

Zak M. Kassas

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Electrical & Computer Engineering E-mail: zkassas@ieee.org
ElectroScience Laboratory (ESL) Web: <http://ece.osu.edu/people/kassas.2>
The Ohio State University Lab: <http://ece.osu.edu/aspin>
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Research Interests Cyber-physical systems, autonomous vehicles, navigation systems, intelligent transportation systems, cognitive software-defined radio

Capsule Bio Prof. Kassas is a Full Professor of Electrical & Engineering at The Ohio State University; Director of the Autonomous Systems Perception, Intelligence, and Navigation (ASPIN) Laboratory; and Director of the U.S. Department of Transportation Center: CARMEN (Center for Automated Vehicles Research with Multimodal Assured Navigation), focusing on navigation resiliency and security of highly automated transportation systems.

He authored more than 150 peer-reviewed journal and conference papers, 9 magazine articles, 3 invited book chapters, and 19 U.S. patents. He received several awards in recognition of his research, including 2022 Air Force Office of Scientific Research (AFOSR) Young Investigator Program (YIP) award; 2019 Office of Naval Research (ONR) YIP award; 2018 National Science Foundation (NSF) CAREER award; 2019 Institute of Navigation (ION) Col. Thurlow Award for “foundational work in the theory and practice of exploiting signals of opportunity for accurate and reliable positioning, navigation and timing;” 2020 IEEE Signal Processing Society grand prize for beamforming research video contest; 2018 ION Samuel Burka Award in recognition of the best paper published in NAVIGATION, Journal of the Institute of Navigation; 2018 IEEE Walter Fried Award in recognition of the best paper published in IEEE/ION PLANS; and 20+ best paper/presentation awards. His students have won several awards, including two Best Ph.D. Dissertation awards (from IEEE and ION); two US DOT Graduate Student of the Year awards; and 20+ best paper, student paper, and paper presentation awards.

He started his academic career in 2014 at the University of California, Riverside; then was an Associate Professor at University of California, Irvine; then was very early promoted to Full Professor and joined The Ohio State University in 2022. Since starting his academic career, his research has attracted more than \$11 million in competitive federal grants from ONR, NSF, AFOSR, DOT, NIST, among others. His research was featured in dozens of national and international media outlets (Science, BBC, Forbes, IEEE, ACM, Ars Technica, among others) and appeared on 5 magazine covers. He was a Plenary Speaker at 2018 European Navigation Conference, Sweden. He is a Senior Editor of IEEE T-IV and an Associate Editor of IEEE T-AES and IEEE T-ITS. He was involved in organizing numerous conferences, workshops, and special sessions at IEEE/ION PLANS, IEEE VTC, IEEE ICASSP, IEEE ITSC, ION GNSS+, ION ITM, FUSION, ACC, and AIAA GNC. He is a Senior Member of IEEE.

Prior to his academic career, he was a research & development engineer with the Control Design & Dynamical Systems Simulation Group at National Instruments (NI), where he contributed to the full-development cycle (research, implementation, and testing) of 6 major and minor releases of: LabVIEW Control Design & Simulation Module, LabVIEW System Identification Toolkit, and LabVIEW PID & Fuzzy Logic Toolkit.

Education

The University of Texas at Austin, Austin, TX
Ph.D., Electrical & Computer Engineering, May 2014
Dissertation: Analysis and Synthesis of Collaborative Opportunistic Navigation Systems
Advisors: Todd E. Humphreys (primary) and Ari Arapostathis (co-advisor)

The University of Texas at Austin, Austin, TX
M.S.E., Aerospace Engineering, August 2010
Report: Optimal \mathcal{H}_2 and \mathcal{H}_∞ Control of Large Segmented Telescopes
Advisor: Robert H. Bishop

The Ohio State University, Columbus, OH
M.S., Electrical & Computer Engineering, December 2003
Thesis: An Optimal Nonlinear Bayesian Filter Design and Combined Hospitability and Synthetic Inclination Approach for Tracking
Advisor: Ümit Özgüner

Lebanese American University, Byblos, Lebanon
B.E. with Honors, Electrical Engineering, March 2001
Final Project: A Power Matching Approach for Using GPS as a Reliable Standalone Positioning System
Advisor: Samer S. Saab

Employment

Full Professor **Jul. 2022 – present**
The Ohio State University
Department of Electrical & Computer Engineering

Center Director **Sep. 2020 – present**
US Department of Transportation (USDOT) Tier 1 University Transportation Center (UTC) – CARMEN: Center for Automated Vehicles Research with Multimodal AssurEd Navigation

Assistant/Associate Professor (Tenured) **Jan. 2019 – Jun. 2022**
University of California, Irvine
Department of Mechanical & Aerospace Engineering
Department of Electrical Engineering & Computer Science
Institute of Transportation Studies

Assistant Professor **Jul. 2014 – Dec. 2018**
University of California, Riverside
Department of Electrical & Computer Engineering

Graduate Research Assistant **Jun. 2011 – Jun. 2014**
The University of Texas at Austin
Radionavigation Laboratory
Wireless Networking & Communications Group (WNCG)

Adjunct Professor **Jan. – May, 2008 – 2011**
Texas State University, San Marcos, TX
Ingram School of Engineering

Research and Development (R&D) Engineer **Oct. 2004 – Dec. 2010**
National Instruments Corp., Austin, TX
Control Design & Dynamical Systems Simulations Group

Graduate Research Associate Apr. 2002 – Sep. 2004
The Ohio State University
Collaborative Center of Control Science (CCCS)

Laboratory Research Assistant Mar. 2001 – May 2001
Lebanese American University, Byblos, Lebanon
GPS Laboratory

**Research
Grants**

Total: \$11,272,900; Conducted as PI: \$8,083,200; Kassas' Share: \$6,345,200

- **Title:** Cognitive Opportunistic Navigation with Unknown LEO and MEO Satellite Signals
Sponsor: Office of Naval Research (ONR)
Amount: \$750,000
Period: 2022–2025
PI: Z. Kassas
- **Title:** SMAC-FIRE: Closed-Loop Sensing, Modeling and Communications for Wild-FIRE
Sponsor: National Science Foundation (NSF)
Amount: \$1,199,087, Kassas' Share: \$300,000
Period: 2012–2025
PI: A. Swindlehurst (UCI), **Co-PI: Z. Kassas**, H. Jafarkhani (UCI), T. Banerjee (UCI), and J. Coen (National Center for Atmospheric Research)
- **Title:** Young Investigator Program (YIP): Dynamic Data Driven C-SPAN: Cognitive Sensing, Perception, Autonomy, and Navigation
Sponsor: Air Force Office of Scientific Research (AFOSR)
Amount: \$450,000
Period: 2022–2025
PI: Z. Kassas
- **Title:** Aircraft Navigation via Opportunistic Radio Frequency Simultaneous Localization and Mapping
Sponsor: Sandia National Laboratories
Amount: \$300,000
Period: 2021–2023
PI: Z. Kassas
- **Title:** Harnessing Terrestrial and Space-Based Millimeter-Wave Signals for Resilient and Accurate Positioning, Navigation, and Timing
Sponsor: Office of Naval Research (ONR)
Amount: \$457,000
Period: 2021–2023
PI: Z. Kassas
- **Title:** Assured Navigation and Timing Engineering for Automated Transportation Education and Research – Department of Transportation Tier 1 University Transportation Center (UTC)
Sponsor: US Department of Transportation (USDOT)
Amount: \$1,925,000 (Cost Share: \$962,500); Kassas' Share: \$375,000 (Cost Share: \$187,500)
Period: 2020–2022

- PI: Z. Kassas; Co-PIs:** D. Grejner-Brzezinska (OSU), C. Toth (OSU), K. Redmill (OSU), Ü. Özgüner (OSU), A. O'brien (OSU), Q. Ahmed (OSU), G. Rizzoni (OSU), T. Humphreys (UT-Austin), C. Bhat (UT-Austin), S. Ritchie (UCI), A. Chen (UCI), K. Cohen (UC)
- **Title:** Assessment of Cellular Signals of Opportunity for Aerial Vehicle Navigation
Sponsor: Sandia National Laboratories
Amount: \$25,000
Period: 2021
PI: Z. Kassas
 - **Title:** AI-Driven Intelligent Navigation for Autonomous Vehicles in Challenging Environments
Sponsor: Institute for Information & Communication Technology Promotion (IITP), South Korea
Amount: \$10,000
Period: 2021
PI: Z. Kassas
 - **Title:** The Internet of Things (IoT) for Wildfire Management
Sponsor: University of California, Irvine
Amount: \$30,000; Kassas' Share: \$12,000
Period: 2020–2021
PI: Lee Swindlehurst (UCI); **Co-PI: Z. Kassas**, H. Jafarkhani (UCI), T. Banerjee (UCI), and A. Eltawil (UCI)
 - **Title:** SNIFFER: Signals of opportunity for Navigation In Frequency-Forbidden EnviRonments
Sponsor: Department of the Air Force
Amount Value: \$250,000
Period: 2019–2020
PI: Z. Kassas
 - **Title:** Developmental Test (DT) Navigation Festival (NAVFEST)
Sponsor: Department of the Air Force
Amount Value: \$43,700
Period: 2019
PI: Z. Kassas
 - **Title:** Young Investigator Program (YIP): I Hear, Therefore I Know Where I Am: Exploiting Signals of Opportunity for Robust and Accurate Navigation in GPS-Denied Environments
Sponsor: Office of Naval Research (ONR)
Amount: \$750,000
Period: 2019–2023
PI: Z. Kassas
 - **Title:** CAREER: Situational Awareness Strategies for Autonomous Systems in Dynamic Uncertain Environments
Sponsor: National Science Foundation (NSF)
Amount: \$500,000
Period: 2018–2023
PI: Z. Kassas
 - **Title:** Ultimate Navigation Chip (uNavChip): Chip-Scale Personal Navigation System Integrating Deterministic Localization and Probabilistic Signals of Opportunity

