Army Research Laboratory Technical Assessment Board: 2024 Panel on Assessment of Photonics, Electronics, and Quantum Sciences

Committee

Pramod K. Varshney

Chair

Pramod K. Varshney is currently a Distinguished Professor of electrical engineering and computer science at Syracuse University. His research addresses fundamental questions in statistics-based signal processing, data/information fusion, sensor data processing, data analytics, machine learning and AI. Starting in the early 1980s, he pioneered the area of data/information fusion and inference in sensor networks. He has published extensively. During 2009-2023, he served as the Executive Director of the NY state-supported Center for Advanced Systems and Engineering (CASE) where he was responsible for technology transition of university expertise to make economic impact in the high-tech economy of New York including several companies in the defense sector. Dr. Varshney received the 1981 ASEE Dow Outstanding Young Faculty Award. In 1997, he was elected to the grade of fellow of IEEE for his contributions in the area of distributed detection and data fusion. In 2000, he received the Third Millennium Medal from the IEEE and the Chancellor's Citation for exceptional academic achievement at Syracuse University. He also received the IEEE 2012 Judith A. Resnik Award, Doctor of Engineering Honoris Causa from Drexel University in 2014, the ECE Distinguished Alumni Award from the University of Illinois in 2015, the ISIF's Yaakov Bar-Shalom Award for a Lifetime of Excellence in Information Fusion in 2018, the Claude Shannon-Harry Nyquist Technical Achievement Award from the IEEE Signal Processing Society, the Pioneer Award from the IEEE Aerospace and Electronic Society in 2021, and Syracuse University Chancellor's Lifetime Achievement Award in 2023. He received the B.S. degree (Highest Honors) in electrical engineering and computer science and the M.S. and Ph.D. degrees in electrical engineering from the University of Illinois at Urbana– Champaign.

Christine A. Wang

Chair

Christine A. Wang (NAE) (retired) is a part-time flex Senior Staff member in the Laser Technology and Applications Group at MIT Lincoln Laboratory. She has done extensive work on compound semiconductor epitaxial materials for advanced optoelectronic devices. Her expertise is in organometallic vapor phase epitaxial crystal growth, materials characterization, and device development. She has advanced the state-of-the-art in gallium arsenide-, gallium antimonide-, and indium phosphide-based materials for diode lasers, quantum cascade lasers, and thermophotovoltaic cells. She received the American Association of Crystal Growth Award. Dr. Wang is a Fellow of the National Academy of Inventors and a member of the National Academy of Engineering. Dr. Wang received the S.B., M.S., and Ph.D. degrees from the Materials Science and Engineering Department of the Massachusetts Institute of Technology.

Jennifer Choy

Member

Jennifer Choy is an assistant professor in the college of engineering at the University of Wisconsin-Madison. Dr. Choy’s current research focuses on the development of quantum sensing platforms and the application of nanoscale optics, photonics, and mechanics to improve the utility and performance of quantum sensors. Her research group will study and engineer light-matter interactions and coherence properties relevant to sensing in two material platforms: cooled neutral atoms and solid-state quantum emitters (e.g., color centers in diamond and silicon carbide). This interdisciplinary research program will involve experimental atomic physics and optics, multi-physics modeling, materials development, and nanofabrication, and is intended to enable practical implementation of quantum instruments in precision navigation systems, clocks, and electromagnetic field and environmental sensors. Prior to joining UW-Madison, Dr. Choy was a Principal Member of Technical Staff at Draper Laboratory where she developed atomic and optical inertial sensors and served as technical director on Draper’s contribution to DARPA’s Chip-scale Combinatorial Atomic Navigator (C-SCAN) program. Dr. Choy received her S.B. degrees in Physics and Nuclear Engineering from the Massachusetts Institute of Technology in 2007, and her Ph.D. in Applied Physics from Harvard University in 2013.

