Mohamed Ibrahim Ahmed

Contact Information

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Research Interests

Mobile Computing, Wireless and Capacitive Sensing, Positioning Systems, Networking, and Applied Machine Learning

Education

Ph.D., Rutgers University, USA 2014 - 2020
Computer Science Department & Wireless Information Network Laboratory (WINLAB)
- Advisor: Prof. Marco Gruteser
- Thesis: Ubiquitous Precise Tracking: from Activity Detection over Indoor Tracking, to Outdoor Vehicle Positioning

M.Sc., Nile University, Egypt 2009 - 2011
Communications and Wireless Technology
- Advisor: Prof. Moustafa Youssef
- Thesis: CellSense: An Accurate Energy-Efficient GSM Positioning System

B.Sc., Alexandria University, Egypt 2004 - 2009
Computer and Systems Engineering Department
- Advisor: Prof. Moustafa Youssef
- Thesis: GSM positioning and Road Traffic estimation system

Research Experience

Carnegie Mellon University, PA, USA 2021 - Present
Postdoctoral Associate
- Designing a machine learning model for wireless physical layer security.
- Designing a long range wireless sensing technique.

WINLAB, Rutgers University, NJ, USA
Research Assistant 2015 - 2020
- Designing and building a vision-based tracking and WiFi association technique.
- Designing and building Wi-Go, a system that simultaneously tracks vehicles and maps WiFi access point positions by fusing WiFi FTMs, GPS, and odometry information.
- Designing and building a body-guided communication system to track and secure every touch.
- Designing and building a system that explores the feasibility of tracking motion and activities of humans using visible light sensors embedded in ceiling lights. It employs communication among light bulbs to coordinate signaling and sensitive difference measurement techniques to detect and infer motion from shadows cast on the floor.
- Investigating interference issues for the coexistence of unlicensed devices with DSRC systems in the 5.9 GHz ITS Band.

General Motors Research, MI, USA
Research Intern Summer 2019
- Designed and developed a scalable and accurate WiFi Fine Time Measurement Vehicle Tracking System.

Comcast Labs, DC, USA
Research Intern Summer 2017
- Designed and developed time-based localization algorithms for tracking LoRaWAN-based sensors through Comcast's gateways.

Bell Labs, Alacatel Lucent, NJ, USA
Research Intern Summer 2016
- Developed a scalable messaging system using IBM Openwhisk serverless computing framework.

Bell Labs, Alacatel Lucent, NJ, USA
Research Intern Summer 2015
- Developed a load balanced elastic caching service in a data center.

GIS Innovation Center, Umm Al Qura University, Makkah, Saudi Arabia
Research Assistant Spring 2014

- Built an optimal energy efficient Bluetooth low energy discovery process, in which we derived the scanning parameters that maximize the detection rate and minimize the power consumption for the scanning devices.

Egypt-Japan University for Science and Technology, Alexandria, Egypt
Research Assistant 2012 - 2014

- Proposed, designed, implemented and evaluated a novel ubiquitous approach for TV detection that opens the door for different research applications. These applications include tracking viewers habits for audience measurements, and providing more spectrum opportunities in the TV white spaces networks. Our approach leverages the array of sensors available in modern mobile devices, e.g., cameras and microphones, for detecting the location of TV sets, their state (ON or OFF), and the channels they are currently tuned to.
- Designed, implemented, and evaluated a framework that enables the testing of cognitive radio routing protocols on conventional laptops. Our approach extends the Click Modular Router thus decreasing the cost of large scale testbeds for cognitive radio routing protocols.
- Proposed, designed, implemented and evaluated a location-aided discovery scheme that adapts in real time with environmental changes in cognitive radio networks. Our scheme varies the number of hops to be discovered to provide a compromise between routing optimality and overhead.

University of Technology of Troyes, Troyes, France
Research Assistant Fall 2011

- Focused on non-GPS based localization systems in sensor networks.

Nile University, Cairo, Egypt
Research Assistant 2009 - 2011

- Designed, implemented, and evaluated a probabilistic RSSI-based fingerprinting localization system for GSM phones. Furthermore, we extended the proposed system using a hybrid technique that combines probabilistic and deterministic estimation to achieve both low computational overhead, and high accuracy. Moreover, we addressed the deployment issues for GSM-based localization systems over heterogeneous phones.

Alexandria University, Alexandria, Egypt
Undergraduate Research Assistant 2008 - 2009

- Participated in designing and implementing, and evaluating a deterministic GSM positioning system and road traffic estimation using smart phones sensors including compass and accelerometer.

Nile University, Cairo, Egypt
Research Assistant Intern Summer 2008

- Designed, implemented, and tested a secure localization system in hybrid sensor networks, where trusted and un-trusted nodes coexist and it becomes important to allow trusted nodes to share information, especially, location information and prevent un-trusted nodes from gaining access to this information.

