RAHUL ANAND SHARMA

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Advisors: Prof. Vyas Sekar and Anthony Rowe

EDUCATION

Carnegie Mellon University   *August 2018 - Present*
Ph.D. CyLab, Department of Electrical and Computer Engineering

International Institute of Information Technology   *July 2011 - July 2016*
B.Tech and MS By Research in Computer Science

APPOINTMENTS

- Research Assistant, **Carnegie Mellon University**   *Aug 2018 - Present*
- Research Intern, **Microsoft Research, Redmond**   *May 2020 - July 2021*
- Research Fellow, **Microsoft Research, India**   *July 2016 - July 2018*
- Software Engineering Intern, **HackerRank**   *May 2015 - Aug 2015*
- Research Assistant, **IIIT Hyderabad, India**   *July 2014 - July 2016*

HONORS AND AWARDS

- Our work on "Lumos" covered by Hackernews, CyLab, and others
- Carnegie Institute of Technology, Deans Fellow, Carnegie Mellon University
- Won outstanding technical achievement award for FarmBeats as part of Microsoft AI School
- Our work on "Annotation of Cricket Videos" covered by the Washington Post, NDTV, and others
- Made into Deans list of Academic and Research excellence at IIIT Hyderabad

PUBLICATIONS

Under Submission: " Lumen: A Framework for Developing and Evaluating ML-Based IoT Network Anomaly Detection"
Rahul Anand Sharma, Ishan Sabane, Maria Apostolaki, Anthony Rowe & Vyas Sekar

USENIX Security: "Lumos: Identifying and Localizing Diverse Hidden IoT Devices in an Unfamiliar Environment"
Rahul Anand Sharma, Elahe Soltanaghaei, Anthony Rowe & Vyas Sekar
USENIX Security, 2022

USENIX Security: "Accurately Measuring Global Risk of Amplification Attacks using AmpMap"
Soo-Jin Moon, Yucheng Yin, **Rahul Anand Sharma**, Yifei Yuan, Jonathan M. Spring & Vyas Sekar
USENIX Security, 2021

BuildSys: "Robust and Practical WiFi Human Sensing Using On-device Learning with a Domain Adaptive Model "
Elahe Soltanaghaei, **Rahul Anand Sharma**, Zehao Wang, Adarsh Chittilappilly, Anh Luong, Eric Giler, Katie Hall, Steve Elias & Anthony Rowe
ACM Conference on Systems for Energy-Efficient Built Environments (BuildSys), 2020

SIGCOMM: "Contention-Aware Performance Prediction for Virtualized Network Functions"
Antonis Manousis, **Rahul Anand Sharma** , Vyas Sekar & Justine Sherry
ACM Special Interest Group on Data Communication (SIGCOMM), 2020

IPSN: "All that GLITTERs: Low-Power Spoof-Resilient Light Anchors for Augmented Reality"
Rahul Anand Sharma, Adwait Dongare, John Miller, Nicholas Wilkerson, Daniel Cohen, Vyas Sekar, Prabal Dutta & Anthony Rowe
ACM/IEEE Conference on Information Processing in Sensor Networks (IPSN), 2020

NSDI Poster: "DeepEdge: A Network Edge for Deep Learning Workloads"'
Rahul Anand Sharma & Ranveer Chandra
USENIX Symposium on Networked Systems Design and Implementation Poster (NSDI Poster), 2019

COMPASS: "Low-Cost Aerial Imaging for Small Holder Farmers"
Vasuki Narasimha Swamy, Deepak Vasisht, Zerina Kapetanovic, **Rahul Anand Sharma**, Ranveer Chandra, Manohar Swaminathan, Anirudh Badam, Gireeja Ranade & Sudipta Sinha
ACM SIGCAS Conference on Computing & Sustainable Societies (COMPASS), 2019

Arxiv: "Learnability of Learned Neural Networks"
Rahul Anand Sharma, Praneeth Netrapalli, Navin Goyal, & Monojit Choudhary

Sensys: "Fall-curve: A novel primitive for IoT Fault Detection and Isolation"
Tusher Chakraborty, Akshay Nambi, Ranveer Chandra, **Rahul Anand Sharma**, Manohar Swaminathan, Jonathan Appavoo & Zerina Kapetanovic
ACM Conference on Embedded Networked Sensor Systems (SenSys), 2018

WACV: "Automated top view registration of broadcast football videos"
Rahul Anand Sharma, Bharath Bhat, Vineet Gandhi & C.V. Jawahar
IEEE Winter Conference on Applications of Computer Vision (WACV), 2018

JOSIVP: "Automatic analysis of broadcast football videos"
Rahul Anand Sharma, Visesh Chari, Vineet Gandhi & C.V. Jawahar
Springer Journal on Signal, Image and Video Processing (JOSIVP), 2016

ACPR: "Fine-Grain Annotation of Cricket Videos"
Rahul Anand Sharma, Pramod Kompalli & C.V. Jawahar
Asian Conference on Pattern Recognition (ACPR), 2015

ICVGIP: "Event Recognition in Broadcast Soccer Videos"
Himangi Saraogi, **Rahul Anand Sharma** & Vijay Kumar
Indian Conference on Computer Vision, Graphics and Image Processing (ICVGIP), 2016

