

# Mohamed Ibrahim

HEWLETT PACKARD LABS - CARNEGIE MELLON UNIVERSITY - RUTGERS UNIVERISTY

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## Research Interests

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I build next-generation networking protocols and sensing systems. My research demonstrates that co-designing wireless networking and sensing systems can facilitate energy efficient, interference-free, cost effective, and accurate wireless systems. Broadly, I am interested in mobile computing, wireless and capacitive sensing, health sensing, positioning systems, networking, systems and applied machine learning.

## Professional Appointment

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### Hewlett Packard Labs

*New Jersey, USA*

RESEARCH SCIENTIST

*2023 - Now*

- I am a part of the Networking and Distributed Systems lab where my research focuses on building private 5G-WiFi Networking System and improving Aruba's OpenLocate.

### Carnegie Mellon University

*Pennsylvania, USA*

POSTDOCTORAL ASSOCIATE

*2021 - 2023*

- Mentors: **Prof. Swarun Kuman** and **Prof. Peter Steenkiste**
- My research bridges the gap between wireless networking and sensing to provide **long-range multiband energy harvesting and battery-free sensing**.

## Education

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### Rutgers University

*New Jersey, USA*

PH.D. IN COMPUTER SCIENCE

*2014 - 2020*

- Advisor: **Prof. Marco Gruteser**
- Thesis: Ubiquitous Precise Tracking: from Activity Detection over Indoor Tracking, to Outdoor Vehicle Positioning

### Nile University

*Cairo, Egypt*

M.SC. IN COMMUNICATIONS AND WIRELESS TECHNOLOGY

*2009 - 2011*

- Advisor: **Prof. Moustafa Youssef**
- Thesis: CellSense: An Accurate Energy-Efficient GSM Positioning System

### Alexandria University

*Alexandria, Egypt*

B.SC. IN COMPUTER AND SYSTEMS ENGINEERING

*2004 - 2009*

- Advisor: **Prof. Moustafa Youssef**
- Thesis: GSM positioning and Road Traffic Estimation System

## Awards, Fellowships, & Grants

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- 2024 **Best Paper Honorable Mention**, ACM CoNEXT'24
- 2019 **Doctoral Dissertation Fellowship**, Computer Science Department, Rutgers University
- 2016 **Best Paper Award**, ACM VLCS at MobiCom'16
- 2012 **Graduate Research Assistantship**, Egypt-Japan University of Science and Technology
- 2009 **Graduate Fellowship**, Nile University
- 2009 **Best Graduation Project Award**, Department of Computer and Systems Engineering, Alexandria University

## Conference Publications

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- A. Hassan, S. Aggarwal, **M. Ibrahim**, P. Sharma, and F. Qian, "Wixor: Dynamic TDD Policy Adaptation for 5G/xG Networks", ACM CoNEXT, 2024. **Best Paper Runner-up**
- M. Ibrahim**, A. Bansal, K. Yuan, J. Zhang and S. Kumar, "Towards Ubiquitous IoT through Long Range Wireless Energy Harvesting", ACM MobiHoc, 2024.
- K. Yuang, **M. Ibrahim**, Y. Song, G. Deng, S. Vijayan, R. Nerone, A. Gadre, S. Kumar, "ToMoBrush: Exploring Dental Health Sensing Using a Sonic Toothbrush", ACM IMWUT (UbiComp'24).
- M. Ibrahim**, A. Bansal, K. Yuan, S. Kumar, and P. Steenkiste, "Battery-free Wideband Spectrum Mapping using Commodity RFID Tags", ACM MobiCom, 2023.
- A. Bansal, **M. Ibrahim**, K. Yuan, S. Kumar, and B. Iannucci., "Long-range Wi-Fi Localization for Radio Quiet Zones.", RFI, 2024.
- H. Liu, A. Alali, **M. Ibrahim**, B. Bo Cao, N. Meegan, H. Li, M. Gruteser, S. Jain, K. Dana, A. Ashok, B. Cheng, H. Lu, "Vi-Fi: Associating Moving Subjects across Vision and Wireless Sensors", ACM/IEEE IPSN 2022.
- M. Ibrahim**, A. Rostami, B. Yu, H. Liu, M. Jawahar, V. Nguyen, M. Gruteser, F. Bai, and Richard Howard, "Wi-Go: Accurate and Scalable Vehicle Positioning using WiFi Fine Timing Measurement", ACM MobiSys 2020.
- M. Ibrahim**, H. Liu, M. Jawahar, V. Nguyen, M. Gruteser, R. Howard, B. Yu, and F. Bai, "Verification: Accuracy Evaluation of WiFi Fine Time Measurements on an Open Platform", ACM MobiCom 2018.
- V. Nguyen, **M. Ibrahim**, H. Truong, P. Nguyen, M. Gruteser, R. Howard, and T. Vu, "Body-Guided Communications: A Low-power, Highly-Confined Primitive to Track and Secure Every Touch", ACM MobiCom 2018.
- M. Ibrahim**, V. Nguyen, S. Rupavatharam, M. Jawahar, M. Gruteser, and R. Howard, "EyeLight: Light-based Occupancy Estimation and Activity Recognition from Shadows on the Floor", IEEE INFOCOM 2018.
- M. Ibrahim**, M. Gruteser, K. A. Harras, and M. Youssef, "Over-The-Air TV Detection using Mobile Devices", IEEE ICCCN 2017. **Invited**
- A. Guirguis, **M. Ibrahim**, K. G Seddik, K. A. Harras, F. Digham, and M. Youssef, "Primary User Aware k-hop Routing for Cognitive Radio Networks", IEEE GLOBECOM 2015.
- M. Ibrahim**, A. Saeed, M. Youssef and K. A. Harras, "Unconventional TV Detection using Mobile Devices", IARIA UBI COMM 2013.
- M. Ibrahim**, and M. Youssef, "Enabling Wide Deployment of GSM Localization over Heterogeneous Phones", IEEE ICC 2013.
- A. Saeed, **M. Ibrahim**, K. A. Harras and M. Youssef, "A Low-Cost Large-Scale Framework for Cognitive Radio Routing Protocols Testing", IEEE ICC 2013.
- M. Ibrahim**, and M. Youssef, "A Hidden Markov Model for Localization Using Low-End GSM Cell Phones", IEEE ICC 2011.
- M. Ibrahim**, and M. Youssef, "CellSense: A Probabilistic RSSI-based GSM Positioning System", IEEE GLOBECOM 2010.

