Amod Agrawal

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Education

University of Illinois at Urbana-Champaign — *Champaign-Urbana, IL*

Master of Science (M.S.) in Computer Science (thesis) — *May 2019*

GPA: 4.0, Advisor: Prof. Romit R. Choudhury - Systems & Networking Research Group.

Thesis: Research towards sensing using RF wireless signals and IMUs to track the user's head orientation to enable untethered, mobile, and outdoor AR & VR experience along with numerous other augmentation applications.

IIIT-Delhi — *New Delhi, India*

Bachelor of Technology (B.Tech) in Computer Science and Engineering — *May 2017*

GPA: 8.76 (of 10.0) — Dean's List (Fall 2015, 2016; Spring 2016, 2017)

Work Experience

Amazon Lab126 - Wireless Sensing R&D — *Applied Scientist II*

Device OS Wireless Connectivity Team, Manager: VenkatRaghavan V — *May 2020 - present*

- Designed and developed novel algorithms for indoor localization, including distance estimation, proximity detection, and motion tracking, leveraging signal processing and machine learning techniques leading to three pending patents.
- Conducted cutting-edge research in RF and wireless sensing technologies, focusing on Bluetooth LE, Ultra-wideband, WiFi CSI, and IMU-based systems to enable advanced smart-home applications.
- Developed proof-of-concept solutions to drive innovative user experience in the smart home Alexa ecosystem, and validated experimental setups for robust performance in real-world scenarios, contributing to internal research and fostering innovation across orgs.
- Partnered with leading researchers, including PhDs from top universities, to explore novel methodologies and push the boundaries of wireless sensing for next-generation smart home solutions.

Amazon Lab126 - Device Tracker service — *Software Development Engineer*

Prototype Device Tracker Team, Manager: Prasanna Prabhu K — *July 2019 - May 2020*

- Engineered scalable cloud-based solution enabling efficient tracking, organization, and management of prototype devices across Amazon Lab126
- Designed and implemented software architectures to streamline prototype lifecycle management, ensuring traceability and operational efficiency in hardware development processes.
- Invented a novel tool assisting 1000+ Engineering Program Managers and Specialists to streamline processes for device production planning, internal allocation, and logistics optimization.

Amazon Lab126 — *SDE Intern, summer 2018*

Prototype Device Tracker Team, Manager: Steve Bennett — *May 2018 - Aug 2018*

– Finite State Machine for Prototype Tracking

- Developed a proof-of-concept abstract and configurable cloud service using Akka to spawn an actor-model based Finite State Machine, which was later integrated into Lab126's solution to streamline and track the device's states across Amazon.

Microsoft Research, India — *Research Intern, summer 2016-2017*

Mentors: Dr. Venkat Padmanabhan, Dr. Saikat Guha, Dr. Manohar Swaminathan, Dr. Vivek Seshadri — *May 2016 – July 2017*

– Harnessing Safety for Auto-Mobiles (HAMS)

- Developed mobile-app based sensing systems to monitor driver behavior and driving patterns using smartphone sensors, camera, and OBD-II sensor. Deployed prototypes on a dozen of on-site cabs at Microsoft to analyze data and monitor them in real-time.
- Contributed to novel algorithms to detect impaired driving, unsafe maneuvering, sharp turning at high-speeds, and driver fatigue.
- Developed Machine Learning models to estimate and predict vehicle fuel consumption for the city of Bangalore by analyzing fuel flow rates based on patterns in vehicle data, routes, traffic, and other external factors.

IBM Research Lab, India — *Research Intern, summer 2015*

Mentor: Dr. Ravi Kothari - Chief Scientist - IBM Research India — *May 2015 – Aug 2015*

– Streaming Data Analytics: Change Point Detection

- Develop a novel online algorithm to detect points where the fundamental underlying function of data changes. Worked with streaming data to test our algorithm in numeric and non-numeric domains.
- Algorithm could be applied to raise flags when anomalies are detected in live data stream regardless of data domain or underlying principles.