Sponsor: National Institute of Standards and Technology (NIST)

Amount: \$1,960,613, **Kassas' Share:** \$350,000

Period: 2017–2022

PI: A. Shkel (UCI), **Co-PI:** Z. Kassas, S. Kia (UCI)

- **Title:** Developing a New Generation of Engineers with Cutting-Edge Knowledge in Resilient Navigation and Communication Systems in Contested Electromagnetic Environments

Sponsor: Office of Naval Research (ONR)

Amount: \$750,000

Period: 2016–2022

PI: Z. Kassas

- **Title:** A Collaborative Opportunistic Framework for Resilient and Accurate Navigation in GPS-Challenged Environments

Sponsor: Office of Naval Research (ONR)

Amount: \$510,000

Period: 2016–2020

PI: Z. Kassas

- **Title:** Geophysical Navigation of Unmanned Underwater Vehicles (UUVs)

Sponsor: Office of Naval Research (ONR)

Amount: \$225,000; **Kassas' Share:** \$150,000

Period: 2016–2020

PI: Z. Kassas; **Co-PI:** J. Farrell (UCR)

- **Title:** Towards Optimal Information Gathering in Unknown Stochastic Environments

Sponsor: National Science Foundation (NSF)

Amount: \$175,000

Period: 2016–2019

PI: Z. Kassas

**In-Kind
Hardware
& Software
Gifts**

Total: \$262,000

- **Sponsor:** Orolia
Items: Skydel GNSS Simulation Engine
Value: \$250,000
Year: 2021
- **Sponsor:** Autel Robotics
Items: X-Star Premium Drone Fleet
Value: \$12,000
Year: 2016

**Honors &
Awards**

Young faculty awards

- **Air Force Office of Scientific Research (AFOSR) Young Investigator Program (YIP) award, 2022**
- **Office of Naval Research (ONR) Young Investigator Program (YIP) award, 2019**
- **National Science Foundation (NSF) Faculty Early Career Development Program (CAREER) award, 2018**
- **NSF Computer and Information Science and Engineering (CISE) Research Initiation Initiative (CRII) award, 2016**

Outstanding research contributions awards

- **Institute of Navigation (ION) Colonel Thomas Thurlow award**, 2019
- **Institute of Navigation (ION) Samuel Burka award**, 2018
- **IEEE Senior Member promotion**, 2011

Plenary, keynote, and distinguished presentations

- **Keynote speaker**, IEEE Vehicular Technology Conference, Workshop on Mission Critical Communications, Helsinki, Finland, 2022
- **Distniguated speaker**, Aerospace Corporation, El Segundo, CA, 2022
- **Keynote speaker**, International Conference on Information Technology: New Generations, Las Vegas, NV, 2020
- **Plenary speaker**, European Navigation Conference, Gothenburg, Sweden, 2018

Research recognition awards

- **Grand prize**, “An indoor localization system exploiting LTE signals: A synthetic aperture-based beamforming approach to mitigate multipath,” IEEE Signal Processing Society video contest for beamforming research (5-MICC), 2020
- **The University of Texas Research Excellence award**, 2013
- **The University of Texas Professional Development award**, 2011–2013

Best paper awards

- **Best student paper award**, “An interacting multiple model estimator of LEO satellite clocks for improved positioning,” IEEE Vehicular Technology Conference, 2022
- **Best paper award**, “Navigation with differential carrier phase measurements from megaconstellation LEO satellites,” IEEE/ION Position, Location, and Navigation Symposium, 2020
- **Best student paper award**, “Deep learning-aided spatial discrimination for multipath mitigation,” IEEE/ION Position, Location, and Navigation Symposium, 2020
- **IEEE Walter Fried Award for Best Paper**, “Precise UAV navigation with cellular carrier phase measurements,” IEEE/ION Position, Location, and Navigation Symposium, 2018
- **Best student paper award**, “A software-defined receiver architecture for cellular CDMA-based navigation,” IEEE/ION Position, Location, and Navigation Symposium, 2016
- **Best paper award**, “Optimal receiver placement for collaborative mapping of signals of opportunity,” ION GNSS+ Conference, 2015
- **Best student paper award**, “Constructing a continuous phase time history from TDMA signals for opportunistic navigation,” IEEE/ION Position, Location & Navigation Symposium, 2012

Best paper presentation awards

- **Best demo award runner-up**, “I am not afraid of the GPS jammer: exploiting cellular signals for accurate ground vehicle navigation in a GPS-denied environment,” ACM Workshop on Automotive and Autonomous Vehicle Security (AutoSec), 2022
- **Best paper presentation award**, “Universal receiver architecture for blind navigation with partially known terrestrial and extraterrestrial signals of opportunity,” ION GNSS+ Conference, 2021
- **Best paper presentation award**, “A machine learning multipath mitigation ap-

- proach for opportunistic navigation with 5G signals,” ION GNSS+ Conference, 2021
- **Best paper presentation award**, “I am not afraid of the jammer: navigating with signals of opportunity in GPS-denied environments,” ION GNSS+ Conference, 2020
 - **Best paper presentation award**, “Blind opportunistic navigation: cognitive deciphering of partially known signals of opportunity,” ION GNSS+ Conference, 2020
 - **Best paper presentation award**, “Assessing real 5G signals for opportunistic navigation,” ION GNSS+ Conference, 2020
 - **Best paper presentation award**, “Assessment of differential carrier phase measurements from broadband LEO satellite signals for opportunistic navigation,” ION GNSS+ Conference, 2019
 - **Best paper presentation award**, “UAV integrity monitoring measure improvement using terrestrial signals of opportunity,” ION GNSS+ Conference, 2019
 - **Best paper presentation award**, “Indoor localization based on LTE carrier phase measurements and synthetic linear antenna array,” ION GNSS+ Conference, 2019
 - **Best paper presentation award**, “Centimeter-accurate UAV navigation with cellular signals,” ION GNSS+ Conference, 2018
 - **Best paper presentation award**, “Inertial navigation system aiding with Orbcomm LEO satellite Doppler measurements,” ION GNSS+ Conference, 2018
 - **Best paper presentation award**, “Distributed signals of opportunity aided inertial navigation with intermittent communication,” ION GNSS+ Conference, 2017
 - **Best paper presentation award**, “Computationally efficient receiver design for mitigating multipath for positioning with LTE signals,” ION GNSS+ Conference, 2017
 - **Best paper presentation award**, “Signals of opportunity aided inertial navigation,” ION GNSS+ Conference, 2016
 - **Best paper presentation award**, “Performance characterization of positioning in LTE systems,” ION GNSS+ Conference, 2016
 - **Best research poster finalist**, “Navigation with cellular CDMA signals,” Southern California Robotics Symposium, 2016
 - **Best paper presentation award**, “Observability analysis of opportunistic navigation with pseudorange measurements,” AIAA Guidance, Navigation & Control Conference, 2012

Professional service awards

- **IEEE Aerospace and Electronic Systems Society (AESS) outstanding technical panel of the year award**, Navigation systems panel, 2018
- **Institute of Navigation (ION) outstanding peer review recognition award**, 2018

Academic recognition awards

- **Lebanese American University School of Engineering Scholarship**, 2000
- **Lebanese American University School of Engineering Dean’s list of distinguished students**, 1999–2001

Student Supervisee Honors & Awards

- **IEEE Aerospace and Electronic Systems Society (AESS) Robert T. Hill Best Ph.D. Dissertation award**, Dr. Joe Khalife, 2021
- **US Department of Transportation (USDOT) Graduate Student of the Year**, Nadim Khairallah, 2021
- **Melucci Endowed Fellowship**, Mu Jia, 2021

