Where: Online/Virtual
When: 25 May, 2022
Registeration link

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Info: farbodk@caltech.edu

Quantum Engineering Workshop, Sponsored by ASME, JAVS

25 May, 2022

A 1-day free online workshop

Pushing the engineering boundaries beyond existing techniques,
Sponsored by American Society for Mechanical Engineers (ASME)

Quantum Engineering Workshop – ***25 May 2022***

Click here to join the Webinar

8:30am–8:40am - Opening welcome

Distingished speakers:

8:40 am - 9:30 am
Dr. Marco Quadrelli, *Jet Propulsion Laboratory*
“Exploring the Intersection between Robotic Space Exploration and Quantum Technology”

9:30 am - 10:00 am
Prof. Prem Kumar, *ECE and Physics, Northwestern University*
“Engineering Challenges for the Emerging Quantum Networks”

10:00 am - 11:00 am
Prof. Steven M. Girvin*, Physics and Applied Physics, Yale University*
“Progress and Prospects for the Second Quantum Revolution”

11:00 am - 11:30 am
Prof. Edoardo Charbon, *Advanced Quantum Architecture Lab (AQUA), EPFL*
On Cryo-CMOS Qubit Control: from a Wild Idea to Working Silicon

11:30 am - 12:00 pm
Dr. Kathy-Anne Brickman Soderberg, *Air Force Research Laboratory (AFRL)*
“Quantum Networking at AFRL”

12:00 pm - 12:30 pm; Break

12:30 am - 1:00 pm
Prof. Tryphon Georgiou, UC Irvine
“Density transport and the Lindblad equation”

1:00 pm - 1:30 pm
Prof. Clarice D. Aiello, *UCLA*
“From nanotech to living sensors”

1:30 pm - 2:00 pm
Prof. Britton Plourde, *Syracuse University*
“Protecting Superconducting Qubits from Environmental Poisoning”

2:00 pm - 2:30 pm; Break

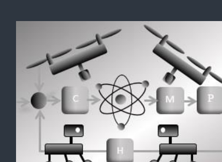
2:30 pm - 3:00 pm
Dr. Alexey Gorshkov, *University of Maryland*
“Quantum Sensor Networks”

3:00 pm - 3:30 pm
Dr. Joshua C. Bienfang, *National Institute of Standards and Technology (NIST)*
"Single-photon detection systems for advanced photon counting"

3:30 pm - 4:00 pm
Dr. Neil Zimmerman, *NIST*
“Challenges of Distributing Entanglement over a Quantum Network”

4:00 pm - 4:30 pm
Dr. Thomas Gerrits, *NIST*
“Optical Quantum Metrology – from component characterization to quantum network metrology”

4:30 pm - 5:30 pm
Dr. Aditya N. Sharma; *NIST*
“Precision-enhanced displacement measurements using correlated photon pairs”



Dr. Marco B. Quadrelli

Dr. Quadrelli is a principal research technologist and the supervisor of the Robotics Modeling and Simulation Group in the Robotics Section at JPL. He is an expert in modeling for dynamics and control of complex space systems. He has a degree in Mechanical Engineering from Padova (Italy), a Master's Degree in Aeronautics and Astronautics from MIT, and a PhD in Aerospace Engineering from Georgia Tech. He was a visiting scientist at the Harvard-Smithsonian Center for Astrophysics, at the Institute for Paper Science and Technology, and a lecturer at the Caltech Graduate Aeronautical Laboratories. After joining NASA JPL in 1997 he has contributed to a number of flight projects including the Cassini-Huygens Probe, Deep Space One, the Mars Aerobot Test Program, the Mars Exploration Rovers, the Space Interferometry Mission, the Autonomous Rendezvous Experiment, and the Mars Science Laboratory, among others. He has been the Attitude Control lead of the Jupiter Icy Moons Orbiter Project, and the Integrated Modeling Task Manager for the Laser Interferometer Space Antenna. He has led or participated in several independent research and development projects in the areas of computational micromechanics, dynamics and control of tethered space systems, formation flying, inflatable apertures, hypersonic entry, precision landing, flexible multibody dynamics, guidance, navigation and control of spacecraft swarms, terra-mechanics, and precision pointing for optical systems. His current research interests are in the areas of multi-domain, multi-physics, multi-body, multi-scale physics-based modeling, dynamics and control. He is an Associate Fellow of the American Institute of Aeronautics and Astronautics, a NASA Institute of Advanced Concepts Fellow, and a Caltech/Keck Institute for Space Studies Fellow.