Academic Research

HeadTrack: Head-orientation tracking for AR & VR systems using UWB

SiNRG @ Illinois

Advisor: Prof. Romit Roy Choudhury - University of Illinois at Urbana-Champaign — *Aug 2017 - May 2019*

- Developed a wearable system that enables occlusion-free, portable, and cost-effective head orientation tracking using ultra-wide band (UWB) radios and IMU sensors.
- HeadTrack uses time-of-flight (ToF) measurements to perform absolute distance ranging providing a novel solution with a bounded and non-diverging average error of *4mm*.

Collective Privacy Analysis in Online Social Networks

PreCog Research Lab, IIIT-Delhi

Advisors: Prof. Ponnurangam Kumaraguru - IIIT-Delhi, Dr. David Garcia - ETH - Zurich — *Aug 2016 - Jan 2018*

- Analyzed the privacy leaks caused by the Twitter users for their offline connections that are not even on the social network platform.
- Worked with Twitter data to show such strong privacy leaks using shadow profiling in multiple domains including location of the users.
- ***Published:*** European Physical Journal (EPJ) Data Science, January 2018.

Smart Android notifications assistive agent

Xerox Research Center

Advisors: Prof. Vinayak Naik - IIIT-Delhi, Dr. Kuldeep Yadav - Xerox Research — *Jan 2016 – May 2016*

- Developed a smart assistive layer that manages notifications on Android by learning their textual semantics and providing suggestions based on active application environment in real-time.
- Worked with chat-bot cloud services like api.ai, wit.ai, and NLP learning models to extract entities of interest from notifications' unstructured text.

Detection of Ransomware using Events Tracking

DELL-EMC & CERC, IIIT-Delhi

Advisors: Prof. Ponnurangam Kumaraguru - IIIT-Delhi, Shuva Brata Deb - RSA Security - Dell EMC — *Aug 2015 - Sept 2016*

- The focus of this project was to analyze modern ransomware and detect system-level patterns to prevent zero-day attacks.
- Worked with Cuckoo Sandbox to propose forty-four indicators of compromise to detect ransomware before it encrypts the system.
- ***Presented:*** RSA Security's Annual Internal Security Conference 2016.

Aspiring Researcher Challenge - Stanford University & UC Santa Cruz

Undergraduate Research Assistant

Mentors: Prof. James Davis, Dr. Michael Wilber, Dr. Andreas Veit, Dr. Rajan Vaish, Dr. Serge Belongie — *Jan 2015 – May 2015*

– Optimizing Human-Machine Task Assignments

- Researched ways to crowdsource vision algorithms' results and maximize the accuracy of the machine-crowd pipeline given a time budget. Worked with computer vision algorithms and developed a software system to detect and annotate vehicles in images.
- ***Published:*** AAAI Conference on Human Computation and Crowdsourcing (HCOMP 2015), November 2015.

Patents

Methods and apparatus to localize devices in the home

Patent No. US86120162

Filed Dec 2023, patent pending

Distance estimation between devices using wireless signals such as BLE RSSI, WiFi RSSI, Acoustic SNR, and applications of multilateration across devices for deriving position estimates.

Device localization based on user touchscreen input during scanning

Patent No. US86128473

Filed Dec 2023, patent pending

Localization of anchor devices in space by tracking the location of customer's mobile device using methods such as visual SLAM and using its location as a proxy to derive position estimates.

Methods for automatic device grouping from wireless signals

Patent No. US86325929

Filed Sept 2024, patent pending

Methods of using WiFi CSI and RSSI based mechanisms to group devices located in the same space in line-of-sight, and using BLE RSSI to automatically group devices co-located in a cluster by capturing signals at different positions on the floor plan.

Skills

Programming Languages	Python, MATLAB, Java, Scala, C++, C, NodeJS, HTML, CSS
Development Environments	Android, iOS, Ruby on Rails, Django, NodeJS, mySQL, Akka, Git, SVN
Data & Machine Learning	R, Weka, TensorFlow, scikit-learn, Weka, MATLAB DL, Twitter APIs, Cuckoo Sandbox
Software Defined Networking	OpenFlow, Mininet, Open vSwitch, Ryu, POX, OpenDaylight
Platforms	Raspbian, Arduino, Decawave, Microsoft Azure, AWS, IoT systems, Actor Model
Sensing	Ultra-wide band (UWB), IMU, FMCW radar, Beamforming, Indoor Localization, Filtering