PATENTS

1. USO10942767B2 : "Deep neural network workload scheduling" *March 2021*
2. US20200150640A: "Sensor Fall Curve Identification" *May 2022*

INVITED TALKS AND CONFERENCES

Lumen: A Framework for Developing and Evaluating ML-Based IoT Network Anomaly Detection

- at CONIX Annual Review, CyLab, CMU, Pittsburgh, PA *Oct 2022*

- at CyLab Annual Review, CyLab, CMU, Pittsburgh, PA *Oct 2022*

Lumos: Identifying and Localizing Diverse Hidden IoT Devices in an Unfamiliar Environment

- at USENIX Security, Boston, MA *Aug 2022*

- at CONIX Student-Liaison Seminar, CMU, Pittsburgh, PA *Aug 2021*

- at IoT Reading Group, CMU, Pittsburgh, PA *July 2021*

- at CONIX Annual Review, CyLab, CMU, Pittsburgh, PA *Oct 2020*

- at CyLab Annual Review, CyLab, CMU, Pittsburgh, PA *Oct 2020*

All that GLITTERs: Low-Power Spoof-Resilient Light Anchors for Augmented Reality

- at CONIX Annual Review, CyLab, CMU, Pittsburgh, PA *Oct 2020*

- at IPSN, CPS-IoT Week 2020 (virtual) *April 2020*

FarmBeats: AI, Edge & IoT for Agriculture

- at Digital Platforms for improving Rural Livelihoods, Patna, India *April 2018*

- at Microsoft Techfest, Redmond, WA *Mar 2018*

Automated top view registration of broadcast football video

- at WACV, Lake Tahoe, NV *Mar 2018*

Fine-Grain Annotation of Cricket Videos

- at R & D Showcase, IIIT Hyderabad, India *Mar 2017*

- at ACPR, Kuala Lumpur, Malaysia *April 2016*

EXPERIENCE

- **Microsoft Research** Bangalore, India
  Research Fellow Aug 2016 - July 2018

  - FarmBeats: Worked with Dr. Ranveer Chandra & Dr. Manohar Swaminathan on FarmBeats: IoT for agriculture. Our mission is to improve farming through data-driven practices. We are inventing new ways to gather data, store them in the cloud, and provide analytics to farmers.

  - Learnability of Neural Networks: Together with Dr. Praneeth Netrapalli & Dr. Navin Goyal, we are exploring the simplicity of learned neural networks under various settings: learned on real vs. random data, varying size/architecture, and using large minibatch size vs. small minibatch size. The notion of simplicity used here is that of learnability, i.e., how accurately can the prediction function of a neural network be learned from labeled samples from it?

  - DeepEdge: In collaboration with Dr. Ranveer Chandra, we propose a new Internet Edge architecture, called DeepEdge, for handling Deep Learning workloads on a network edge. It leverages insights about the structure of Deep Neural Networks (DNN) to schedule tasks in a way that can achieve good performance for small workloads and gracefully degrades when the workload increases

- **HackerRank** Bangalore, India
  Software Engineering Intern May 2015 - Aug 2015

  - Code Checker: HackerRank organizes various online programming contests, and Codechecker is the module that makes sure that each submitted solution passes the required test cases meanwhile following the specified resource constraints. As part of my work, I improved the Codechecker by adding support for Image Processing related problems. My other work as an intern led to ten-fold reduction in deployment time by improvising the asset pre-compilation pipeline.

- Static Code Analysis: As part of the internal hackathon organized by the company, we developed a static code analysis tool which is currently under development to be offered as a service to end-users

- **IIIT Hyderabad**   Hyderabad, India
  Research assistant   May 2013 - Aug 2016

  - Automated top view registration of broadcast football videos: Developed a system for automatic registration of a broadcast soccer frame to its corresponding top view. For the task of image registration, we propose an alternate approach exploiting the edge information and demonstrating its success in a specific scenario of registering football broadcast video frames on the static top view model of the playing surface

  - Automatic analysis of broadcast football videos using contextual priors: Demonstrated that contextual information can be harnessed for automatic analysis of sports videos. Here the proposed algorithm allows us to extract salient events such as Goals, fouls, corners, substitution,s etc. automatically from a given broadcast soccer video.

  - Fine Grain Annotation of Cricket Videos: Presented a solution that enables rich semantic annotation of Cricket videos at a fine temporal scale. Our approach circumvents technical challenges in visual recognition by utilizing information from online text commentaries. We obtain a high annotation accuracy, as evaluated over a large video collection.

  - Event Recognition in Broadcast Soccer Videos: Proposed an approach for soccer event recognition using deep convolutional features combined with domain-specific cues. This approach uses the deep convolution feature (TDD) in combination with our proposed algorithm of Automated top view registration to improve upon the task of Event recognition.

- **IIIT Hyderabad**   Hyderabad, India
  Teaching Assistant

  - Artificial Intelligence

  - Principle of Programming Languages

  - Digital Image Processing

  - Digital Signal Analysis and Applications

REFERENCES

Available upon Request