

Raghav Hampapur Venkatnarayan

Graduate Assistant
Department of Computer Science
North Carolina State University
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2015 – present
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RESEARCH INTERESTS

Wireless Sensing and Interaction: Contactless human gesture and activity recognition through pervasive modalities (RF/WiFi, visible light) using machine learning and channel models

Human and Robot Localization: Design and modeling of wireless channels to achieve accurate localization of humans and robots.

Networks: Measurement and design of wireless networks

EDUCATION

Ph.D. Computer Science, North Carolina State University, NC, USA.
08/2015 - 12/2019
GPA: 3.71/4.00

M.Tech Computer Science and Engineering, International Institute of Information Technology, Hyderabad, India.
07/2012 - 05/2014
GPA: 9.28/10.00

B.E. Computer Science and Engineering, Visvesvaraya Technological University, Belgaum, India
09/2008 - 06/2012
GPA: 81.5/100

FUNDED GRANTS

I am the main student contributor, together with my advisor, to the design, experiments, and writing of the following funded grant proposals.

1. *“WiFi based Indoor Mapping and Human Discovery”*
PI: Muhammad Shahzad. Amount: \$200,000 (Approx.)
Funding agency : Army Research Office, USA.
2. *“Accurate Position Tracking Through Smart Fusion of Inertial Sensors with Ambient WiFi”*,
PI: Muhammad Shahzad. Amount : \$150,000 (Approx.)
Funding Agency : Sony Corporation, Japan.
3. *“CRII: CSR: Pervasive Gesture Recognition Using Ambient Light”*
PI: Muhammad Shahzad. Amount: \$174,878.
Funding agency: National Science Foundation, USA.

REFEREED JOURNAL PAPERS

1. Raghav Hampapur Venkatnarayan, Muhammad Shahzad. “Gesture Recognition Using Ambient Light”, In *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies*, (**UbiComp/IMWUT**), Vol. 2, No. 1, 2018.
2. Raghav Hampapur Venkatnarayan, Muhammad Shahzad. “Enhancing Indoor Inertial Odometry with WiFi”, In *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies*, (**UbiComp/IMWUT**), Vol.3, No. 2, 2019.

REFEREED CONFERENCE PAPERS

1. Raghav Hampapur Venkatnarayan, Griffin Page, Muhammad Shahzad. “Multi-User Gesture Recognition using WiFi”, In *Proceedings of the 16th ACM International Conference on Mobile Systems, Applications, and Services (MobiSys)*, Munich, Germany, June 2018.

REFEREED WORKSHOP PAPERS

1. Prasesh Adina, Raghav H Venkatnarayan, Muhammad Shahzad “Impacts & Detection of Network Layer Attacks on IoT Networks”, In *Proceedings of the 1st ACM MobiHoc Workshop on Mobile IoT Sensing, Security, and Privacy (MobiHoc)*, Los Angeles, CA, USA, June 2018.

INVITED WORKSHOP PAPERS

1. Raghav H Venkatnarayan, Muhammad Shahzad “Recognizing Gestures with Ambient Light”, In *Proceedings of the 10th ACM Wireless of the Students, by the Students, and for the Students Workshop (S3)*, New Delhi, India, November 2018.
2. Raghav H Venkatnarayan, Muhammad Shahzad “Demo : Measuring Distance Traveled by an Object using WiFi-CSI and IMU Fusion’, In *2019 IEEE 27th International Conference on Network Protocols (ICNP)*, Chicago, USA, October 2019.

POSTER PAPERS

1. Raghav Venkatnarayan, Prasesh Adina, Shakir Mahmood and Muhammad Shahzad “ Poster : A Framework to Secure IoT Networks Against Network Layer Attacks”, In *IFIP Networking 2019 Conference (IFIP)*, Warsaw, Poland, May 2019.

INVITED POSTER PAPERS

1. Raghav H Venkatnarayan, Muhammad Shahzad “Demo : Measuring Distance Traveled by an Object using WiFi-CSI and IMU Fusion’, In *2019 IEEE 27th International Conference on Network Protocols (ICNP)*, Chicago, USA, October 2019.

REFEREED CONFERENCE PAPERS (UNDER SUBMISSION)

1. MobiCom 2020
 2. InfoCom 2020
 3. PerCom 2020
- Titles not shown as per conference policies*

PATENTS

1. “Accurate Localization of an Object by a Network Device”, Co-inventors: Kyu-Han Kim, Christina Vlachou, Sangki Yun, and Raghav Hampapur Venkatnarayan. United States Patent Application 16/176326. Filed: December 2018.