Talk: Exploring the Intersection between Robotic Space Exploration and Quantum Technology

Abstract: In this talk, Dr. Quadrelli will present an overview of robotic systems for planetary exploration being developed at JPL, the trends driving the current developments in planetary robotics, some of the technical challenges involved, and some of his personal thoughts on possible applications of quantum-related technologies in this area.

Professor Prem Kumar

Prem Kumar is Professor of Information Technology in the McCormick School of Engineering at Northwestern University. His research focus is on quantum photonic devices and their applications: generation, distribution, and ultrafast processing of photonic entanglement for applications in quantum information networks; novel quantum light states for precision measurements, imaging, and sensing; and novel optical amplifiers and devices for networked optical communications. Ph.D. graduates from his research group (35 completed & 5 in progress) have gone on to build careers in academia, industry, and US national labs. His group has cumulatively published >500 research papers (Google Scholar h-index: 62). During 2013-2017, Dr. Kumar was a Program Manager at DARPA, where he created and managed a portfolio of programs in basic and applied sciences. He was selected Program Manager of the Year in 2015 and awarded the Secretary of Defense Medal for Outstanding Public Service in 2016. He is a Fellow of Optica (formerly OSA), APS, IEEE, IoP (U.K.), AAAS, and SPIE. He has been a Distinguished Lecturer for the IEEE Photonics Society, Hermann A. Haus Lecturer at MIT, recipient of the Quantum Communication Award from Tamagawa University in Tokyo, Japan, and the Walder Research Excellence Award from the Provost's office at Northwestern University. Since 2020 he is serving as the Editor-in-Chief of Optica (2020 Impact Factor: 11.1), the flagship journal of the Optica Publishing Group for high-impact results across the whole spectrum of optics and photonics, pure and applied.

Talk: Engineering Challenges for the Emerging Quantum Networks

Quantum internet of the future will require device functionalities that implicitly respect the fundamental facts such as quantum information cannot be copied, and cannot be measured precisely. A quantum repeater, for example,—analog of an optical amplifier that enabled global reach of the ubiquitous Internet connectivity we enjoy today—is yet to be demonstrated, although recent years have seen tremendous progress. Many other device functionalities—switches, routers, format converters, etc.—would also be needed that do not unnecessarily disturb or corrupt the quantum information as it flows from one node of the internet to another. In recent years, my group has engineered many quantum tools and techniques that fulfill the requirements for distributing quantum information in a networked environment. In this talk, I will present our motivation, design, construction, characterization, and utilization of some example techniques for near-term networked quantum applications.

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Professor Steven M. Girvin
Eugene Higgins Professor of Physics and Professor of Applied Physics, Yale University
Websites:
https://girvin.sites.yale.edu/
https://quantuminstitute.yale.edu/
https://www.bnl.gov/quantumcenter/

After graduating in a high school class of 5 students in the small village of Brant Lake, NY and completing his undergraduate degree in physics from Bates College, Dr. Girvin earned his Ph.D. in theoretical physics from Princeton University in 1977.
Dr. Girvin joined the Yale faculty in 2001, where he is Eugene Higgins Professor of Physics and Professor of Applied Physics. From 2007 to 2017 he served as Yale's Deputy Provost for Research, overseeing strategic planning for research across Yale. From 2019 to 2021, he served as founding director of the Co-Design Center for Quantum Advantage, one of five national quantum information science research centers funded by the Department of Energy.
Along with his experimenter colleagues Michel Devoret and Robert Schoelkopf, Professor Girvin co-developed 'circuit QED,' the leading architecture for construction of quantum computers based on superconducting microwave circuits.
Dr. Girvin is a Foreign Member of the Royal Swedish Academy of Sciences and Member of the US National Academy of Sciences. In 2007, he and his collaborators, Allan H. MacDonald and James P. Eisenstein were awarded the Oliver E. Buckley Prize of the American Physical Society for their work on the fractional quantum Hall effect. In 2019, he and coauthor Kun Yang published the textbook "Modern Condensed Matter Physics" with Cambridge University Press.

Talk: Progress and Prospects for the Second Quantum Revolution

Department of Physics & Yale Quantum Institute, Yale University, and Co-Design Center for Quantum Advantage, Brookhaven National Laboratory
The first quantum revolution brought us the great technological advances of the 20th century—the transistor, the laser, the atomic clock and GPS, the global positioning system. A 'second quantum revolution' is now underway based on our relatively new understanding of how information can be stored, manipulated and communicated using strange quantum hardware that is neither fully digital nor fully analog. We now realize that 20th century hardware does not take advantage of the full power of quantum machines. This talk will give a gentle introduction to the basic concepts that underlie this quantum information revolution and describe recent remarkable experimental progress in the race to build quantum machines for computing, sensing and communication.

