

# Elahe Soltanaghai

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## Research Interests

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- Wireless Sensing and communication
- Millimeter-wave Networks
- Cyber-Physical Systems
- Intelligent and Autonomous Systems
- Embedded Computing
- Internet of Things

## Professional Experience

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### Assistant Professor

University of Illinois Urbana-Champaign

2021-Present

Urbana, IL

### Postdoctoral Researcher

Carnegie Mellon University, Advisor: Prof. Anthony Rowe

2019-2021

Pittsburgh, PA

### Graduate Research Assistant

University of Virginia, Advisor: Prof. Kamin Whitehouse

2014 - 2019

Charlottesville, VA

### Research Intern

Microsoft Research, Supervisor: Dr. Bodhi Priyantha

2018

Redmond, WA

### Researcher

Data and Network Security (DNS) Lab, Sharif University of Technology

2011 - 2012

Tehran, Iran

## Honors and Awards

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- 2022 **Recipient of Google Research Scholar Award**, Early-career faculty award.
- 2021 **Named one of the 10 Rising Star Women Worldwide in Communication and Networking**,
- 2020 **Received ACM SIGMOBILE Dissertation Award**, Runner Up.
- 2019 **Named as 2019 EECS Rising Stars**, hosted by the University of Illinois at Urbana-Champaign.
- 2019 **Winner of Research Pitch Competition**, 2019 EECS Rising Stars workshop.
- 2019 **Awarded N2Women Young Researcher Fellowship**, MobiCom'19.
- 2017 **2nd place winner**, in ACM Student Research Competition (SRC) at MobiCom'17.
- 2017 **Best poster award**, MobiSys'17, Women's Workshop.
- 2017 **2nd place winner**, Three Minute Thesis (3MT) competition at UVA.
- 2017 **UVA Department of Computer Science Graduate Student Award**, for Outstanding Service.
- 2017 **Awarded NSF travel grant**, to attend MobiSys'17, MobiCom'17, and CRA-W Grad Cohort
- 2017 **Scholarship recipient**, to attend Grace Hopper Celebration (GHC).
- 2016 **Best presentation award**, in ACM BuildSys'16.
- 2016 **Awarded NSF travel grant**, to attend ACM SenSys/BuildSys'16, MobiSys'17.
- 2016 **Awarded N2Women Young Researcher Fellowship**, MobiCom'16.
- 2015 **Scholarship recipient**, to attend CRA-W (Computing Research Association) Grad Cohort.
- 2011 **Distinguished BSc student award**, with honorary acceptance for the MSc program.
- 2010 **2nd place**, among 90 Computer Engineering B.S. students, Amirkabir University of Technology.

## Education

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### University of Virginia

Charlottesville, US

*Ph.D. in Computer Science - Advisor: Prof. Kamin Whitehouse*

2014 - 2019

- Dissertation: Sensing the physical environment using pervasive wireless infrastructure

### Sharif University of Technology

Tehran, Iran

*M.S. in Computer Engineering - Advisor: Prof. Mehdi Kharrazi*

2011 - 2013

- Thesis: Botnet command & control channel detection based on DNS traffic analysis

### Amirkabir University of Technology

Tehran, Iran

*B.S. in Information Technology Engineering - Advisor: Prof. Babak Sadeghyan*

2009 - 2013

- Thesis: Botnet detection based on Sequential Probability Ratio Test

### Amirkabir University of Technology

Tehran, Iran

*B.S. in Computer (Software) Engineering - Advisor: Prof. Babak Sadeghyan*

2007 - 2011

- Thesis: Privacy preserving network-based intrusion detection system

## Publications

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### Peer Reviewed Conference, Journal, and Workshop Papers