- **Institute of Navigation (ION) Bradford Parkinson award** for best Ph.D. Dissertation, Dr. Kimia Shamaei, 2020
- **Paul and Beverly Holmes Endowed Fellowship**, Ali Abdallah, 2019
- **US Department of Transportation (USDOT) Graduate Student of the Year**, Joshua Morales, 2018
- **University of California, Riverside (UCR) Bourns College of Engineering Outstanding Achievement Award**, Souradeep Bhattacharya, 2018
- **University of California, Riverside (UCR) Graduate Student of the Year**, in the National Center for Sustainable Transportation (NCST) University Transportation Center (UTC), Joe Khalife, 2017
- **23 Best paper, best student paper, or best paper presentation awards**

**Media
Visibility**

Research featured in dozens of national and international media outlets (Science, BBC, Forbes, The Independent, IEEE Spectrum, ACM, Ars Technica, Science Magazine, GPS World, Inside GNSS, Inside Unmanned Systems, Phys.org, Space.com, EurekAlert.org, Homeland Security News, Military Embedded Systems, Cnet.com, Singularity Hub, Yahoo!, EuropaPress, India TV, among others) and appeared on 5 magazine covers

**Industrial
Experience**

National Instruments Corp., Austin, TX **Oct. 2004 – Dec. 2010**
Research and Development (R&D) Engineer

Product Development:

- Developed software: LabVIEW Control Design & Simulation Module, System Identification Toolkit, and PID & Fuzzy Control Toolkit
- Executed various phases (research, implementation, and testing) of the development cycle of six major and minor releases of software
- Coded multi-platform algorithms for off-line design and simulation and Real-Time (RT) and Field Programmable Gate Array (FPGA) deployment
- Led initiatives to improve quality of software, resulting in automated frameworks guaranteeing numerical robustness and reducing testing time from months to hours

Supervision:

- Guided junior engineers in overseas company branches (China and Brazil)
- Served as an industrial advisor for projects from The Ohio State University, Virginia Tech, California State University, and Brigham Young University

Leadership:

- Interviewed candidates for software and hardware R&D positions
- Organized on-campus recruiting booths at Engineering Career Fairs of The Ohio State University
- Assisted with organizing the National Instruments Conference (NI Week), Austin, TX, August 2005 and 2007; an event that attracts more than 3,000 engineers, educators, and scientists

**Teaching
Experience**

The Ohio State University **Aug. 2022 – present**
Graduate Courses:

- EE 257: Satellite-Based & Terrestrial Radio Navigation (Fall 2022), 9 students

University of California, Irvine, CA

Jan. 2019 – Jun. 2022

Undergraduate Courses:

- MAE 170: Introduction to Control Systems (Winter 2019, 2020, 2022), 165 students

Graduate Courses:

- MAE 295: Global Navigation Satellite System Signal Processing & Software-Defined Radio Design (Fall 2019, 2020), 19 students
- MAE 295: Advanced Detection & Estimation Theory (Spring 2019, 2022), 20 students
- ECPS 209: CPS Case Studies: Applied Optimal Estimation (Winter 2018), 11 students

University of California, Riverside, CA

Oct. 2014 – Dec. 2018

Graduate Courses:

- EE 235: Linear Systems Theory (Fall 2014, 2015, 2016, 2017, 2018), 105 students
- EE 257: Global Navigation Satellite System Signal Processing & Software-Defined Radio Design (Fall 2015, Spring 2018), 16 students
- EE 260: Advanced Detection & Estimation Theory (Spring 2017), 8 students

Undergraduate Courses:

- EE 132: Automatic Control (Spring 2015, 2016, 2017), 200 students

Texas State University, San Marcos, TX

Jan. – May, 2008 – 2011

Undergraduate Courses:

- MFGE 4376: Control Systems & Instrumentation (Spring 2008, 2009, 2010), 100 students
- EE 4377: Digital Signal Processing (Spring 2011), 13 students

Journal Publications

[J55] Khairallah, N., & **Kassas, Z.** (2022). Ephemeris tracking and error propagation analysis of LEO satellites with application to opportunistic navigation. *IEEE Trans. on Aerospace and Electronic Systems*, submitted.

[J54] Abdallah, A., Khalife, J., & **Kassas, Z.** (2022). Exploiting on-demand 5G downlink signals for opportunistic navigation. *IEEE Signal Processing Letters*, submitted.

[J53] **Kassas, Z.**, Abdallah, A., & Khalife, J. (2022). No GPS no problem: exploiting cellular OFDM-based signals for accurate navigation. *IEEE Trans. on Aerospace and Electronic Systems*, submitted.

[J52] Neinavaie, M., Kozhaya, S., Shadram, Z., & **Kassas, Z.** (2022). Exploiting unknown LEO satellite signals: acquisition, Doppler tracking, and differential navigation. *NAVIGATION, Journal of the Institute of Navigation*, submitted.

[J51] Jia, M., Khalife, J., & **Kassas, Z.** (2022). Opportunistic ARAIM for navigation with GNSS signals fused with terrestrial signals of opportunity: requirements and performance. *IEEE Trans. on Intelligent Transportation Systems*, submitted.

[J50] **Kassas, Z.**, Khairallah, N., Kozhaya, S., Khalife, J., Neinavaie, M., & Haidar-Ahmad, J., (2022). Ad astra: simultaneous tracking and navigation with megaconstellation LEO satellites. *IEEE Aerospace and Electronic Systems Magazine*, submitted.

[J49] Khalife, J., & **Kassas, Z.** (2021). A static reduced-order multiple-model adaptive

estimator for noise identification. *IEEE Trans. on Aerospace and Electronic Systems*, submitted.

[J48] Neinavaie, M., Khalife, J., & **Kassas, Z.** (2021). Cognitive detection of unknown beacons of terrestrial signals of opportunity for localization. *IEEE Trans. on Wireless Communications*, submitted.

[J47] **Kassas, Z.**, Khalife, J., Abdallah, A., Lee, C., Jurado, J., Wachtel, S., Duede, J., Hoeffner, Z., Hulsey, T., Quirarte, R., & Tay, R. (2021). Flight demonstration of high altitude aircraft navigation with cellular signals. *IEEE Intelligent Transportation Systems Magazine*, submitted.

[J46] Khalife, J., & **Kassas, Z.** (2021). Performance-driven design of carrier phase differential navigation frameworks with megaconstellation LEO satellites. *IEEE Trans. on Aerospace and Electronic Systems*, submitted.

[J45] Morales, J., Khalife, J., & **Kassas, Z.** (2022). Event-based communication strategies for collaborative inertial radio SLAM. *IEEE Trans. on Aerospace and Electronic Systems*, accepted.

[J44] Sabbagh, R., & **Kassas, Z.** (2022). Observability analysis of receiver localization via pseudorange measurements from a single LEO satellite. *IEEE Control Systems Letters*, accepted.

[J43] Jao, C., Abdallah, A., Chen, C., Seo, M., Kia, S., **Kassas, Z.**, & Shkel, A. (2022). PINDOC: pedestrian indoor navigation system integrating deterministic, opportunistic, and cooperative functionalities. *IEEE Sensors Journal*, accepted.

[J42] Khalife, J., & **Kassas, Z.** (2022). Differential framework for submeter-accurate vehicular navigation with cellular signals. *IEEE Trans. on Intelligent Vehicles*, accepted.

[J41] Khalife, J., Maaref, M., & **Kassas, Z.** (2022). Opportunistic autonomous integrity monitoring for enhanced UAV safety. *IEEE Aerospace and Electronic Systems Magazine*, accepted.

[J40] **Kassas, Z.**, Khalife, J., Abdallah, A., Lee, C., Jurado, J., Wachtel, S., Duede, J., Hoeffner, Z., Hulsey, T., Quirarte, R., & Tay, R. (2022). Assessment of cellular signals of opportunity for high altitude aircraft navigation. *IEEE Aerospace and Electronic Systems Magazine*, accepted.

[J39] Lee, H., Seo, J., & **Kassas, Z.** (2022). Urban road safety prediction: a satellite navigation perspective. *IEEE Intelligent Transportation Systems Magazine*, accepted.

[J38] Khalife, J., & **Kassas, Z.** (2022). On the achievability of submeter-accurate UAV navigation with cellular signals exploiting loose network synchronization. *IEEE Trans. on Aerospace and Electronic Systems*, accepted.

[J37] **Kassas, Z.**, Khalife, J., Abdallah, A., & Lee, C. (2022). I am not afraid of the GPS jammer: resilient navigation via signals of opportunity in GPS-denied environments. *IEEE Aerospace and Electronic Systems Magazine*, (37)7, pp. 4–19.

[J36] Neinavaie, M., Khalife, J., & **Kassas, Z.** (2022). Acquisition, Doppler tracking, and positioning with Starlink LEO satellites: first results. *IEEE Trans. on Aerospace and Electronic Systems*, (58)3, pp. 2606–2610.