Honors and Awards

Doctoral Dissertation fellowship, Computer Science Department, Rutgers University.

Best paper award, ACM VLCS at MobiCom 2016.

Invited to the seventh PhD Summer School at Microsoft Research Cambridge, July 2012.

Graduate Research Assistantship, Egypt-Japan University of Science and Technology, March 2012.

Graduate Fellowship, Nile University, October 2009.

Best Graduation Project Award from Department of Computer and Systems Engineering, Alexandria University, July 2009.

Alexandria University, Egypt: **Faculty Certificate of Honor**, 2005-2009.

Conference Publications

Mohamed Ibrahim, Ali Rostami, Bo Yu, Hansi Liu, Minitha Jawahar, Viet Nguyen, Marco Gruteser, Fan Bai, and Richard Howard, *"Wi-Go: Accurate and Scalable Vehicle Positioning using WiFi Fine Timing Measurement"*, The 18th ACM International Conference on Mobile Systems, Applications, and Services (ACM MobiSys 2020), Toronto, Canada, 2020.

Mohamed Ibrahim, Hansi Liu, Minitha Jawahar, Viet Nguyen, Marco Gruteser, Richard Howard, Bo Yu, and Fan Bai, *"Verification: Accuracy Evaluation of WiFi Fine TimeMeasurements on an Open Platform"*, The 24th Annual International Conference on Mobile Computing and Networking (ACM MobiCom 2018), New Delhi, India, 2018.

Viet Nguyen, **Mohamed Ibrahim**, Hoang Truong, Phuc Nguyen, Marco Gruteser, Richard Howard, and Tam Vu, *"Body-Guided Communications: A Low-power, Highly-Confined Primitive to Track and Secure Every Touch"*, The 24th Annual International Conference on Mobile Computing and Networking (ACM MobiCom 2018), New Delhi, India, 2018.

Mohamed Ibrahim, Viet Nguyen, Siddharth Rupavatharam, Minitha Jawahar, Marco Gruteser, and Richard Howard, *"EyeLight: Light-based Occupancy Estimation and Activity Recognition from Shadows on the Floor"*, IEEE International Conference on Computer Communications (INFOCOM), Honolulu, USA, 2018.

Mohamed Ibrahim, Marco Gruteser, Khaled A. Harras, and Moustafa Youssef, *"Over-The-Air TV Detection using Mobile Devices"*, The 26th International Conference on Computer Communications and Networks (ICCCN), Vancouver, Canada, 2017. **Invited**

Arsany Guirguis, **Mohamed Ibrahim**, Karim G Seddik, Khaled A. Harras, Fadel Digham, and Moustafa Youssef, *"Primary User Aware k-hop Routing for Cognitive Radio Networks"*, IEEE Global Communications Conference (Globecom), San Diego, USA, 2015.

Mohamed Ibrahim, Ahmed Saeed, Moustafa Youssef and Khaled A. Harras, *"Unconventional TV Detection using Mobile Devices"*, The Seventh International Conference on Mobile Ubiquitous Computing, Systems, Services and Technologies (UBICOMM), Porto, Portugal, 2013

Mohamed Ibrahim, and Moustafa Youssef, *"Enabling Wide Deployment of GSM Localization over Heterogeneous Phones"*, IEEE International Conference on Communications (ICC), Budapest, Hungary, 2013.

Ahmed Saeed, **Mohamed Ibrahim**, Khaled A. Harras and Moustafa Youssef, *"A Low-Cost Large-Scale Framework for Cognitive Radio Routing Protocols Testing"*, IEEE International Conference on Communications (ICC), Budapest, Hungary, 2013.

Mohamed Ibrahim, and Moustafa Youssef, *"A Hidden Markov Model for Localization Using Low-End GSM Cell Phones"*, IEEE International Conference on Communications (ICC), Kyoto, Japan, 2011.

Mohamed Ibrahim, and Moustafa Youssef, *"CellSense: A Probabilistic RSSI-based GSM Positioning System"*, IEEE Global Communications Conference (Globecom), Miami, USA, 2010.

Journal Publications

Arsany Guirguis, Fadel Digham, Karim G Seddik, **Mohamed Ibrahim**, Khaled A. Harras, and Moustafa Youssef, *"Primary User-aware Optimal Discovery Routing for Cognitive Radio Networks"*, IEEE Transactions on Mobile Computing, 2018

Ahmed Saeed, **Mohamed Ibrahim**, Khaled Harras, and Moustafa Youssef, *"Towards Dynamic Real-Time Geo-location Databases for TV White Space"*. IEEE Network, vol. 29, no. 5, pp. 76-82, September-October 2015.

