.
- Used computer vision methods to identify faces and items being picked.

Project AVA: Smart backpack for preventing child abduction 2017-18
Under the supervision of ***Dr. Aman Parnami*** *New Delhi, India*

- Designed and developed an augmented backpack - along with an accompanying Android application - for school-going children to help prevent child abduction.
- Project Website

OFDMA based D2D Communication using USRP 2017
Under the supervision of ***Dr. Vivek Ashok Bohara*** *New Delhi, India*

- Used USRPs as nodes of a cellular network as well as a D2D pair. The performance of Cellular link was calculated in the presence of a D2D pair(source of interference) in both overlay and subcarrier sharing mode.

Technical Skills

Languages: [Proficient: C, Matlab, Python]; [Prior Experience: Embedded C, Spice, JavaScript]
Frameworks: PyTorch, TensorFlow, Keras
Tools: [Proficient: Git, GNU Radio, Wireshark, LabView, AngularJS, Bootstrap]; [Prior Experience: Cadence Virtuoso, Eldo Spice, Advanced Design System, LTSPice, Hostapd, iPerf, NodeJS]

Awards and Achievements

- Amazon Doctoral Fellowship**, 2021-22** – Tuition and Stipend
- Electrical and Computer Engineering (ECE) Departmental Fellowship**, 2018-19** – Tuition and Stipend
- Graduate Student Association (GSA) Presidential Service Award**, 2020-21**
- Semi-finalist, UCLA Grad Slam**, 2020**
- Served as the Elections Commissioner / Attorney General for the GSA, 2 terms**, 2020-22**
- Founding committee, ECE mentor of the year award that is awarded to the best mentors in the department**, 2021**
- Dean's List for academic achievement, IIIT-D**, 2017**
- First Prize, Innovation Challenge, Innovation Challenge (IIIT-D)**, 2017**
- National Talent Search (NTSE) Scholar, Government of India**, 2010**