Professor Edoardo Charbon
Edoardo Charbon (SM'00 F'17) received the Diploma from ETH Zurich, the M.S. from the University of California at San Diego, and the Ph.D. from the University of California at Berkeley in 1988, 1991, and 1995, respectively, all in electrical engineering and EECS. He has consulted with numerous organizations, including Bosch, X-Fab, Texas Instruments, Maxim, Sony, Agilent, and the Carlyle Group. He was with Cadence Design Systems from 1995 to 2000, where he was the Architect of the company's initiative on information hiding for intellectual property protection. In 2000, he joined Canesta Inc., as the Chief Architect, where he led the development of wireless 3-D CMOS image sensors. Since 2002 he has been a member of the faculty of EPFL. From 2008 to 2016 he was with Delft University of Technology's as full professor and Chair of VLSI design. He has been the driving force behind the creation of deep-submicron CMOS SPAD technology, which is mass-produced since 2015 and is present in telemeters, proximity sensors, and medical diagnostics tools. His interests span from 3-D vision, LiDAR, FLIM, FCS, NIROT to super-resolution microscopy, time-resolved Raman spectroscopy, and cryo-CMOS circuits and systems for quantum computing. He has authored or co-authored over 400 papers and two books, and he holds 23 patents. Dr. Charbon is a distinguished visiting scholar of the W. M. Keck Institute for Space at Caltech, a fellow of the Kavli Institute of Nanoscience Delft, a distinguished lecturer of the IEEE Photonics Society, and a fellow of the IEEE.

Talk: On Cryo-CMOS Qubit Control: from a Wild Idea to Working Silicon

Abstract—The core of a quantum processor is generally an array of qubits that need to be controlled and read out by a classical processor. This processor operates on the qubits with nanosecond latency, several millions of times per second, with tight constraints on noise and power. This is due to the extremely weak signals involved in the process that require highly sensitive circuits and systems, along with very precise timing capability. We advocate the use of CMOS technologies to achieve these goals, whereas the circuits will be operated at deep-cryogenic temperatures. We believe that these circuits, collectively known as cryo-CMOS control, will make future qubit arrays scalable, enabling a faster growth in qubit count. In the lecture, the challenges of designing and operating complex circuits and systems at 4K and below will be outlined, along with preliminary results achieved in the control and read-out of qubits by ad hoc integrated circuits that were optimized to operate at low power in these conditions. The talk will conclude with a perspective on the field and its trends.

Dr. Kathy-Anne Brickman Soderberg

Dr. Kathy-Anne Brickman Soderberg is a Principal Research Scientist at the Air Force Research Laboratory (AFRL) Information Directorate in Rome, NY. Dr. Soderberg is the primary investigator and team lead for AFRL's Trapped-Ion Quantum Networking group. Dr. Soderberg received a B.S. in physics from the College of William and Mary, a M.S. and Ph.D. in physics from the University of Michigan, and was a postdoctoral researcher at the University of Chicago. Dr. Soderberg has over fifteen years of technical experience in atomic physics and quantum information processing. Her graduate work focused on trapped-ion quantum computing research and included key demonstrations of phonon-mediated entangling gates and proof-of-principle quantum algorithms (the Grover search algorithm). Her postdoctoral work focused on novel neutral-atom quantum computing and the difficulties associated with targeted atomic interactions and optical lattice translation and control. Before joining AFRL, Dr. Soderberg was a technical consultant for quantum information science.

Talk: Quantum Networking at AFRL

Abstract: Effective and efficient ways to connect disparate qubit technologies is an outstanding challenge in quantum information science. However, the ability to interface different qubit modalities will have far-reaching implications for quantum computing and quantum networking. Here we present plans and progress toward developing a distributed quantum networking testbed to distribute entanglement between trapped ion, superconducting, and integrated photonic qubits.

Professor Tryphon Georgiou
University of California, Irvine

Tryphon T. Georgiou was educated at the National Technical University of Athens, Greece, and the University of Florida, Gainesville (PhD 1983). He is currently a Distinguished Professor of Mechanical and Aerospace Engineering at the University of California, Irvine. He is also Professor Emeritus at the University of Minnesota, where he held the Hermes-Luh Chair (2002-2016) and served as co-director of the Control Science and Dynamical Systems Center (1990-2016). Dr. Georgiou is a Fellow of the IEEE, SIAM, IFAC, and a Foreign Member of the Royal Swedish Academy of Engineering Sciences (IVA).