- [J35] Morales, J., Khalife, J., & **Kassas, Z.** (2022). Information fusion strategies for collaborative inertial radio SLAM. *IEEE Trans. on Intelligent Transportation Systems*, (23) 8, pp. 12935–12952.
- [J34] Neinavaie, M., Khalife, J., & **Kassas, Z.** (2022). Cognitive opportunistic navigation in private networks with 5G signals and beyond. *IEEE Journal of Selected Topics in Signal Processing*, (16)1, pp. 129–143.
- [J33] Abdallah, A., Jao, C., **Kassas, Z.**, & Shkel, A. (2022). A pedestrian indoor navigation system using deep-learning-aided cellular signals and ZUPT-aided foot-mounted IMUs. *IEEE Sensors Journal*, (22)6, pp. 5188–5198.
- [J32] Khalife, J., Neinavaie, M., & **Kassas, Z.** (2022). The first carrier phase tracking and positioning results with Starlink LEO satellite signals. *IEEE Trans. on Aerospace and Electronic Systems*, (58)2, pp. 1487–1491.
- [J31] Yang, Y., Khalife, J., Morales, J., & **Kassas, Z.** (2022). UAV waypoint opportunistic navigation in GNSS-denied environments. *IEEE Trans. on Aerospace and Electronic Systems*, (58)1, pp. 663–678.
- [J30] Maaref, M., & **Kassas, Z.** (2022). Autonomous integrity monitoring for vehicular navigation with cellular signals of opportunity and an IMU. *IEEE Trans. on Intelligent Transportation Systems*, (23)6, pp. 5586–5601.
- [J29] Abdallah, A., & **Kassas, Z.** (2021). Multipath mitigation via synthetic aperture beamforming for indoor and deep urban navigation. *IEEE Trans. on Vehicular Technology*, (70)9, pp. 8838–8853.
- [J28] Maaref, M., Khalife, J., & **Kassas, Z.** (2021). Aerial vehicle protection level reduction by fusing GNSS and terrestrial signals of opportunity. *IEEE Trans. on Intelligent Transportation Systems*, (22)9, pp. 5976–5993, (special issue).
- [J27] Shamaei, K., & **Kassas, Z.** (2021). A joint TOA and DOA acquisition and tracking approach for positioning with LTE signals. *IEEE Trans. on Signal Processing*, (69), pp. 2689–2705.
- [J26] Shamaei, K., & **Kassas, Z.** (2021). Receiver design and time of arrival estimation for opportunistic localization with 5G signals. *IEEE Trans. on Wireless Communications*, (20)7, pp. 4716–4731.
- [J25] Ragothaman, S., Maaref, M., & **Kassas, Z.** (2021). Autonomous ground vehicle path planning in urban environments using GNSS and cellular signals reliability maps: simulation and experimental results. *IEEE Trans. on Aerospace and Electronic Systems*, (57)4, pp. 2575–2586.
- [J24] Ragothaman, S., Maaref, M., & **Kassas, Z.** (2021). Autonomous ground vehicle path planning in urban environments using GNSS and cellular signals reliability maps: models and algorithms. *IEEE Trans. on Aerospace and Electronic Systems*, (57)3, pp. 1562–1580.
- [J23] Morales, J., & **Kassas, Z.** (2021). Tightly-coupled inertial navigation system with signals of opportunity aiding. *IEEE Trans. on Aerospace and Electronic Systems*, (56)3, pp. 1930–1948.

- [J22] Khalife, J., Sevinc, C., & **Kassas, Z.** (2020). Performance evaluation of TOA positioning in asynchronous cellular networks using stochastic geometry models. *IEEE Wireless Communications Letters*, (9)9, pp. 1422–1426.
- [J21] Maaref, M., & **Kassas, Z.** (2020). Measurement characterization and autonomous outlier detection and exclusion for ground vehicle navigation with cellular signals. *IEEE Trans. on Intelligent Vehicles*, (5)4, pp. 670–683.
- [J20] **Kassas, Z.**, Maaref, M., Morales, J., Khalife, J., & Shamaei, K. (2020). Robust vehicular localization and map-matching in urban environments through IMU, GNSS, and cellular signals. *IEEE Intelligent Transportation Systems Magazine*, (12)3, pp. 36–52.
- [J19] Khalife, J., & **Kassas, Z.** (2020). Opportunistic UAV navigation with carrier phase measurements from asynchronous cellular signals. *IEEE Trans. on Aerospace and Electronic Systems*, (56)4, pp. 3285–3301.
- [J18] Maaref, M., & **Kassas, Z.** (2020). Ground vehicle navigation in GNSS-challenged environments using signals of opportunity and a closed-loop map-matching approach. *IEEE Trans. on Intelligent Transportation Systems*, (21)7, pp. 2723–2738.
- [J17] Garcia, J., Farrell, J., **Kassas, Z.**, & Ouimet, M. (2019). Autonomous surface vehicle multistep look-ahead measurement location planning for optimal localization of underwater acoustic transponders. *IEEE Trans. on Aerospace and Electronic Systems*, (55)6, pp. 2836–2849.
- [J16] Khalife, J., & **Kassas, Z.** (2019). Optimal sensor placement for dilution of precision minimization via quadratically constrained fractional programming. *IEEE Trans. on Aerospace and Electronic Systems*, (55)4, pp. 2086–2096.
- [J15] Maaref, M., Khalife, J., & **Kassas, Z.** (2019). Lane-level localization and mapping in GNSS-challenged environments by fusing lidar data and cellular pseudoranges. *IEEE Trans. on Intelligent Vehicles*, (4)1, pp. 73–89.
- [J14] Morales, J., & **Kassas, Z.** (2019). Stochastic observability and uncertainty characterization in simultaneous receiver and transmitter localization. *IEEE Trans. on Aerospace and Electronic Systems*, (55)2, pp. 1021–1031.
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Book Chapters

[BC3] **Kassas, Z.** (2021). Navigation from low Earth orbit – Part 2: models, implementation, and performance. In J. Morton, F. van Diggelen, J. Spilker, Jr., & B. Parkinson (Eds.), *Position, Navigation, and Timing Technologies in the 21st Century*, (Ch. 43, pp. 1381–1412). Hoboken, NJ: Wiley-IEEE.

[BC2] **Kassas, Z.** (2021). Navigation with cellular signals of opportunity. In J. Morton, F. van Diggelen, J. Spilker, Jr., & B. Parkinson (Eds.), *Position, Navigation, and Timing Technologies in the 21st Century*, (Ch. 38, pp. 1171–1223). Hoboken, NJ: Wiley-IEEE.

[BC1] Layne, J., Eilders, M., **Kassas, Z.**, & Ozguner, U. (2003). A hospitality map approach for estimating a mobile target location. In S. Butenko, R. Murphey, & P. Pardalos (Eds.), *Recent Developments in Cooperative Control and Optimization* (pp. 117–124). Norwell, MA: Kluwer Academic Publishers.

Patents

[P19] **Kassas, Z.**, & Neinavaie, M. (2022). Systems and methods for positioning and navigation with low Earth orbit satellite signals. U.S. Patent Application No. 63/393,501.

[P18] **Kassas, Z.**, & Abdallah, A. (2022). Systems and methods for determining cellular downlink observables and navigation. U.S. Patent Application No. 63/355,890.

[P17] **Kassas, Z.**, & Abdallah, A. (2022). Systems and methods for user equipment based 5G navigation and downlink bandwidth operations. U.S. Patent Application No. 63/315,719.

[P16] **Kassas, Z.**, Khalife, J., & Neinavaie, M. (2021). Systems and methods for

acquisition and tracking of unknown LEO satellite signals. U.S. Patent Application No. 63/210,595.

[P15] **Kassas, Z.**, & Khalife, J. (2021). Systems and methods for differential and non-differential navigation with cellular signals. U.S. Patent Application No. 63/155,048.

[P14] **Kassas, Z.**, Neinavaie, M., & Khalife, J. (2020). Systems and methods for blind opportunistic navigation, cognitive deciphering of partially known signals of opportunity, and blind Doppler estimation from LEO satellite signals. U.S. Patent Application No. 63/087,591.

[P13] **Kassas, Z.**, Khalife, J., & Neinavaie, M. (2020). Navigation with differential carrier phase measurement from low Earth orbit satellites. U.S. Patent Application No. 63/047,796.

[P12] **Kassas, Z.**, & Shamaei, K. (2020). Systems and methods for opportunistic time of arrival estimation for opportunistic localization with 5G signals. U.S. Patent Application No. 63/026,360.

[P11] **Kassas, Z.**, & Shamaei, K., (2020). Systems and methods for TOA and DOA acquisition and tracking for signal of opportunity positioning. U.S. Patent Application No. 63/013,638.

[P10] **Kassas, Z.**, & Shamaei, K. (2019). Sub-meter accurate navigation and cycle slip detection with LTE carrier phase measurements. U.S. Patent Application No. 62/930,298.