Elizabeth A. Donley

Member

Elizabeth Donley has been with the NIST Time and Frequency Division since 2002 and has been serving as Chief of the Time and Frequency Division since November of 2018. She is an experimental physicist with expertise in atomic, molecular, and optical physics that includes single-molecule spectroscopy, Bose-Einstein condensation, atomic clocks, and inertial sensors. She has authored or co-authored over 100 papers in technical journals. She is the recipient of two Department of Commerce Gold Medal Awards, an IEEE Sawyer Award, and a UFFC Distinguished Service Award. She currently serves on multiple working groups for the Consultative Committee for Time and Frequency for the International Bureau of Weights and Measures, including serving as chair of the Working Group on Algorithms. She recently served as the Working Group Chair for the revision of two IEEE standards on the topic of frequency control. Other recent service to the time and frequency community includes organizing symposia and training at national and international conferences, serving as Vice President for Frequency Control for the IEEE UFFC Society, and advising graduate students from the University of Colorado. Dr. Donley received her Ph.D. in the natural sciences from the Swiss Federal Institute of Technology in 2000.

F. Barry Dunning

Member

F. Barry Dunning is the Sam and Helen Worden Professor of Physics in the Department of Physics and Astronomy at Rice University in Houston, Texas where he has served multiple terms as Department Chair. He has expertise in the area of atomic, molecular, and optical physics, specifically the physics and applications of Rydberg atoms/molecules, a field which he pioneered, as well as in surface physics, specifically in design and application of spin-sensitive and other surface spectroscopies. The Rice “micromott” spin analyzer design that was developed in this work is now used in many laboratories world-wide. In all, he has authored over 350 peer-reviewed publications covering these areas. He is a Fellow of the American Institute of Physics and the Institute of Physics UK. He has chaired both the Division of Atomic, Molecular, and Optical Physics of the American Physical Society and the International Conference on Photonic, Electronic and Atomic Collisions. He has served as Member/Chair of multiple APS Prize committees and also on the National Academies’ Panel on the Future of Atomic, Molecular, and Optical Sciences as well as the Grants Advisory Committee for the Research Corporation. Dr. Dunning received both his BSc (Honors), and his PhD in atomic physics (in 1969), from University College London.

Jennifer O. Hasler

Member

Jennifer Olson Hasler is the Regents Professor for Entrepreneurship at the Georgia Institute of Technology in the School of Electrical and Computer Engineering. Dr. Hasler founded the Integrated Computational Electronics (ICE) laboratory at Georgia Tech, a laboratory affiliated with the Laboratories for Neural Engineering. Her general expertise includes: computer engineering, electronics; medical device design, development and delivery; micro and nano device engineering; miniaturization and integration; and semiconductors and her research interests include: analog-digital signal processing / mixed signal integrated circuits (systems on a chip); scaling of deep submicron devices; floating-gate devices, circuits, and systems; The use of floating-gate MOS transistors to build "smart" interfaces for MEMS sensors; low power electronics; and, analog VLSI models of on-chip learning and sensory processing in neurobiology Dr. Hasler is a member of Tau Beta P, Eta Kappa Nu, and the IEEE. Dr. Hasler received her B.S.E. and M.S. degrees in electrical engineering from Arizona State University. She received her Ph.D. in computation and neural systems from California Institute of Technology.

Michael Judy

Member

Michael Judy recently became a laboratory fellow at Draper Laboratory. He was previously at Analog Devices where he served as a Technical Fellow in the field of MEMS Technology and Sensors. He has 30 years of experience in all aspects of MEMS technology and product development including MEMS manufacturing. He has developed many different MEMS devices including accelerometers, gyros, optical switches, microphones, pressure sensors, CMUTs, microresonators, filters and temperature sensors. While at Analog Devices his technical focus was on multi-physics applications such as inertial sensors and high-performance cooling technology. Most recently he was the Director of MEMS design and director MEMS Research & Development. Dr. Judy has 40 U.S. patents pending or awarded and holds a Doctorate of Electrical Engineering from University of California, Berkeley and a Bachelor of Science from the Massachusetts Institute of Technology.