- On the Feasibility of BUilding-Scale Power Line Backscatter Communication  
J. Zhang, **E. Soltanaghaei**, A. Balanuta, R. Grimsley, S. Kumar, A. Rowe.  
NSDI, 2022.
- Multi-User Augmented Reality with Infrastructure-free Relative Positioning.  
J. Miller, **E. Soltanaghaei**, R. Duvall, J. Chen, N. Pereira, A. Rowe.  
IPSN, 2022.
- Lumos: Detecting and Localizing Unknown IoT Devices in an Untrusted Environment  
R. Sharma, **E. Soltanaghaei**, V. Sarkar, A. Rowe.  
Usenix Security, 2022.
- mmWave Retro-Reflectors for Long Range Localization in Autonomous Driving.  
**E. Soltanaghaei**, A. Prabhakara, A. Balanuta, M. Anderson, S. Kumar, A. Rowe.  
MobiCom, 2021 (*Acceptance Rate: 16%*).
- TagFi: Locating an Ultra-Low Power Tag Using Existing WiFi Infrastructure  
**E. Soltanaghaei**, A. Dongare, A. Prabhakara, S. Kumar, A. Rowe, K. Whitehouse.  
IMWUT-UbiComp, 2021
- Robust and Practical WiFi Human Sensing Using On-device Learning with a Domain Adaptive Model  
**E. Soltanaghaei**, R. Sharma, Z. Wang, A. Chittilappilly, E. Giler, A. Rowe.  
BuildSys, 2020 (*Acceptance Rate: 27%*).
- Doorpler: a radar-based system for low power, real-time zone occupancy sensing  
A. Kalyanaraman, **E. Soltanaghaei**, K. Whitehouse  
RTAS, 2019.
- Multipath Triangulation: decimeter-level WiFi localization and orientation with a single unaided receiver  
**E. Soltanaghaei**, A. Kalyanaraman, K. Whitehouse  
MobiSys, 2018. (*Acceptance Rate: 26%*)
- Peripheral WiFi Vision: exploiting Multipath reflections for more sensitive human sensing  
**E. Soltanaghaei**, A. Kalyanaraman, K. Whitehouse  
4th International Workshop on Physical Analytics (WPA), 2017.

- FormaTrack: tracking people based on body shape  
A. Kalyanaraman, D. Hong, **E. Soltanaghaei**, K. Whitehouse  
IMWUT-UbiComp, 2017.
- Practical occupancy detection for programmable and smart thermostats  
**E. Soltanaghaei**, K. Whitehouse  
Applied Energy, 2017. (*Impact factor: 7.9*)
- WalkSense: classifying home occupancy states using walkway sensing  
**E. Soltanaghaei**, K. Whitehouse  
BuildSys, 2016. (*Best Presentation Award*)
- Multi-option, multi-class path scheduling methods for advance reservation systems  
**E. Soltanaghaei**, M. Veeraraghavan  
16th International conference on High Performance Switching and Routing (HPSR), 2015.
- Detection of Fast-Flux botnets based on DNS analysis  
**E. Soltanaghaei**, M. Kharrazi  
International Journal of Science and Technology (Scientia Iranica), 2014.
- Pattern extraction for high-risk accidents in the construction industry: a data mining approach  
M. Amiri, A. Ardeshir, MH. Fazel Zarandi, **E. Soltanaghaei**  
International Journal of Injury Control and Safety Promotion, 2014.
- Analysis of high risk occupational accidents in construction industry using data mining methods  
M. Amiri, A. Ardeshir, **E. Soltanaghaei**  
Journal of Iranian Occupational Health, Tehran university of medical sciences, 2013 [in Persian].

#### **Posters and Short Papers**

- Characterizing Uncertainties of Wireless Channels in Connected Vehicles  
**E. Soltanaghaei**, M. Elnaggar, K. Kleeman, K. Whitehouse, C. Fleming  
MobiCom, 2019. [short paper]
- Object Tracking with Battery-free WiFi-RFID Tags  
**E. Soltanaghaei**, B. Priyantha, K. Whitehouse  
NSDI, 2019.
- Improving multipath resolution using MIMO smoothing  
**E. Soltanaghaei**, A. Kalyanaraman, K. Whitehouse  
MobiCom, 2017. [short paper] (*2nd place winner in ACM Student Research Competition*)
- Occupancy state detection using WiFi signals: poster  
**E. Soltanaghaei**, A. Kalyanaraman, K. Whitehouse  
MobiSys, 2017. (*Best Poster Award*)

#### **Patents**

- **E. Soltanaghaei**, K. Whitehouse. *Unaided localization with a single WiFi receiver*. U.S. Patent Application 62/628526, filed February 2018.
- **E. Soltanaghaei**, A. Prabhakara, A. Balanuta, S. Kumar, A. Rowe. *Ultra-low power long-range Millimeter-wave retro-reflectors*. U.S. Patent Application 63/144509, filed February 2021.

## **Teaching**

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### **instructor, University of Illinois Urbana Champaign**

Spring 2022

*Smart Cities, Phones, and Beyond*

- This course explores the principles and practice of smart physical places and things (Smart-X), covering state-of-the-art technologies that address various visions of the future platforms supporting Smart-X. It will also stress the cyber-physical aspects of these systems, providing safe, secure, and efficient interaction with the physical world. This course will offer significant hands-on experience through a semester-long project, paper critiques, and overview of the commercial landscapes of the topics covered in class.

### **Co-instructor, Carnegie Mellon University**

Fall 2020

*Embedded Real-time System*

- Teaching lectures on real-time scheduling and resource sharing, embedded communication, zero-energy platforms, and machine-learning at the edge.

### **Teaching Assistant, University of Virginia**

Fall 2015

*Internet of Things*

- Developed lab instructions and course materials in the lab sessions.
- Instructed lab sessions that involved programming raspberry Pis for different sensing and control use cases such as voice recognition, temperature/humidity sensor reading and controlling robotic arms.