[P9] **Kassas, Z.**, Abdallah, A., & Shamaei, K. (2019). Indoor localization system with LTE code and carrier phase measurements and an IMU. U.S. Patent Application No. 62/913,078.

[P8] **Kassas, Z.**, & Abdallah, A. (2019). Synthetic aperture navigation with LTE signals. U.S. Patent Application No. 62/913,074.

[P7] **Kassas, Z.**, Khalife, J., & Abdallah, A. (2019). Receiver design for Doppler positioning with low Earth orbit satellites and differential carrier phase measurements. U.S. Patent Application No. 62/834,317.

[P6] **Kassas, Z.**, Morales, J., & Khalife, J. (2019). Simultaneous tracking and navigation using LEO satellite signals. U.S. Patent Application No. 62/834,313.

[P5] **Kassas, Z.**, Maaref, M., & Khalife, J. (2018). Lane-level navigation system for ground vehicles with lidar and cellular signals. U.S. Patent Application No. 62/721,967.

[P4] **Kassas, Z.**, & Morales, J. (2016). Signals of opportunity aided inertial navigation system. U.S. Patent Application No. 62/398,413.

[P3] **Kassas, Z.**, Shamaei, K., & Khalife, J. (2016). SDR for navigation with LTE signals. U.S. Patent Application No. 62/398,403.

[P2] **Kassas, Z.**, Khalife, J., & Shamaei, K. (2016). SDR for navigation with cellular CDMA signals. U.S. Patent Application No. 62/294,758.

[P1] **Kassas, Z.**, & Lewis, J. (2012). Multi-channel algorithm infrastructure for programmable hardware elements. U.S. Patent No. 8,122,238. Washington, DC: U.S. Patent and Trademark Office.

**Invited
Presentations**

- 2023 Department of Aerospace Engineering & Mechanics, University of Minnesota, Twin Cities, Minneapolis, MN (*Seminar*)
- 2022 ION Global Navigation Satellite Systems Conference (ION GNSS+), Session: Autonomous Navigation for Ground, Seaborne, and Airborne Vehicles, Denver, CO (*Invited Speaker*)
- 2022 ION Global Navigation Satellite Systems Conference (ION GNSS+), Session: Beyond GNSS: Emerging Trends in LEO-based Satnav and Signals of Opportunity for PNT , Denver, CO (*Invited Speaker*)
- 2022 Department of Aerospace and Ocean Engineering, Virginia Tech, Blacksburg, VA (*Seminar*)
- 2022 Department of Mechanical and Aerospace Engineering, West Virginia University, Morgantown, WV (*Seminar*)
- 2022 GPS World Magazine, Online Webinar (*Invited Speaker*)
- 2022 IEEE Vehicular Technology Conference, Workshop on Mission Critical Communications, Helsinki, Finland (*Distinguished Speaker*)
- 2022 Aerospace Corporation, El Segundo, CA (*Distinguished Speaker Series*)
- 2022 Munich Satellite Navigation Summit, Munich, Germany (*Invited Speaker & Panelist*)
- 2021 GPS World Magazine, Online Webinar (*Invited Speaker*)
- 2021 Department of Mechanical Engineering, Tufts University, Medford, MA (*Seminar*)
- 2021 ION Global Navigation Satellite Systems Conference (ION GNSS+), Session: AI-Enabled Navigation in Smart Cities, St. Louis, MO (*Invited Speaker*)
- 2021 ION Global Navigation Satellite Systems Conference (ION GNSS+), Session: On the Road to Automated Vehicles, St. Louis, MO (*Invited Speaker & Panelist*)
- 2021 Lebanese American University, Byblos, Lebanon (*Seminar*)
- 2021 National Institute of Standards and Technology (NIST), Public Safety Broadband Stakeholder Meeting, Virtual (*Invited Speaker*)
- 2021 International Technical Symposium on Navigation and Timing, Toulouse, France (*Invited Speaker*)
- 2021 ASCE International Conference on Transportation and Development, Virtual (*Invited Speaker & Panelist*)
- 2021 Safety and Security for Connected Autonomous Vehicles, University of California, Irvine, Virtual (*Invited Speaker & Panelist*)
- 2021 Air Force Research Laboratory, Wright-Patterson Air Force Base, OH, Virtual (*Seminar*)
- 2021 US–EU GPS–Galileo Working Group C, Resilience Subgroup, Virtual (*Invited Speaker*)
- 2020 Workshop on Spectrum Challenges and Opportunities for 6G and Navigation, Stanford University, Stanford, CA (*Invited Speaker & Panelist*)
- 2020 ION Global Navigation Satellite Systems Conference (ION GNSS+), Session: PNT for AI-Enabled Autonomous Systems: The Good, the Bad, and the Ugly, St. Louis, MO (*Invited Speaker & Panelist*)
- 2020 National Institute of Standards and Technology (NIST), Public Safety Broadband Stakeholder Meeting, Virtual (*Invited Speaker*)
- 2020 International Conference on Information Technology: New Generations, Las Vegas, NV (*Keynote Speaker*)

- 2020 University of California, Irvine, CA (*Invited Speaker & Panelist*)
- 2020 Information Theory and Applications Workshop, University of California, San Diego, CA (*Invited Speaker*)
- 2019 Institute of Navigation (ION), Online Webinar (*Invited Speaker*)
- 2019 IEEE Vehicular Technology Conference, Honolulu, HI (*Invited Speaker & Panelist*)
- 2019 ION Global Navigation Satellite Systems Conference (ION GNSS+), Session: The Spectrum of Autonomy in Navigation, Miami, FL (*Invited Speaker & Panelist*)
- 2019 ION Global Navigation Satellite Systems Conference (ION GNSS+), Session: PNT Security and Robustness, Miami, FL (*Invited Speaker & Panelist*)
- 2019 ION Cognizant Autonomous Systems for Safety Critical Applications Conference, Miami, FL (*Keynote Speaker*)
- 2019 National Institute of Standards and Technology (NIST), Public Safety Broadband Stakeholder Meeting, Chicago, IL (*Invited Speaker*)
- 2019 Naval Surface Warfare Center, Corona, CA (*Seminar*)
- 2019 University of California, Irvine, CA (*Invited Speaker & Panelist*)
- 2019 École de Technologie Supérieure (ÉTS), Montreal, Canada (*Seminar*)
- 2018 Asilomar Conference on Signals, Systems and Computers, Session: Signal Processing for GNSS and/or Localization with Terrestrial Networks, Pacific Grove, CA (*Invited Session*)
- 2018 ION Global Navigation Satellite Systems Conference (ION GNSS+), Session: Autonomous Cyber-Physical Systems – The Way Ahead, Miami, FL (*Invited Speaker*)
- 2018 Naval Surface Warfare Center, Corona, CA (*Seminar*)
- 2018 IFAC Networked & Autonomous Air & Space Systems Workshop, Session: UAV Estimation & Control, Santa Fe, NM (*Invited Speaker in Plenary Session*)
- 2018 European Navigation Conference, Gothenburg, Sweden (*Plenary Speaker*)
- 2018 IEEE Wireless Communications and Networking Conference, Session: Localization in Current and Emerging Networks, Barcelona, Spain (*Invited Session*)
- 2018 Department of Aeronautics & Astronautics, University of Washington, Seattle, WA (*Seminar*)
- 2018 Department of Aerospace Engineering Sciences, University of Colorado Boulder, CO (*Seminar*)
- 2018 Department of Electrical & Computer Engineering, University of California, Santa Barbara, CA (*Seminar*)
- 2018 ION Cognizant Autonomous Systems for Safety Critical Applications Workshop, Reston, VA (*Keynote Speaker*)
- 2017 Department of Mechanical & Aerospace Engineering, University of California, San Diego, CA (*Seminar*)
- 2017 Position, Navigation, & Time (PNT) Symposium, Stanford University, Stanford, CA (*Invited Speaker*)
- 2017 Texas Wireless Summit, Wireless Networking & Communications Group (WNCG), The University of Texas at Austin, TX (*Invited Speaker & Panelist*)
- 2017 Department of Aerospace Engineering & Engineering Mechanics, The University of Texas at Austin, TX (*Seminar*)
- 2017 Naval Surface Warfare Center, Corona, CA (*Seminar*)