Robert A. Lieberman

Member

Robert Lieberman (NAE) is President of Lumoptix LLC. His technology focus has primarily been on the development of optics-based sensing and monitoring techniques and products, including sensors based on chemically sensitized fibers, free-space propagation, photonic integrated circuits, and a variety of spectroscopic techniques (UV-VIS-NIR; WMS and DC infrared, THz, Raman, fluorescence, plasmon resonance). He has also worked with non-optical sensors, and optical/photonic projects unrelated to sensing. Applications have included diagnostics, chemical detection, nondestructive evaluation, structural health monitoring, environmental monitoring, alternative fuel vehicle safety, aerospace systems, and many others. Educated in solid-state physics and molecular biophysics Dr. Lieberman worked for ten years at AT&T Bell Labs in the semiconductor Development, Physics Research, and Materials Research Laboratories. Dr. Lieberman became Vice President of R&D at Physical Optics Corporation (POC) in 1991, and in 1998 spun off his division of POC to found Intelligent Optical Systems (IOS). While serving as President and CTO, Dr. Lieberman maintained an active research career as Principal Investigator for NSF, NIH, DOE, NASA, DARPA, Army, and other U.S. agencies until his retirement from IOS in 2015. Dr. Lieberman holds 34 U.S. patents on biological, physical, and chemical sensors and systems, has organized and chaired more than 30 conferences on optical sensors, and has helped found several companies. Dr. Lieberman is a Life Member of IEEE, a Fellow of SPIE, and was SPIE’s 2016 President. He was a founding member of the National Photonics Initiative and currently serves as a director and/or advisory board member of several for-profit and nonprofit organizations. He earned a B.S. and M.S. in physics from Rensselaer Polytechnic Institute and a Ph.D. in physics from the University of Michigan.

Alejandro Rodriguez

Member

Alejandro Rodriguez is a professor of electrical and computer engineering at Princeton University and the Director of Education Program, MIRTHE+. Advances in nano-fabrication over the past few decades have enabled the study of material structures with features at the scale or smaller than the electromagnetic wavelength. These engineered materials (photonic crystals, plasmonic nanoresonators, and metamaterials) can lead to a wide range of unusual optical behaviors (photonic bandgaps, ballistic transport, ultra-slow propagation, and negative refraction) which allow unprecedented control and tunability over the properties of light. His research focuses on applying and developing theoretical and computational techniques to explore the ways in which complex nanostructures can lead to new optical phenomena and devices. Current and past research interests include: fluctuation phenomena (casimir and van der waals forces, thermal radiation, spontaneous emission); nonlinear optics; fundamental limits on optical phenomena; large-scale photonic optimization (inverse design); and topological photonics. Dr. Rodriguez held joint post-doctoral positions at the School of Engineering and Applied Sciences at Harvard University and at the Department of Mathematics at MIT. Past honors include a Presidential Early Career Award from Princeton University, an E. Lawrence Keys, Jr./Emerson Electric Co. Faculty Award from the School of Engineering and Applied Science, a National Science Foundation Early CAREER Award, and Kavli Fellowship from the National Academy of Sciences. He received B.S. and Ph.D. degrees in physics from the Massachusetts Institute of Technology.

Kathy-Anne B. Soderberg

Member

Kathy-Anne Soderberg is the Air Force Research Laboratory (AFRL) Senior Scientist (ST) for Quantum Science and Technology. She serves as a senior technical advisor to the Department of the Air Force. Before serving in this ST role, she was a principal research scientist and team lead for AFRL's Trapped-Ion Quantum Networking group. Dr. Soderberg has over twenty 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 scientific and technical consultant for quantum information science. She served on the 2023 National Research Council Panel Review of the National Institutes of Standards and Technology's Physical Measurement Laboratory. 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 a postdoctoral researcher at the University of Chicago.