Niranjini Rajagopal

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Education

Jan 2013 onwards **Carnegie Mellon University (CMU)**, *Ph.D.*, Electrical and Computer Engineering.
Advisors: Prof. Anthony Rowe, Prof. Bruno Sinopoli. Committee: Prof. Prabal Dutta, Dr. Brent Ledvina

2011 – 2012 **Carnegie Mellon University (CMU)**, *M.S.*, Electrical and Computer Engineering.

2004 – 2008 **National Institute of Technology Tiruchirappalli (NITT), India**, *B.Tech.*, Electronics and Communication Engineering.

Awards

2018 Among MIT EECS Rising Stars

2018 First place in Microsoft Indoor Localization Competition in 3D Infrastructure-based category

2018 Best Demo Award, International Conference on Information Processing in Sensor Networks (IPSN)

2017 Ben Taskar Memorial Best Poster Award, TerraSwarm Annual Meeting

2016 – 2017 Samsung Ph.D. Fellowship (among 5 students in US), for Internet of Things area

2015 – 2016 Carnegie Mellon William S. Dietrich II Presidential Ph.D. Fellowship

2015 First place in Microsoft Indoor Localization Competition in 2D Infrastructure-based category

2014 Fourth place in Microsoft Indoor Localization Competition in 2D Infrastructure-based category

2014 – 2015 Travel Grants: NSF for SenSys 2015 and MobiCom 2014; ACM SIGBED for CPS Week 2014

2013 – 2014 Carnegie Institute of Technology Dean's Tuition Fellowship

2014 Networking Networking (N2) Women Young Researcher Fellowship award for CPS Week

2011 Narotam Sekhsaria Foundation Scholarship for Higher Studies, India (among 12 students in India)

2011 J N Tata Endowment Scholarship for Higher Studies, India

2003 – 2008 National Talent Search Examination Scholarship (NTSE), awarded by the National Council of Education, Research and Training (NCERT), India

Publications

IPSN '18 Niranjini Rajagopal, Patrick Lazik, Nuno Pereira, Sindhura Chayapathy, Bruno Sinopoli and Anthony Rowe, **Enhancing Indoor Smartphone Location Acquisition using Floor Plans**, The 17th International Conference on Information Processing in Sensor Networks, 2018, Porto, Portugal

RTAS '17 Adwait Dongare, Patrick Lazik, Niranjini Rajagopal, Anthony Rowe, **Pulsar: A Wireless Propagation-Aware Clock Synchronization Platform**, 23rd IEEE Real-Time and Embedded Technology and Applications Symposium, Pittsburgh, Pennsylvania, April, 2017

IPIN '16 Niranjini Rajagopal, Sindhura Chayapathy, Bruno Sinopoli, Anthony Rowe, **Beacon Placement for Range-Based Indoor Localization**, The 7th International Conference on Indoor Positioning and Indoor Navigation. October, 2016, Madrid, Spain

SenSys '15 Patrick Lazik, Niranjini Rajagopal, Oliver Shih, Bruno Sinopoli, Anthony Rowe, **ALPS: A Bluetooth and Ultrasound Platform for Mapping and Localization**, The 13th ACM Conference on Embedded Networked Sensing Systems. November, 2015, Seoul, South Korea

IPSN '15 Lymberopoulos et al., **A Realistic Evaluation and Comparison of Indoor Location Technologies: Experiences and Lessons Learned**, ACM/IEEE 14th International Conference on Information Processing in Sensor Networks, Seattle, Washington, April 13th, 2015

RTAS '15 Patrick Lazik, Niranjini Rajagopal, Bruno Sinopoli, Anthony Rowe, **Ultrasonic Time Synchronization and Ranging on Smartphones**, 21st IEEE Real-Time and Embedded Technology and Applications Symposium, Seattle, Washington, April 13th, 2015