- 2017 European Signal Processing Conference, Session: Positioning In Challenging Environments, Kos Island, Greece (*Invited Session*)
- 2017 GPS World Magazine, Online Webinar (*Invited Speaker*)
- 2017 Department of Electrical & Computer Engineering, University of California, Riverside, CA (*Seminar*)
- 2017 Department of Mechanical, Materials & Aerospace Engineering, Illinois Institute of Technology, Chicago, IL (*Seminar*)
- 2017 Department of Electrical Engineering, University of California, Los Angeles, CA (*Seminar*)
- 2017 Department of Electrical & Computer Engineering, The Ohio State University, Columbus, OH (*Seminar*)
- 2017 Department of Electrical & Computer Engineering, Carnegie Mellon University, Silicon Valley, CA (*Seminar*)
- 2017 Department of Electrical Engineering & Computer Science, University of California, Irvine, CA (*Seminar*)
- 2016 Society of Women Engineers, University of California, Riverside, CA (*Invited Speaker*)
- 2016 Department of Electrical Engineering & Computer Science, Ohio University, Athens, OH (*Seminar*)
- 2016 Department of Electrical & Computer Engineering, Air Force Institute of Technology, Wright-Patterson Air Force Base, OH (*Seminar*)
- 2016 Department of Electrical & Computer Engineering, The Ohio State University, Columbus, OH (*Seminar*)
- 2016 Department of Aeronautics & Astronautics, University of Washington, Seattle, WA (*Seminar*)
- 2016 ION Southern California Section, John Deere, Torrance, CA (*Seminar*)
- 2016 Department of Aeronautics & Astronautics, Stanford University, Stanford, CA (*Seminar*)
- 2015 Department of Electrical Engineering, University of South Florida, Tampa, FL (*Seminar*)
- 2015 Department of Electrical & Computer Engineering, University of California, Santa Barbara, CA (*Seminar*)
- 2015 Department of Electrical & Computer Engineering, University of California, Riverside, CA (*Seminar*)
- 2015 Naval Research Laboratory, Washington, D.C. (*Seminar*)
- 2014 Department of Aerospace Engineering & Mechanics, University of Minnesota, Twin Cities, Minneapolis, MN (*Seminar*)
- 2014 Department of Electrical & Computer Engineering, American University of Beirut, Lebanon (*Seminar*)
- 2014 Department of Electrical & Computer Engineering, University of California, Riverside, CA (*Seminar*)
- 2013 IEEE Global Conference on Signal & Information Processing, Session: Software Defined and Cognitive Radios, Austin, TX (*Invited Session*)
- 2013 The Aerospace Corporation, El Segundo, CA (*Seminar*)
- 2013 Northrop Grumman Electronic Systems, Woodland Hills, CA (*Seminar*)
- 2013 Charles Stark Draper Laboratory, Cambridge, MA (*Seminar*)
- 2013 Robotics & Autonomous Vehicles Summit, National Instruments Week Conference, Austin, TX (*Invited Speaker*)

- 2013 Academic Forum, National Instruments Week Conference, Austin, TX (*Invited Speaker*)
- 2012 Texas Wireless Summit, Austin, TX (*Invited Session*)
- 2012 National Science Foundation Wireless Internet Center for Advanced Technology (NSF-WICAT), Virginia Tech, Blacksburg, VA (*Invited Session*)
- 2008 Department of Electrical & Computer Engineering, American University of Beirut, Lebanon (*Seminar*)
- 2007 Mechatronics Symposium, National Instruments Week Conference, Austin, TX (*Invited Speaker*)
- 2007 Air Force Research Laboratory, Wright-Patterson Air Force Base, OH (*Seminar*)
- 2007 L-3 Communications, Cincinnati, OH (*Seminar*)
- 2007 Belcan Engineering, Cincinnati, OH (*Seminar*)
- 2007 Center for Automotive Research, The Ohio State University, Columbus, OH (*Seminar*)
- 2005 Department of Electrical & Computer Engineering, The Ohio State University, Columbus, OH (*Seminar*)

Committees and Panels

- **Vice chair**, *IEEE Aerospace and Electronic Systems, Navigation Systems Panel*, (2021 – present)
- **Panelist**, *IEEE Aerospace and Electronic Systems Vision and Perspectives Panel*, (2021 – present)
- **Panelist**, *IEEE Aerospace and Electronic Systems, Navigation Systems Panel*, (2017 – present)
- **Council member-at-large**, *Institute of Navigation (ION)*, (2019 – 2021)

Journal Editorship

- **Senior editor**, *IEEE Transactions on Intelligent Vehicles*, (2021 – present).
- **Associate editor**, *IEEE Transactions on Intelligent Transportation Systems*, (2019 – present).
- **Associate editor**, *IEEE Transactions on Aerospace and Electronic Systems*, (2016 – present).
- **Guest editor**, *IEEE Intelligent Transportation Systems Magazine, Special issue on Recent Advances in the Use of GNSS-based Positioning for Intelligent Transport Systems*, (2018 – 2019).

Conference Organization

- 2023 **Program chair**, *IEEE/ION Position, Location and Navigation Symposium*, Monterey, CA
- 2022 **Special session co-organizer**, “Estimation and Fusion for Navigation,” *International Conference on Information Fusion*, Linköping, Sweden
- 2022 **Co-organizer and co-chair**, *IEEE Vehicular Technology Conference: Workshop on Mission Critical Communications*, Helsinki, Finland
- 2022 **Special session organizer**, “AI and Advanced Technologies for Next Generation GNSS,” *Munich Satellite Navigation Summit*, Munich, Germany
- 2021 **Track chair**, “Algorithms and Methods,” *ION Global Navigation Satellite System Conference*, Saint Louis, MO
- 2021 **Special session co-organizer**, “AI-Enabled Navigation in Smart Cities,” *ION Global Navigation Satellite System Conference*, Saint Louis, MO

- 2021 **Special session co-organizer and co-chair**, “Resilient and Secure Navigation for Highly Automated Transportation Systems,” *IEEE International Conference on Intelligent Transportation Systems*, Indianapolis, IN
- 2020 **Special session organizer and chair**, “PNT for AI-Enabled Autonomous Systems: The Good, the Bad, and the Ugly,” *ION Global Navigation Satellite System Conference*, Saint Louis, MO
- 2020 **Program chair**, *IEEE/ION Position, Location and Navigation Symposium*, Portland, OR
- 2020 **Special session organizer and chair**, “Signal Processing for Sensing, Information Fusion, and Situational Awareness in Autonomous Systems,” *International Conference on Acoustics, Speech, and Signal Processing*, Barcelona, Spain
- 2019 **Co-organizer and co-chair**, *IEEE Vehicular Technology Conference: Workshop on Reliable Ubiquitous Navigation in Smart Cities*, Honolulu, HI
- 2019 **Special session co-organizer and co-chair**, “Navigating Smart and Connected Cities,” *ION Global Navigation Satellite System Conference*, Miami, FL
- 2019 **General chair**, *ION Cognizant Autonomous Systems for Safety Critical Applications Conference*, Miami, FL
- 2018 **Special session co-organizer and co-chair**, “Autonomous Cyber-Physical Systems – The Way Ahead,” *ION Global Navigation Satellite System Conference*, Miami, FL
- 2018 **Track chair**, “Applications to Automated, Semi-Autonomous, and Fully-Autonomous Systems,” *IEEE/ION Position, Location and Navigation Symposium*, Monterey, CA
- 2018 **Organizer and general chair**, *ION Cognizant Autonomous Systems for Safety Critical Applications Workshop*, Reston, VA
- 2022 **Review panelist**, *National Science Foundation (NSF), Cyber-Physical Systems (CPS)*, Alexandria, VA
- 2021 **Review panelist**, *National Science Foundation (NSF), Smart and Connected Communities (S&CC)*, Alexandria, VA
- 2021 **Review panelist**, *National Science Foundation (NSF), Cyber-Physical Systems (CPS)*, Alexandria, VA
- 2019 **Review panelist**, *National Science Foundation (NSF), Cyber-Physical Systems (CPS)*, Alexandria, VA
- 2019 **Review panelist**, *National Science Foundation (NSF), Secure and Trustworthy Cyberspace (SaTC)*, Alexandria, VA
- 2019 **Review panelist**, *National Science Foundation (NSF), Cyber-Physical Systems (CPS)*, Alexandria, VA
- 2018 **Review panelist**, *National Science Foundation (NSF), Smart and Autonomous Systems (S&AS)*, Alexandria, VA
- 2018 **Review panelist**, *National Science Foundation (NSF), Cyber-Physical Systems (CPS)*, Alexandria, VA
- 2018 **Review panelist**, *National Science Foundation (NSF), Computer and Network Systems (CNS)*, Alexandria, VA
- 2018 **Review panelist**, *National Science Foundation (NSF), Cyber-Physical Systems (CPS)*, Alexandria, VA