### **Teaching Assistant, Sharif University of Technology**

Fall 2010

*Advanced Network Security*

- Developed 5 security project assignments, graded them and held office hours.

### **Pedagogical and Career Training**

Spring 2017

*Center for Teaching Excellence, University of Virginia*

- Research Communication Training Program (semester-long)
- Workshop on Active Learning Techniques for a more engaged Engineering Class
- Workshop on Strategic Career Design for the Peak Performing Professor

## **Presentations**

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### **Invited Talk, COMSNETS'22**

January 2022

*Co-designing Future Wireless Sensing and Networking Infrastructures*

Virtual

### **Invited Seminar Talks on “Sensing the World with Pervasive Wireless Infrastructures”**

- Michigan State University, October 2021
- Microsoft Research, April 2021
- University of Illinois Urbana-Champaign, April 2021
- Arizona State University, April 2021
- George Mason University, March 2021
- University of Wisconsin - Madison, March 2021
- MIT, March 2021
- Oregon State University, March 2021
- University of Pennsylvania, February 2021
- Washington University, February 2021
- Northeastern University, January 2021
- University of Waterloo, November 2020
- ETH Zurich, March 2020
- Imperial College London, March 2020
- Carnegie Mellon University, May 2019
- UC San Diego, April 2019
- Wayne State University, February 2019
- Ohio State University, January 2019

Virtual

### **ACM BuildSys**

November 2020

*Robust and Practical WiFi Human Sensing Using On-device Learning with a Domain Adaptive Model*

Virtual

<b>Invited Talk, CONIX Annual Review Workshop</b> <i>Emerging Applications of Millimeter-wave Wireless Systems</i>	October 2020 Virtual
<b>E-Workshop Series, Semiconductor Research Corporation (SRC)</b> <i>Sensing the Physical World using Pervasive Wireless Infrastructure</i>	April 2020 Virtual
<b>Invited Talk, Texas Instrument Kilby Innovation Technology Center</b> <i>Sensing the Physical World using Pervasive Wireless Infrastructure</i>	Nov 2019 Dallas, TX
<b>Microsoft's Immersion day</b> <i>Single-shot Tag Localization</i>	August 2018 Redmond, WA
<b>Sensing and Processing Across Networks Lab, University of Utah</b> <i>Human Sensing with Commodity WiFi</i>	October 2017 Salt Lake City, UT
<b>ACM Student Research Competition, MobiCom</b> <i>MIMO Smoothing for Improving Multipath Resolution</i>	October 2017 Snowbird, UT
<b>ACM Workshop on Physical Analytic, MobiSys</b> <i>Peripheral WiFi Vision: exploiting Multipath reflections for more sensitive human sensing,</i>	June 2017 Niagara Fall, NY
<b>5th Annual Three-Minute Thesis Competition</b> <i>Device-free Human Detection using WiFi</i>	April 2017 Charlottesville, VA
<b>iLab.X Workshop, Technology Entrepreneurship Fellows Program</b> <i>Smart WiFi Access Points (1 of 2 finalists whose research has been selected for commercialization.)</i>	December 2016 Charlottesville, VA
<b>ACM BuildSys, Stanford University</b> <i>WalkSense: classifying home occupancy states using walkway sensing</i>	November 2016 Stanford, CA

## Service

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- **N2Women Co-Chair**, MobiCom, 2021.
- **Technical Program Committee (TPC) member**,
  - SIGCOMM 2022
  - MobiCom 2022
  - WWW 2021
  - IEEE SECON 2020
  - ACM S3 Workshop 2018 (co-located with MobiCom'18).
- **Birds-of-Feather (BoF) Panel moderator**, Mobisys, 2020.
- **Workshop Co-Chair**, ACM S3 Workshop 2019 (co-located with MobiCom'19).
- **Expert Panelist**, the environmental science class at Charlottesville High School, Spring 2018.
- **Scribe**, NSF visioning workshop on extreme networking, 2017.
- **Invited Reviewer**:
  - MobiCom 2019 (ACM Conference on Mobile Computing and Networking)
  - UbiComp 2017 (ACM Conference on Pervasive and Ubiquitous Computing)
  - BuildSys 2017 (ACM Conference on Systems for Built Environments)
  - ACM Proceedings on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT)
  - ACM Transaction on Sensor Networks (TOSN)
  - IEEE Journal of Wireless Communication Letters
  - IEEE Sensors Journal

- International Journal of Sensor Networks
- EURASIP Journal on Wireless Communications and Networking
- **CS Grad Student Group (GSG) Steering Committee Member**, University of Virginia, 2017.
- **Organizer**, N2Women event at ACM Mobicom 2016.