VLCS '14 Niranjini Rajagopal, Patrick Lazik, Anthony, Rowe, **Hybrid Visual Light Communication for Cameras and Low-Power Embedded Devices**, 1st ACM Workshop on Visible Light Communication Systems, Sep 7, 2014, Maui, Hawaii

IPSN '14 Niranjini Rajagopal, Patrick Lazik, Anthony Rowe, **Visual Light Landmarks for Mobile Devices**, ACM/IEEE International Conference on Information Processing in Sensor Networks, 2014, Berlin Germany

RTSS '13 Maxim Buevich, Niranjini Rajagopal, Anthony Rowe, **Hardware Assisted Clock Synchronization for Real-Time Sensor Networks**, IEEE Real-Time Systems Symposium, Vancouver, CA 2013

ICCPS '13 Niranjini Rajagopal, Suman Giri, Mario Berges, Anthony Rowe, **A Magnetic Field-based Appliance Metering System**, The 4th ACM/IEEE International Conference on Cyber-Physical Systems, Apr. 8th, Philadelphia, USA 2013

VLSID '09 Ramasamy, S., B. Venkataramani, R. Niranjini, and K. Suganya. *100KHz-20MHz Programmable Subthreshold $G_m - C$ Low-Pass Filter in $0.18\mu m$ CMOS*. In 2009 22nd International Conference on VLSI Design, pp. 105-110. IEEE, 2009

Patents

2017 **Method and Apparatus for Locating a Mobile Device within an Indoor Environment**. Patrick Lazik, Niranjini Rajagopal, Oliver Shih, Anthony Rowe, Bruno Sinopoli - US Patent 9,766,320, 2017

Industry

Summer 2015 **Apple Inc.**, *Wireless Location Team*, Mentor: Dr. Brent Ledvina.

- Worked on the earliest experiments, prototype and preliminary modeling of time-of-flight RF ranging technology in the location team, and was selected to present the work and *demonstrate a prototype* to Craig Federighi, SVP of Software Engineering, Apple. Subsequently, this resulted in product impact.

Summer 2013 **Texas Instruments, Dallas**, *Embedded Processing Team*, Mentors: Dr. Srinath Hosur, Dr. Ariton Xhafa, Hybrid communication over power line and WiFi.

- Analyzed the feasibility of integrating wireless and power line communication technologies.
- Designed and simulated co-existence of both technologies at the MAC and PHY layer.

Aug'09 – Jul'11 **Signals & Systems India Pvt. Ltd., Chennai, India**, Role: R&D Engineer, Project: Embedded products for power sector, with focus on embedded software.

- Designed energy metering products (Reference energy meters, multi-function transducers). Involved in entire product development process from customer specification to field deployment in collaboration with hardware, production and customer support teams.
- Implemented DLMS communication stack for metering applications.
- Revamped factory calibration processes, reducing the production line time by 60%.

Jun'08 – Jul'09 **Analog Devices Inc., Bangalore, India**, Role: IC Design Engineer in the SHARC DSP Group, Project: SHARC 2146x-2148x verification.

- Designed and implemented test plan for the Variable Instruction Set Architecture, verified Core and IOP modules at the RTL and Gate Level.

Demonstrations

NIST '18 Niranjini Rajagopal, John Miller, Anh Luong, Anthony Rowe, **An Infrastructure-Free Localization System for Firefighters**, Public Safety Broadband Stakeholder Meeting, organized by NIST, San Diego, June, 2018 (not peer-reviewed)

IPSN '18 Niranjini Rajagopal, John Miller, Krishna Kumar, Anh Luong, Anthony Rowe, **Demo Abstract: Welcome to My World: Demystifying Multi-user Augmented Reality with the Cloud**, The 17th International Conference on Information Processing in Sensor Networks, 2018, Porto, Portugal (Best Demo Award)

IPIN '16 Niranjini Rajagopal, Sindhura Chayapathy, Bruno Sinopoli, Anthony Rowe, **A Toolchain for Beacon Placement for Range-Based Indoor Localization**, The 7th International Conference on Indoor Positioning and Indoor Navigation. October, 2016, Madrid, Spain