**Review
Panels**

**Professional
Service**

- 2017 **Review panelist**, *National Science Foundation (NSF), Cyber-Physical Systems (CPS)*, Alexandria, VA
- 2017 **Review panelist**, *National Science Foundation (NSF), Computer and Network Systems (CNS)*, Arlington, VA
- 2017 **Review panelist**, *National Science Foundation (NSF), Cyber-Physical Systems (CPS)*, Arlington, VA
- 2017 **Review panelist**, *National Science Foundation (NSF), Smart and Autonomous Systems (S&AS)*, Arlington, VA
- 2016 **Review panelist**, *National Science Foundation (NSF), Computer and Network Systems (CNS)*, Arlington, VA
- 2016 **Review panelist**, *National Science Foundation (NSF), Cyber-Physical Systems (CPS)*, Arlington, VA
- 2022 **Selection committee member**, *ION Bradford Parkinson Award for Best Ph.D. Dissertation*, Denver, CO
- 2022 **Session co-chair**, “Indoor Navigation and Positioning,” *ION Global Navigation Satellite System Conference*, Denver, CO
- 2022 **Selection committee member**, *ION GNSS+ Conference Best Student Paper Award*, Denver, CO
- 2022 **Session co-chair**, “Position, Navigation and Timing Security in Highly Automated Vehicles,” *IFAC Symposium on Advances in Automotive Control*, Columbus, OH
- 2020 **Session chair**, “Positioning 1,” *IEEE Vehicular Technology Conference*, Helsinki, Finland
- 2022 **International program committee member**, *IFAC Symposium on Advances in Automotive Control*, Columbus, OH
- 2022 **Technical program committee member**, *IEEE Vehicular Technology Conference*, Helsinki, Finland
- 2022 **Session chair**, “Autonomous Driving Security 2,” *ACM Workshop on Automotive and Autonomous Vehicle Security*, San Diego, CA
- 2022 **Session co-chair**, “Radionavigation with Terrestrial and LEO Signals,” *ION International Technical Meeting*, Long Beach, CA
- 2021 **Technical program committee member**, *IEEE Military Communications Conference*, San Diego, CA
- 2021 **Selection committee member**, *ION GNSS+ Conference Best Student Paper Award*, St. Louis, MO
- 2021 **Associate editor**, *American Control Conference*, New Orleans, LA
- 2021 **Technical program committee member**, *IEEE Vehicular Technology Conference*, Helsinki, Finland
- 2021 **Session co-chair**, “Radionavigation Beyond Medium Earth Orbit GNSS,” *ION International Technical Meeting*, San Diego, CA
- 2020 **Technical program committee member**, *IEEE Vehicular Technology Conference*, Victoria, Canada
- 2019 **Session chair**, “Aerial Vehicle Autonomy 2,” *ION Cognizant Autonomous Systems for Safety Critical Applications Conference*, Miami, FL
- 2019 **Session chair**, “Localization Techniques,” *IEEE Vehicular Technology Conference*, Kuala Lumpur, Malaysia

- 2018 **Selection committee member**, *ION Bradford Parkinson Award for Best Ph.D. Dissertation*, Miami, FL
- 2018 **Session chair**, “Active Safety and Autonomous Driving,” *European Navigation Conference*, Gothenburg, Sweden
- 2018 **Session co-chair**, “Autonomous Navigation,” *ION International Technical Meeting*, Reston, VA
- 2017 **Session co-chair**, “Multisensor Navigation in Challenging Environments,” *ION Global Navigation Satellite System Conference*, Portland, OR
- 2017 **Session co-chair**, “Autonomous Robots II,” *American Control Conference*, Seattle, WA
- 2017 **Associate editor**, *American Control Conference*, Seattle, WA
- 2017 **Session co-chair**, “Autonomous Navigation,” *ION International Technical Meeting*, Monterey, CA
- 2016 **Session co-chair**, “Collaborative and Networked Navigation,” *IEEE/ION Position, Location and Navigation Symposium*, Savannah, GA
- 2016 **Session co-chair**, “Multi-Sensor Fusion,” *ION International Technical Meeting*, Monterey, CA
- 2013 **Session co-chair**, “Sensor Systems for GNC II,” *AIAA Guidance, Navigation, & Control Conference*, Boston, MA
- 2013 **Review panelist**, *IEEE Senior Membership Advancement*, Austin, TX
- 2012 **Advisory panelist**, *The University of Texas at Austin Graduate Lecture Series*, Austin, TX
- 2011 **Session co-chair**, “Control Applications,” *IFAC World Congress*, Milan, Italy

**Peer-Review
Activities**

Journals

- IEEE Transactions on Aerospace and Electronic Systems
- IEEE Transactions on Intelligent Transportation Systems
- IEEE Transactions on Intelligent Vehicles
- IEEE Transactions on Wireless Communications
- IEEE Transactions on Signal Processing
- IEEE Journal of Selected Topics in Signal Processing
- IEEE Aerospace and Electronic Systems Magazine
- IEEE Intelligent Transportation Systems Magazine
- IEEE Vehicular Technology Magazine
- NAVIGATION, Journal of the Institute of Navigation
- IEEE Control Systems Letters
- SPIE Journal of Applied Remote Sensing
- Sensors

Conferences

- IEEE/ION Position, Location, and Navigation Symposium
- IEEE Vehicular Technology Conference
- ION GNSS+ Conference
- IEEE Intelligent Vehicles Symposium
- IEEE International Conference on Acoustics, Speech, and Signal Processing
- IEEE Military Communications Conference
- IEEE Wireless Communications and Networking Conference

- ION International Technical Meeting
- IEEE Conference on Control Technology and Applications
- European Signal Processing Conference
- AIAA Guidance, Navigation, and Control Conference
- American Control Conference
- IEEE Multiconference on Systems and Control
- IFAC World Congress

Professional Memberships

- Institute of Electrical and Electronics Engineers (IEEE) Senior Member
- IEEE Aerospace and Electronic Systems Society, IEEE Intelligent Transportation Systems Society, IEEE Signal Processing Society, IEEE Communications Society, IEEE Vehicular Technology Society, and IEEE Control Systems Society
- Institute of Navigation (ION)

University Committees

**The Ohio State University
Department of Electrical & Computer Engineering**

- Personnel Committee, 2022–present

**University of California, Irvine
Department of Mechanical & Aerospace Engineering**

- Faculty Search Committee, 2019–2020
- Graduate Studies Committee, 2018–2019

Campus

- Campus Selection Committee for proposal submission to the Department of Defense Research and Education Program (REP), for Historically Black Colleges and Universities/Minority Serving Institutions (HBCU/MI), 2021

**University of California, Riverside
Campus**

- Cluster Hiring in Autonomy, Robotics, and Dynamics Committee

Bourns College of Engineering

- Research & Instructional Infrastructure Committee

Department of Electrical & Computer Engineering

- Colloquium Series Co-organizer (2016–2017, 2017–2018)
- Undergraduate Curriculum Committee
- Outreach, Recruitment, & Publicity Committee
- Department Webpage Redesign Committee

Visiting Faculty Hosted

- Prof. Jiwon Seo (Yonsei University, South Korea), 2020 – 2021

Postdoctoral Researcher Supervision

- Dr. Zeinab Shadram, 2021 – 2022
- Dr. Joe Khalife, 2020 – 2021
- Dr. Mahdi Maaref, 2017 – 2020