Talk: Density transport and the Lindblad equation

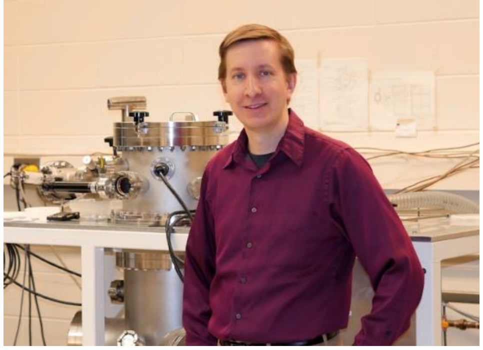
Abstract: A celebrated result by Jordan, Kinderlehrer and Otto, in 1998, expressed the Fokker-Planck equation as a gradient flow of the Shannon entropy with respect to a metric on probability laws induced by optimal mass transport. We will discuss extensions of the formalism of optimal mass transport to the non-commutative setting that aims at quantum density matrices. It allows defining suitable optimal transport geometries. For a specific choice and the corresponding metric on density functions, the Lindblad equation of open quantum systems (quantum diffusion) can be expressed as gradient flow of the von Neumann quantum entropy, generalizing the Jordan etal. result.
Joint work with Yongxin Chen (GaTech) Wilfrid Gangbo (UCLA) and A. Tannenbaum (Stony Brook)

Dr. Clarice D. Aiello

Prof. Clarice D. Aiello is a quantum engineer interested in how quantum physics informs biology at the nanoscale. She is an expert on nanosensors harnessing room-temperature quantum effects in noisy environments. Aiello received her Ph.D. from MIT in Electrical Engineering and held postdoctoral appointments in Bioengineering at Stanford, and in Chemistry at Berkeley. She joined UCLA in 2019, where she leads the Quantum Biology Tech (QuBiT) Lab.

Talk: From nanotech to living sensors: unraveling the spin physics of biosensing at the nanoscale

Substantial in vitro and physiological experimental results suggest that similar coherent spin physics might underlie phenomena as varied as the biosensing of magnetic fields in animal navigation and the magnetosensitivity of metabolic reactions related to oxidative stress in cells. If this is correct, organisms might behave, for a short time, as "living quantum sensors" and might be studied and controlled using quantum sensing techniques developed for technological sensors. I will outline our approach towards performing coherent quantum measurements and control on proteins, cells and organisms in order to understand how they interact with their environment, and how physiology is regulated by such interactions. Can coherent spin physics be established – or refuted! – to account for physiologically relevant biosensing phenomena, and be manipulated to technological and therapeutic advantage?



Professor Britton Plourde

Britton Plourde is a Professor of Physics at Syracuse University where he runs a low-temperature research lab focused on the design, fabrication, and measurement of superconducting circuits for quantum information processing. He received his Ph.D. in Physics from the University of Illinois at Urbana-Champaign in 2000, then worked on superconducting flux qubit experiments as a postdoc with John Clarke at UC Berkeley until 2005, at which time he joined the faculty at Syracuse. Some of his many contributions to the field include investigations of decoherence mechanisms related to trapped vortices and quasiparticles, parametric driving schemes for coupling qubits and resonant modes, and digital coherent control and readout of superconducting qubits. He received an NSF CAREER Award and the IBM Faculty Award. From 2013-2019 he was the Editor-in-Chief of the IEEE Transactions on Applied Superconductivity, and from 2021-2022 he was the Editor-in-Chief of the IEEE Transactions on Quantum Engineering.

Talk: Protecting Superconducting Qubits from Environmental Poisoning

Superconducting circuits are an attractive system for forming qubits in a quantum computer because of the natural energy gap to excitations in the superconductor. However, experimentally it is observed that superconducting qubits have excitations above the superconducting ground state, known as quasiparticles, at a density that is many orders of magnitude above the expected equilibrium level. These quasiparticles are dissipative and can directly impact qubit coherence; in some cases, quasiparticle poisoning bursts can lead to correlated errors between qubits across an array, a process that is fatal to quantum error correction schemes. Quasiparticles can be generated by a range of energy-deposition sources, including photons from the qubit environment with energy above the superconducting gap, or the impact of high-energy particles from background radioactivity or cosmic ray muons. I will give an overview of these various quasiparticle poisoning mechanisms and describe some recent experiments in my lab to study correlated quasiparticle poisoning in multiqubit chips. In this case, the correlations are due to energetic phonons traveling through the device substrate. We have implemented a technique for using thick normal-metal reservoirs on the back-side of the qubit chip for downconverting these phonons to energies below the superconducting gap. We demonstrate a decrease in the flux of poisoning phonons by more than a factor of 20 and a two order-of-magnitude reduction in correlated poisoning due to ambient radiation. This approach reduces correlated errors due to background radiation below the level necessary for fault-tolerant operation of a multiqubit array.