SenSys '15 Patrick Lazik, Niranjini Rajagopal, Oliver Shih, Bruno Sinopoli, Anthony Rowe, **Demo Abstract: Where Am I And Where Are The Walls?**, The 13th ACM Conference on Embedded Networked Sensor Systems, 2015, Seoul, South Korea

IPSN '14 Niranjini Rajagopal, Patrick Lazik, Anthony Rowe, **Demo Abstract: How Many Lights do You See?**, in Proceedings of the 13th ACM/IEEE International Conference on Information Processing in Sensor Networks, Berlin, Germany,2014

ICCPS '13 Niranjini Rajagopal, Suman Giri, Mario Berges, Anthony Rowe, **Demo Abstract: Magnetic Field-based Appliance Metering System**, The 4th ACM/IEEE International Conference on Cyber-Physical Systems, Apr. 8th, Philadelphia, USA

Workshops

USC '18 Mixed Reality Workshop, organized by CONIX Research Center, at Institute for Creative Technologies, University of Southern California, Aug 2018

UCLA '18 Enhanced Situational Awareness Workshop, organized by CONIX Research Center, at University of California Los Angeles, Aug 2018

VLCS '14 1st ACM Workshop on Visible Light Communication Systems (VLCS), in conjunction with MobiCom, Sep 7, 2014, Maui, Hawaii. **(Poster: Is There a Place for VLC in Wireless Sensor Networks?**

UMich '14 Indoor localization Workshop, organized by the TerraSwarm Research Center, at University of Michigan **(Poster: Visible Light Landmarks for Phones and Low-Power Sensors)**

CMU '14 Open Building Automation Systems Workshop, organized by DOE Building Technologies Office Project, at CMU **(Poster: Solid-State Lighting for Sensor Mapping)**

Talks

CyLab **Augmented Reality meets Internet-of-Things**, CyLab Partners Conference, Pittsburgh, Sep 2018

CONIX **Mobile Augmented Reality**, CONIX Annual Review, Pittsburgh, Sep 2018

Magic Leap **Towards Location-Aware Computing**, Magic Leap, Seattle Sep 2018

Amazon **Towards Location-Aware Computing**, Amazon, Seattle, Sep 2018

Intel **Towards Location-Aware Computing**, Intel Labs, Santa Clara, Sep 2018

COMPASS **The Current Status of Research on Mobile Location Aware Technology**, Conference on Mobile Position Awareness Systems and Solutions, San Francisco Exploratorium, Sep 2018

KTH **Where am I? A Sensor-Fusion Approach to Indoor Localization**, ETH Zurich, June 2018

ETH **Where am I? A Sensor-Fusion Approach to Indoor Localization**, KTH Royal Institute of Technology Stockholm, June 2018

IPSN **Enhancing Indoor Smartphone Location Acquisition using Floor Plans**, The 17th International Conference on Information Processing in Sensor Networks, 2018, Porto, Portugal

IPIN **Beacon Placement for Range-Based Indoor Localization**, The 7th International Conference on Indoor Positioning and Indoor Navigation (IPIN), Oct 2016

ETH **Automatic Placement and Mapping of Beacon-based Localization Systems**, ETH Zurich, Oct 2016

CyLab **Grappling with Billions of Devices - A Step Towards Spatially-Aware IoT**, CyLab Partners Conference, CMU, Sept 2016

Samsung **Sensor Fusion and Automatic Infrastructure Mapping for Indoor Localization Systems**, Samsung, San Jose, March 2016

MSR **Smartphone-based Indoor Localization**, Microsoft Research, Bangalore, India, May 2015

IISc **Smartphone-based Indoor Localization**, Robert Bosch Centre for Cyber-Physical Systems, Indian Institute of Science, Bangalore, India, May 2015