SERVICE ACTIVITIES

1. **Journal Reviewer:** Elsevier Pervasive and Mobile Computing, IEEE Transactions on Big Data, IEEE Internet of Things Journal, Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (UbiComp/IMWUT)
2. **Conference Reviewer :** IEEE Infocom 2020

AWARDS

1. **Outstanding Doctoral Scholar of the Year 2018** - Awarded for the Class of 2015 in the Dept. of Computer Science, NC State University, USA. Only 1 student out of 200 receives this award every year.
2. **Academic Distinction 2014** - Ranked 5 out of 72 for the class of 2014 and featured on the Deans List 2014 at International Institute of Information Technology(IIT) Hyderabad, India.
3. **Best Outgoing Student Award 2012** - Ranked 1 out of 60 in the class of 2012 in the Computer Science and Engineering Department at Visvesvaraya Technological University(VTU), Belgaum, India.
4. **National Talent Search Scholar 2006** - A highly selective national level scholarship awarded by the Govt. of India. Ranked 7th in the state of Karnataka and awarded an annual scholarship for 8 years (2006-2014)
5. **Student Travel Awards** - MobiSys 2018, MobiCom 2018, UbiComp 2018, IFIP 2019, ICNP 2019

TEACHING EXPERIENCE

- **Internet of Things – Architectures, Applications, and Implementation:** 4 Guest lectures in Spring 2016, Spring 2018
- **Introduction to IoT Systems:** 4 Guest lectures in Spring 2019
- **Software for Wireless Sensor Systems:** 4 Guest lectures in Spring 2017

WORK EXPERIENCE

Hewlett Packard Enterprise, Palo Alto, CA, USA*Research Associate Intern*

May 2018 – Apr 2019

- Built a human tracking system for a single WiFi access point.
- Developed a full-stack processing tool ranging from WiFi device firmware, device driver to a user-space program.

North Carolina State University, Raleigh, NC, USA*Graduate Research Assistant*

May 2016 – present

- Built a novel gesture recognition system solely based on a user's shadow under indoor lighting. Achieved recognition accuracy of 96.36% across 15,000 samples collected from 20 users for 5 gestures.
- Devised a multi-user gesture recognition system using patterns from WiFi signals. Achieved recognition rate of 95.0, 94.6, 93.6, 92.6, and 90.9% for 2, 3, 4, 5, and 6 simultaneously performed gestures from up to 6 users spanning 1050 samples.
- Implemented a novel data-driven (vs model-based) approach for decoding MIMO streams of indoor visible light communication. Demonstrated an order of magnitude higher BER than conventional model-based approaches.

- Impelemented a novel WiFi assisted IMU distance sensing system for humans and robots. Demonstrated a state-of-the-art median localization error of just 55cm in Non-Line-of-Sight scenarios.

Graduate Teaching Assistant

Aug 2015 – Apr 2016

- Provided teaching assistance for 46 graduate students for the Internet of Things (IoT) course. Conducted office hours and delivered hands-on tutorials for programming IoT devices.

International Institute of Information Technology, Hyderabad, India

Teaching Assistant

Aug 2013 – Nov 2013

- Created a laboratory course plan for Scripting and Computer Environments Course. Prepared tests, quizzes, assignments and built an automated evaluator. Organized weekly meetings and tutorials for 140 students

Virtual Labs, Hyderabad, India

Research Assistant

Aug 2013 – Nov 2013

- Explored designs for a private cloud infrastructure using Eucalyptus for Virtual Labs, India. Demonstrated a service orchestration layer using Juju for scalability and rapid deployment of services

OTHER ACADEMIC PROJECTS

1. Application of Diverse Frequent Patterns for Item based Recommendation Systems (2014): Built an improvised Apriori style miner that exploits diversity as part of a research study on collaborative recommender systems. Improved performance by 10%(Java)
2. Wiki Search (2013): Built an offline command line search engine for Wikipedia data. Used a complete 40 GB XML dump of Wikipedia to search offline and produced results in milliseconds (Java)
3. Database System (2013): Built a simple database system similar to MySQL with indexing, join algorithms and an online shell to interpret SQL queries and execute them (C++)
4. Expense Manager (2013): Built an Android application for managing personal expenses. Implemented Geo fencing for location based reminders with optimal power usage (Java, SQLite)
5. Tag Recommender System (2013): Built a recommendation system using a Support Vector Machine to suggest relevant tags to users for a given URL and description, similar to del.icio.us (Java)
6. Topic based Search Engine (2012): Built a topic based search engine for eBook collections (Java).

PROGRAMMING SKILLS

1. General programming: Matlab, C, C++, Java, Python, Java
2. General scripting: Bash, JavaScript
3. Device programming : RaspberryPi, Arduino Uno, ARM Cubox, TI MSP432, Android

REFERENCES

1. **Muhammad Shahzad**, Assistant Professor, North Carolina State University, Raleigh, NC, USA.
Email: mshahza@ncsu.edu

2. **Harry Perros**, Professor, North Carolina State University, Raleigh, NC, USA.
Email: hp@ncsu.edu
3. **Kyu-Han Kim**, Principal Research Scientist, Hewlett Packard Enterprise, Palo Alto, CA, USA.
Email: kyu-han.kim@hpe.com