Dr. Alexey Gorshkov

Alexey Gorshkov received his A.B. and Ph.D. degrees from Harvard in 2004 and 2010, respectively. In 2013, after three years as a Lee A. DuBridge Postdoctoral Scholar at Caltech, he became a staff physicist at NIST. At the same time, he started his own research group at the University of Maryland, where he is a fellow of the Joint Quantum Institute and of the Joint Center for Quantum Information and Computer Science. His theoretical research is at the interface of quantum optics, atomic physics, condensed matter physics, and quantum information science. Applications of his research include quantum computing, quantum communication, and quantum sensing. He is a recipient of the 2020 Arthur S. Flemming Award, the 2020 APS Fellowship, the 2019 PECASE, and the 2018 IUPAP Young Scientist Prize in AMO Physics.

Talk: Quantum Sensor Networks

Entangling quantum sensors, such as magnetometers or interferometers, can dramatically increase their sensitivity. In this talk, we will discuss how entanglement in a network of quantum sensors can be used to accurately measure one or more properties of spatially varying fields and how to do such measurements with a minimal use of entanglement.

Dr. Joshua C Bienfang

Dr. Bienfang is a physicist in the Quantum Optics Group at the National Institute of Standards and Technology. He began his post-graduate research on high-speed quantum key distribution in 2003, research that lead to research on high-performance single-photon detection systems, detector characterization techniques, and the investigation of other quantum communications protocols. He was part of the 2015 NIST team to conduct a loophole-free Bell test, and he continues to focus on detector development and quantum networks.

Talk: Single-photon detection systems for advanced photon counting

Abstract: Single-photon detectors provide a critical bridge from the quantum to the classical domains, and while they are often identified by a single element (e.g. a nanowire or an avalanche diode), they operate in a control and readout system that often has a major impact on the detector's performance. I will discuss readout an control systems for both single-photon avalanche diodes (SPADs) and large-format superconducting nanowire single-photon detector (SNSPD) arrays. I will discuss our use of RF interferometry to bias and readout SPADs that has lead to an increase in single-photon count rates in Si SPADs of a factor of 10, and a significant reduction in noise in gated InGaAs/InP SPADs. For mega-pixel scale SNSPD arrays I will present recent advances in superconducting-electronics-based systems for accumulating counts at the sensor for later readout.

Dr. Neil Zimmerman

Neil Zimmerman received a Ph.D. in Physics from Cornell University in 1989; he worked as a postdoc at Bell Labs Murray Hill, and since 1994 has been working at NIST in Gaithersburg, MD, USA. His main research topics have been single-electron transport in metal and semiconducting quantum dots, and he is now starting up a collaboration on combining single-electron with single-photon physics. The main goals of this work are i) electrical and optical metrology and ii) quantum coherent phenomena including QIST. He also has a role as the Coordinator of the Quantum Network Grand Challenge at NIST.

Talk: Challenges of Distributing Entanglement over a Quantum Network

Abstract: Using the definition that a quantum network is one that can distribute entanglement between stationary qubits, I will discuss the major technical and scientific challenges facing the community. It is likely that Workshop attenders are familiar with many of the technical challenges, and I will review them – switches, fiber attenuation/distortion/Raman scattering, deterministic sources, Photonic Integrated Circuits (PICs), . As part of my presentation, I would also like to have a focused discussion about what I see as the biggest scientific (or perhaps programmatic) challenge: What is the “killer app” for a Quantum Network or a Quantum Internet? Please come prepared to give your thoughts on this!

Dr. Thomas Gerrits

Thomas Gerrits is a Physicist in the Applied and Computational Mathematics Division at the National Institute of Standards and Technology, where he is developing widgets, methods and protocols for the characterization of future quantum network components. His research interests include the generation of exotic quantum states of light, optical quantum metrology, development of measurement tools for quantum and classical optics and single photon imaging.