- Ph.D. Student Supervision**
- Joe Saroufim
 - Samer Watchi Hayek
 - Ali Kaiss
 - Haitham Kanj
 - Shaghayegh Shahcheraghi
 - Sharbel Kozhaya
 - Mu Jia
 - Mohammad Neinavaie
 - Dr. Joshua Morales, Dissertation: “Inertial radio SLAM: Standalone and collaborative architectures,” 2020
 - Dr. Joe Khalife, Dissertation: “Precise navigation with cellular signals: Receiver design, differential and non-differential frameworks, and performance analysis,” 2020
 - Dr. Kimia Shamaei, Dissertation: “Exploiting cellular signals for navigation: 4G to 5G,” 2020
- Visiting Ph.D. Student Supervision**
- Halim Lee (Yonsei University, South Korea), 2020 – 2021
- M.S. Student Supervision**
- Nadim Khairallah, Thesis: “Towards opportunistic navigation with LEO satellites: Adaptive clock estimation and closed-loop ephemeris tracking,” 2022
 - Alexander Nguyen, Thesis: “Aerial vehicle navigation with terrestrial signals of opportunity: Performance analysis and transmitter selection,” 2022
 - Ali Abdallah, Thesis: “Indoor navigation with cellular signals utilizing synthetic aperture for multipath mitigation,” 2022
 - Sonya Ragothaman, Thesis: “Path Planning for Autonomous Ground Vehicles using GNSS and Cellular LTE Signal Reliability Maps and GIS 3-D Maps,” 2018
 - Jesse Garcia, Thesis: “Autonomous Surface Vehicle Measurement Location Planning for Optimal Underwater Acoustic Transponder Localization,” 2018
 - Christian Ardito, non-thesis, 2020
 - Trier Mortlock, non-thesis, 2021
 - Mohamad Orabi, non-thesis, 2022
- Undergraduate Student Supervision**
- [31] Jonathan Low (Jan. 2022 – Mar. 2022) [30] Shiming Xu (Sep. 2021 – Mar. 2022), [29] Eddie Huang (Jan. 2020 – Mar. 2022), [28] Oleon Hariharan (Apr. 2021 – Dec. 2021), [27] Vivek Hatte (Apr. 2021 – Jun. 2021), [26] Giles Pierre Nunez Carlos (Apr. 2021 – Jun. 2021), [25] Raphael Feliciano (Oct. 2020 – Jun. 2021), [24] Andrew Zhao (Oct. 2020 – Jun. 2021), [23] Sharbel Kozhaya (Jul. 2020 – Aug. 2020), [22] Carlos Acebes Cebrián (Feb. 2020 – Jul. 2020), [21] Qitai (Neo) Meng (Oct. 2019 – Jun. 2020), [20] Yanhao Yang (Oct. 2019 – Jun. 2020), [19] Xinyi Taylor Zhang (Jun. 2019 – Mar. 2020), [18] Zainab Ashai (Apr. 2019 – Mar. 2020), [17] Bhavani Panda (Apr. 2019 – Dec. 2019), [16] Aishwarya Bhandari (Apr. 2019 – Dec. 2019), [15] Michael Maher (Oct. 2019 – Dec. 2019), [14] MyLinh Nguyen (Apr. 2019 – Sep. 2019), [13] Labiba Saleh (Jun. 2019 – Sep. 2019), [12] Mohamad Orabi (Jun. 2019 – Aug. 2019), [11] Naji Tarabay (Jun. 2019 – Aug. 2019), [10] Brandon Lam (Apr. 2019 - Jun. 2019), [9] Jerry Lee (Jan. 2019 – Jun. 2019), [8] Kyle Semelka (Apr. 2018 – Jun. 2019), [7] Chester Lau (Jul. 2018 – Apr. 2019), [6] Souradeep Gogol Bhattacharya (Oct. 2015 – Jun. 2018), [5] Christian Ardito (Mar. 2018 – Jun. 2018), [4] Sonya Ragothaman (Apr.

2016 – Sep. 2016), [3] Jesse Garcia (Apr. 2016 – Sep. 2016), [2] Gustavo Correa (Jul. 2017 – Dec. 2017), [1] Farah Khalife (Jun. 2015 – Aug. 2015)

**High School
Student
Supervision**

[2] Frank Li (Jun. 2019 – Aug. 2019), [1] Shintaro Mori (Jun. 2017 – Jun. 2018)

**Senior Design
Project
Co-supervision**

- “CubeSat” Taekyoo Won, Elias Andraos, Andraos Arain, Sarah Catania Orozco, Edwin Christhuraraj, Manasi Deshpande, Adam Adam, Aileen Juang, Jimmy Juarez, Tasmima Khan, Tasmima Koo, Tyler Lee, Bryan Matel, Krish Mehta, Shreejan Mistry, Adrian Osorio, Gabrielle Palar, Gabrielle Phan, Kendrick Phan, Kendrick Prata, Sherlock Qin, Erik Ren, Diego Rodriguez Orozco, Brianna Sandoval, Alexandria Shin, Enson Su, Raineir Tabano, Yi-Ju Tsai, Gary Villar, Grazelle Vilorio, Duong Vu, April Wu, Mengjie Xie, Catherine Zhang, Jun. 2022
- “Unmanned Floating Vehicle,” Eli Tsao, Chaz Fazio, Reece Rivera, Wessam Elmasri, Mar. 2022
- “Autonomous Target Robot,” Erik Sandelin, Huy Ho, Sary Aranki, Megan Uozumi, Anthony Atz, Mar. 2022
- “CubeSat,” Taekyoo Won, Suleyman Varlibas, Piunik Hagnazarian, Kelby Custodio, James Bohne, Anthony Castillo, Mohamed Abdelwahab, Angel Alarcon, Alarcon Chen, Edwin Christhuraraj, Sarah Catania Orozco, Tyler Cook, An Thanh Dang, Andrew Kettle, Jaeven Laron, Tyler Lee, Alexei Lorion, Adrian Osorio, Elijah Reed, Jason Sanchez, Sergio Sandoval, Alexandria Shin, Arianne Agno, Hafsah Arain, Oscar Castro, Manasi Deshpande, Aileen Juang, Xavier Lian, Weixin Lin, Andrew Nguyen, Aditi Pai, Micah Raney, Erik Ren, Diego Rodriguez Orozco, Brianna Sandoval, Enson Su, Adel Tani, Junyang Zhang, Jun. 2021.
- “Opportunistic Navigation with Iridium Next LEO Satellites,” Carlos Acebes Cebrián, Jul. 2020.
- “CubeSat,” Taekyoo Won, Armen Ter Avetisyan, Sergio Sandoval, Baldwin Ngo, Edwin Christhuraraj, Syed Hassan, Akash Idnani, Jaeven Laron, Adrian Osorio, Caleb Smith, Anthony Drabeck, Fadi Samaan, Jun. 2020.
- “Mobile Simulated Buoy Hub II,” Shyam Patel, Joseph Parra, Haniel Youlesivanson, Jeffery Vuong, and Alexander Kim, Mar. 2020.
- “Mobile Simulated Buoy Hub I,” Taylor Filemon, Chunguang Yang, Jiayi Wu, and Christopher Navarro, Mar. 2020.
- “Unmanned Surface Vehicle with Auto Attach/Detach Data Connectors,” Lorjean Sagabaen, Alexander Janbo, Dennis Chua, Yuchen Geng, and James Le, Mar. 2020.
- “Autonomous Target Scoring Drone II,” Leo Leal, Kian Farsany, June Chen, and Zachary Agness, Mar. 2020.
- “Trilateral FM Signal Locator,” Yiran Xu, Gary Zhou, and Zhi Qiu, Mar. 2020.
- “Wideband Spectrum Monitor,” Brian Dang, Mark Tullen, Jesus Lopez, and Vincent Villacorta, Mar. 2020.
- “Rogue RF Signal Detector Drone,” Yehuda Rousso, Erick Magana, and Che-Wei Chang, Mar. 2020.
- “Drone Leader-Follower II,” Andy Vu, Lawrence Dizon, David Phan, and Hugh Fong, Mar. 2020.
- “Autonomous Target Robot II,” Olga Shigapova, Don Isbell, and Carmine Choi, Mar. 2020.

- “Drone Leader-Follower I,” Ameer Hussain, Amauri Villegas, Phillip Flores, and Jacob Hurley, Mar. 2020.
- “Autonomous Target Robot I,” Alex Yamamura, Brandon Kuo, Simon Lee, and William Hartono, Mar. 2020.
- “Autonomous Target Scoring Drone I,” Sukhmanjit Kaur, Eric Rodriguez, Bert Yu, and Bibek Adhikari, Mar. 2020.
- “Auto-Adjusting P2P Microwave Link,” David Tiao, Wilfredo Paraiso, and Wilfredo Paraiso, Mar. 2020.
- “Rogue RF Signal Detector Drone,” Sem Diaz, Edwin Torres, and Matthew Scudder, Mar. 2019.
- “Trilateral FM Signal Locator,” Sean Pickman and Alan Nguyen, Mar. 2019.
- “Wideband Spectrum Monitor,” Daniel Aleman, Robert Almeida, and Karla Penney, Mar. 2019.
- “Autonomous Target Robot,” Coulter Mulvihill, Henry Hua, and Xinyi Wu, Mar. 2019.
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- “Autonomous Target Robot,” Taylor Che, Samuel Choi, and Francisco Munoz, Mar. 2018.
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- “Auto-Adjusting P2P Microwave Link,” Shane Owens, Jesse Layman, and Curtis Smith, Mar. 2018.
- “Autonomous Target Scoring Drone,” Jiaming Zhou and Gerardo Hernandez, Mar. 2018.
- “Trilateral FM Signal,” Wang Hu, Rongjia Zhang, and Xin Ke, Mar. 2018.
- “Localization of RF Transmission Using Phased Arrays,” Albert Liu and Matthew Lumantas, Mar. 2018.
- “Wideband Spectrum Monitor,” Christian Ardito and Bradley Evans, Mar. 2018.

M.S. Thesis Committees

- Jiarui Liu, “Analysis of EV Charging Load Based on Household Driving Data in California,” Jul. 2015.

Ph.D. Dissertation Defense Committees

- Yiming Chen, “A New Approach for Computationally Efficient and Reliable Carrier Integer Ambiguity Resolution in GPS/INS,” Dec. 2014.
- Sheng Zhao, “Realtime, Decimeter Accuracy Navigation Using Sliding Window Estimator and Autonomous Vehicle Trajectory Tracking Control,” Dec. 2014.

Outreach

Creator of “Game of Drones,” an annual competition for middle and high school students to inspire students to pursue science, technology, engineering, and mathematics (STEM) fields. Since 2016, Game of Drones has engaged nearly 300 students.