## Journal Publications

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- A. Guirguis, F. Digham, K. G Seddik, **M. Ibrahim**, K. A. Harras, and M. Youssef, "Primary User-aware Optimal Discovery Routing for Cognitive Radio Networks", IEEE Transactions on Mobile Computing, 2018
- A. Saeed, **M. Ibrahim**, K. Harras, and M. Youssef, "Towards Dynamic Real-Time Geo-location Databases for TV White Space". IEEE Network 2015.
- M. Youssef, **M. Ibrahim**, M. Abdelatif, L. Chen, and A. V. Vasilakos, "Routing Metrics of Cognitive Radio Networks: A Survey", IEEE Communications Surveys & Tutorials 2014.
- M. Ibrahim**, and M. Youssef, "CellSense: An Accurate Energy-Efficient GSM Positioning System", IEEE Transactions on Vehicular Technology 2012.

## Workshop Publications

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- H. Truong, P. Nguyen, V. Nguyen, **M. Ibrahim**, R. Howard, M. Gruteser and T. Vu "Through-body Capacitive Touch Communication", ACM MobiCom S3 Workshop 2017.
- M. Ibrahim**, V. Nguyen, S. Rupavatharam, M. Jawahar, M. Gruteser, and Richard Howard, "Visible light based activity sensing using ceiling photosensors", ACM VLCS 2016. **Best Paper Award**

## Patents

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**M. Ibrahim**, A. Saeed, M. Youssef, and K. Harras "Towards Dynamic Real-Time TV White Spaces", Patent Application No. 61/850,410, USA.

M. Youssef, and **M. Ibrahim**, "Probabilistic Energy-Efficient Accurate RSSI-based Localization for Cell Phones", Patent Application No. 61/384,251, USA.

## Research Experience

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### **Carnegie Mellon University**

POSTDOCTORAL ASSOCIATE

Mentors: Swarun Kuman and Peter Steenkiste

*Pennsylvania, USA*

*2021 - Now*

### **WINLAB, Rutgers University**

RESEARCH ASSISTANT

Advisors: Marco Gruteser

*North Brunswick, NJ*

*2015-2020*

### **General Motors Research**

RESEARCH INTERN

Mentors: Bo Yu and Fan Bai

*MI, USA*

*Summer 2019*

### **Comcast Labs**

RESEARCH INTERN

Mentors: Vamsi Potluru and Jan Neumann

*DC, USA*

*Summer 2017*

### **Bell Labs, Nokia**

RESEARCH INTERN

Mentors: Avinash Vyas and Oscar Gonzalez

*NJ, USA*

*Summer 2016*

### **Bell Labs, Alacatel Lucent**

RESEARCH INTERN

Mentors: Katherine Guo

*NJ, USA*

*Summer 2015*

### **GIS Innovation Center, Umm Al Qura University**

RESEARCHER

Mentors: Moustafa Youssef

*Mekkah, Saudi Arabia*

*Spring 2014*

### **Egypt-Japan University for Science and Technology**

RESEARCHER

Mentors: Moustafa Youssef

*Alexandria, Egypt*

*2012 - 2014*

### **Nile University**

RESEARCH ASSISTANT

Mentors: Moustafa Youssef

*Cairo, Egypt*

*2009 - 2011*

### **Alexandria University**

UNDERGRADUATE RESEARCH ASSISTANT

Mentors: Moustafa Youssef

*Alexandria, Egypt*

*2008 - 2009*

### **Nile University**

RESEARCH INTERN

Mentors: Moustafa Youssef

*Cairo, Egypt*

*Summer 2008*

## Teaching Experience

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### **Carnegie Mellon University, Electrical and Computer Engineering Department**