Talk: Optical Quantum Metrology – from component characterization to quantum network metrology

Abstract: In classical optical communication systems, the development of improved measurements, telemetry, emulation, and control protocols has ensured the success of each new generation of commercial deployment. Quantum network technology remains in the research and development phase, with a wide range of approaches and techniques being pursued. However, it is essential that robust quantum metrology protocols and procedures be established to implement the consistent telemetry needed to ensure seamless integration of these technologies. In addition, metrics, and measurement methods to characterize quantum network components and the interaction between classical and quantum networks will be necessary. All the above involve the verifiable dissemination of quantum information, including entanglement, and by far the most promising method for entanglement distribution is with the use of optical photons. Establishing standardized metrology procedures and tools to characterize quantum information carried by photons through complex heterogeneous networks of quantum systems and to further the development of network components will be necessary. I will present our efforts towards the metrology of quantum networks and review some of the metrology tools already developed in our labs for quantum component and quantum network characterization.

Dr. Aditya N. Sharma

Aditya N. Sharma is a postdoctoral researcher at the Joint Quantum Institute at the University of Maryland, College Park. He received his Ph.D. from the University of Illinois at Urbana-Champaign in 2016, for work on multipartite entanglement using hyperentangled photons. His more recent research has included work on quantum gates in fused-silica waveguides, and precision measurement using entangled states of light. He currently works on experiments in rare-earth-doped crystals, towards realizing a practical quantum memory.

Talk 1: Atomic frequency combs for broadband quantum memory

Quantum memory will play an important role in quantum networks, notably as components in quantum repeaters. One promising technique for realizing broadband quantum memory, the atomic frequency comb (AFC) protocol, calls for a material with large inhomogeneous broadening and small homogeneous broadening: spectral-hole burning techniques can be used to prepare the absorption spectrum in a periodic pattern of narrow peaks (an AFC). A single photon, absorbed as a collective excitation, will be reemitted after a time interval fixed by the AFC tooth spacing. On-demand retrieval can also be realized by using control pulses to implement spin-wave storage.

Rare-earth-doped crystals like Pr3+:Y2SiO5 are well-suited to the AFC protocol. However, in many cases the materials have hyperfine structure that limits AFC bandwidth. Here, we present an experiment showing that it is possible to work within these constraints to generate broadband AFCs.

Talk 2: Precision-enhanced displacement measurements using correlated photon pairs

Beam-displacement measurement is useful for a variety of applications requiring detection of positional displacements or angular deflections. Typically, the maximum precision achievable by these measurements is limited by the inverse of the beam width. Here we present an experimental demonstration of a scheme for evading this limitation using split detection of correlated photon pairs. The techniques discussed here may prove useful in measurement scenarios requiring high sensitivity at low light intensity..

Organizer: Dr. Farbod Khoshnoud

Contact: farbodk@caltech.edu

Farbod Khoshnoud, PhD, PGCE, CEng, M.IMechE, M.ASME, HEA Fellow, is a faculty member in Electromechanical Engineering at California State Polytechnic University, Pomona. His current research areas include Self-powered Dynamic Systems, Nature/Biologically Inspired Dynamic Systems, and Quantum Entanglement and Quantum Cryptography for Multibody Dynamics, Robotics, Controls, and Autonomy applications. He is a visiting associate in the Center for Autonomous Systems and Technologies in the Department of Aerospace Engineering at California Institute of Technology.

He was a research affiliate in the Mobility and Robotic Systems section at NASA Jet Propulsion Laboratory, Caltech in 2019; an Associate Professor of Mechanical Engineering at California State University, USA; a visiting Associate Professor in the Department of Mechanical Engineering at the University of British Columbia (UBC), Vancouver, Canada, in 2017; a Lecturer in the Department of Mechanical Engineering at Brunel University London, UK, 2014-16; a senior lecturer at the University of Hertfordshire, 2011-2014; a visiting scientist and postdoctoral researcher in the Industrial Automation Laboratory, Department of Mechanical Engineering, at UBC, Vancouver, 2007-2012; a visiting researcher at California Institute of Technology, USA, 2009-2011; and a Postdoctoral Research Fellow in the Department of Civil Engineering at UBC, 2005-2007. He received his Ph.D. in Mechanical Engineering from Brunel University in 2005. He has worked in industry as a mechanical engineer for over six years. He is an associate editor of the Journal of Mechatronic Systems and Control (formerly Control and Intelligent Systems); and the editor of the Quantum Engineering special issue of the Journal of Mechatronic Systems and Control.

Journal of Autonomous Vehicles and Systems (JAVS)

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