SII **Smart Lighting: Technology and Applications for Building Automation**, Carnegie Mellon Smart Infrastructure Institute (SII), Dec 2014

VLCS **Hybrid Visible Light Communication for Cameras and Low-Power Embedded Devices**, 1st ACM Workshop on Visible Light Communication Systems Workshop (VLCS), Sep 2014

IPSN **Visual Light Landmarks for Mobile Devices**, 13th ACM/ IEEE International Conference on Information Processing in Sensor Networks (IPSN), Apr 2014

ICCPS **A Magnetic Field-based Appliance Metering System**, 4th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS), Apr 2013

Courses at CMU

Digital Signal Processing, Advanced Digital Signal Processing, Linear Systems, Smart Grid and Future Energy Systems, Wireless Communication, Information Theory, Convex Optimization, Networked Cyber Physical Systems, Estimation Detection and Identification, Machine Learning, Entrepreneurship and Technology Innovation Management.

Teaching

Spring 2017 **Wireless Networks and Applications, Teaching Assistant**, *ECE, CMU*.

Spring 2015 **Signals and Systems, Teaching Assistant**, *ECE, CMU*.

Fall 2012 **Signals and Systems, Teaching Assistant**, *ECE, CMU*.

Jan'15 onwards **Eberly Center for Teaching Excellence and Educational Innovation, Graduate Teaching Fellow**.

- Teaching peer consultant, to support the professional development of the CMU graduate student community by providing classroom observations, facilitating microteaching workshops, providing feedback on teaching strategies, and facilitating early-course feedback focus groups in classroom.
- Gain deeper professional development in pedagogical research and learning science through consultation training, pedagogical reading and discussions.

Jan'15 onwards **Future Faculty Program, CMU**.
Attended 12 seminars by the Eberly Center for Teaching Excellence and Educational Innovation, received feedback on teaching through workshops and obervation of teaching in classroom.

Students Mentoring

May '17-'18 **Enhancing augmented reality on iOS with sensors**, *Krishna Kumar*, MS ECE, CMU.

Jan-May '17 **Fusion of IMU with acoustic ranging**, *Nikhil Choudhary*, BS ECE, CMU.

May '15-'16 **Integration of floor plan for range-based localization**, *Sindhura Chayapathy*, MS ECE, CMU.

Professional Service and Leadership

2017 Student volunteers coordinator, CPS Week 2017, Pittsburgh, PA

2015 Student organizer, Workshop on Wearable Systems and Applications, co-located with MobiSys

2015 Shadow Technical Program Committee member, IPSN

2014 Organizer, N2 (Networking Networking) event for women researchers at CPS Week

2014 – 2016 Organizer, CyLab student seminar series

2014 onwards Reviewer - IEEE Wireless Communications Magazine '14, Conference on Decision and Control '14 (External), CoNEXT '15 (External), IEEE ICC Optical Wireless Comm. Workshop '16, IEEE Transactions on Signal Processing '16, IEEE Transactions on Mobile Computing '16 & '17, Symposium on Wireless Personal Multimedia Communications '17, IEEE Wireless Communications Magazine '17, IEEE Vehicular Technology Conference '18, IEEE Communications Letters '18, IEEE Sensors Journal '18,

2012 – 2013 Vice President, ECE Masters Students Advisory Council

K-12 Outreach at CMU

2014 – 2016 Co-chair ECE Outreach Mobile Labs, CMU. Expanded ECE Outreach program to high-schools. Initiated pilot program with Oakland Catholic Girls High School, Pittsburgh in Spring 2015

2013 – 2017 Teaching Assistant, ECE Outreach Spark Saturdays Program, CMU. Assist in introductory electrical and computer engineering classes for grade 9-12 students

2013 – 2014 Volunteer, High School Days, Society of Women Engineers

Aug'12 – Jul'14 Volunteer, Carnegie Mellon Institute for Talented Elementary and Secondary Students (C-MITES). Assisted in mathematics, robotics and science hands-on classes for grade 1-5 students