PA, USA

GUEST LECTURER

2023

**CMU 18-613** (Computer Systems) taught by Prof. Gregory Kaseden, on Linux open interface for WiFi ranging

### **Carnegie Mellon University, Electrical and Computer Engineering Department**

PA, USA

GUEST LECTURER

2023

**CMU 18-213** (Computer Systems) taught by Prof. Swarun Kumar, on Linux open interface for WiFi ranging

### **Carnegie Mellon University, Electrical and Computer Engineering Department**

PA, USA

GUEST LECTURER

2022

**CMU 18-741** (Computer Networks) taught by Prof. Swarun Kumar, on future wireless networking and sensing systems

### **Rutgers University, Computer Science Department**

NJ, USA

TEACHING ASSISTANT

2014-2016

**CS352** - Internet Technology (Computer Networks): Fall 2014, Fall 2015, Spring 2016, Fall 2016

### **Rutgers University, Computer Science Department**

NJ, USA

TEACHING ASSISTANT

2015

**CS211** - Computer Architecture: Spring 2015

## Mentoring

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2021-Now **Atul Bansal**, PhD Student, Carnegie Mellon University

2022-Now **Kuang Yuan**, PhD Student, Carnegie Mellon University

Sum. 2022 **Guoxiang Deng** MSc Student, Carnegie Mellon University

Spr. 2022 **Ishan Darwhekar**, MSc Student, Carnegie Mellon University

2016-2018 **Siddharth Rupava**, MSc Student, Rutgers University; Next: PhD student, Rutgers University

2016-2018 **Minitha Jawahar**, MSc Student, Rutgers University; Next: PhD student, Rutgers University

2013-2014 **Arsany Guirguis**, Undergrad., Alexandria University; Next: PhD from EPFL

2013-2014 **Raymond Guirguis**, Undergrad., Alexandria University; Next: Software Engineer, Microsoft

## Outreach & Professional Development

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### JOURNAL REVIEWER

2021-Now **ACM Transactions of Sensor Networks (TOSN)**

2019-2021 **ACM Transactions of Mobile Computing (TMC)**

2021 **IEEE Internet of Things Journal (IoT-J)**

2021 **IEEE Wireless Communications Letters (WCL)**

2019 **IEEE Transactions on Cognitive Communications and Networking (TCCN)**

2019 **IEEE Transactions on Vehicular Technology (TVT)**

2018-2019 **IEEE Transactions on Wireless Communications (TWC)**

2018 **Elsevier Computer Networks (COMNET)**

2014 **IEEE/ACM Transactions on Networking (TON)**

### CONFERENCE REVIEWER

2018 **ACM UBICOMP/IMWUT**

2014 **IEEE GLOBECOM**

### SERVICE AND OUTREACH

2022-now **CMU ECE Outreach Program** Volunteer Lecturer  
2016 **ACM MobiCom '16** Volunteer Organizer  
2010 **IEEE ITW '10** Volunteer Organizer

## Presentations

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### INVITED TALKS

Spring 2021. *Ubiquitous Precise Tracking: From Indoor Activity Detection, to Outdoor Vehicle Positioning*. CMU, PA, USA.  
Spring 2021. *Ubiquitous Precise Tracking: From Indoor Activity Detection, to Outdoor Vehicle Positioning*. NEC Labs, NJ, USA.  
Summer 2019. *Wireless Networks and Mobile Computing Projects*. Bell labs, NJ, USA.  
Summer 2017. *Time-of-flight based Localization of LoRaWAN sensors using Comcast's Gateways*. Comcast labs, NJ, USA.  
Summer 2016. *Scalable Messaging System using IBM Openwhisk Serverless Computing Framework.*. Bell labs, NJ, USA.  
Fall 2012. *Wireless Networks and Mobile Computing Projects*. ETH, Zurich, Switzerland.  
Summer 2012. *CogFrame: Large Scale Deployment of Cognitive Radio Routing*. Microsoft Research, Cambridge, UK.  
Spring 2012. *CellSense: An Accurate Energy-Efficient GSM Positioning System*. E-JUST, Alexandria, Egypt.  
Fall 2011. *CellSense: An Accurate Energy-Efficient GSM Positioning System*. University of Technology of Troyes, Troyes, France

## References

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### **Prof. Marco Gruteser**

Professor  
Rutgers University  
gruteser@winlab.rutgers.edu

### **Prof. Swarun Kumar**

Associate Professor  
Carnegie Mellon University  
swarun@cmu.edu

### **Prof. Peter Steenkiste**

Professor  
Carnegie Mellon University  
prs@cs.cmu.edu

### **Prof. Richard E. Howard**

Research Professor  
Rutgers University  
reh@winlab.rutgers.edu