Moustafa Youssef, **Mohamed Ibrahim**, Mohamed Abdelatif, Lin Chen, and Athanasios V. Vasilakos, *"Routing Metrics of Cognitive Radio Networks: A Survey"*, IEEE Communications Surveys & Tutorials 16.1 (2014): 92-109.

Mohamed Ibrahim, and Moustafa Youssef, *"CellSense: An Accurate Energy-Efficient GSM Positioning System"*, IEEE Transactions on Vehicular Technology 61.1 (2012): 286-296.

Workshop Publications

Hoang Truong, Phuc Nguyen, Viet Nguyen, **Mohamed Ibrahim**, Richard Howard, Marco Gruteser and Tam Vu *"Through-body Capacitive Touch Communication"*, In Proceedings of the 9th Wireless of the Students, by the Students, and for the Students (S3) Workshop (held with MobiCom), Utah, Oct 2017.

Mohamed Ibrahim, Viet Nguyen, Siddharth Rupavatharam, Minitha Jawahar, Marco Gruteser, and Richard Howard, *"Visible light based activity sensing using ceiling photosensors"*, In Proceedings of the ACM 3rd Workshop on Visible Light Communication Systems (VLCS, held with MobiCom), New York, Oct 2016. **Best Paper Award**

Refereed Posters

Ahmed Saeed, **Mohamed Ibrahim**, Khaled A. Harras and Moustafa Youssef, *"Enabling Large Scale Flexible Deployment of Cognitive Radio Routing Protocols"*, Research Poster, the 7th ACM International Workshop on Wireless Network Testbeds, Experimental evaluation and Characterization (WiNTECH) in conjunction with MobiCom, Istanbul, Turkey, 2012.

Research Demos

Mohamed Adel, **Mohamed Ibrahim**, Karim Abulmakarem, Moustafa Youssef, and Mohamed Eltoweissy, *"HyberLoc: Demonstrating Secure Localization in Hybrid Sensor Networks"*, The Fourteenth Annual International Conference on Mobile Computing and Networking (MobiCom), San Francisco, USA, September 2008.

Patents

Mohamed Ibrahim, Ahmed Saeed, Moustafa Youssef, and Khaled Harras *"Towards Dynamic Real-Time TV White Spaces"*, Patent Application No. 61/850,410, USA.

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

Teaching Experience

Rutgers University , NJ, USA 2014 - 2017

Teaching Assistant

- **CS352** - Internet Technology [Fall 2014, Fall 2015 and Fall 2016].
- **CS211** - Computer Architecture [Spring 2015].

Course Work

CS535 - Pattern Recognition: Theory & Applications.

CS510- Numerical Analysis.

CS536 - Machine Learning.

CS522 - Network and Combinatorial Optimization Algorithms.

CS673 - Beyond Worst Case Analysis in Machine Learning.

CS547 - The Security and Dependability of Distributed Systems.

CS596 - Theoretical Machine Learning.

CS671 - Parallel Programming and Extreme-scale Computing.

Professional Experience

Reviewer at different conferences and journals including IEEE Globecom, IEEE VTC, IEEE IWCMC, IEEE/ACM ToN, IEEE TMC, ACM IMWUT, IEEE TWC, IEEE TCCN, Elsevier COMNET, IEEE TOSN.

Talks and Presentations

"Wireless Networks and Mobile Computing Projects", ETH, Zurich, Switzerland, 2012.

"CogFrame: Enabling Large Scale Flexible Deployment of Cognitive Radio Routing Protocols", Microsoft Research, Cambridge, UK, 2012.

"CellSense: An Accurate Energy-Efficient GSM Positioning System", Egypt-Japan University of Science and technology (E-JUST), Alexandria, Egypt, 2012.

"CellSense: An Accurate Energy-Efficient GSM Positioning System", University of Technology of Troyes, Troyes, France, 2011.

Technical Skills

Languages:

- C/C++, Java, Python, C#, HTML, JavaScript, Linux shell scripting, MATLAB, NesC, 8086 Assembly, SQL, VHDL and LaTeX.

Frameworks:

- Click Modular Router, ns2, Android SDK, Docker Containers, IBM Openwhisk, J2SE, J2EE, J2ME and .NET.

Experienced designing a novel Simultaneous Localization and Mapping (SLAM) framework

References available to contact

Prof. Marco Gruteser
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Prof. Swarun Kumar
Assistant Professor
Carnegie Mellon University
PA, USA
swarun@cmu.edu

Prof. Moustafa Youssef
Associate Professor
Alexandria University
Alexandria, Egypt
Email: moustafa.youssef@ejust.edu.eg

Prof. Richard E. Howard
Research Professor
Rutgers University
NJ, USA
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More references are available upon request