

## 2019 Fellow Newly Elevated Fellows

Ali Abdi

*for contributions to wireless channel modeling and underwater communications*

Karim Abed-Meraim

*for contributions to blind system identification and source separation for communications*

Edward Adelson

*for contributions to image representation and analysis in computer vision*

Sonia Aissa

*for contributions to design and performance analysis of cognitive radio and cooperative communication systems*

J .Stewart Aitchison

*for contributions to nonlinear optical devices and point-of-care testing systems*

Elad Alon

*for contributions to mixed-signal integrated circuit design and methodology*

Max Ammann

*for contributions to compact antennas for wideband wireless applications*

Leopoldo Angrisani

*for contributions to test and measurement of communication systems*

Yoshihiro Baba

*for contributions to electromagnetic modeling of lightning*

Michael Backes

*for contributions to computer security and privacy*

Matthias Bauer

*for contributions to growth technologies for alloys for transistors*

Navakanta Bhat

*for contributions to electrochemical biosensors in nanoelectronic devices*

William Blackwell

*for contributions to atmospheric remote sensing algorithms and instrumentation*

Pierre Blondy

*for contributions to radio frequency micro electromechanical systems*

Iustin Radu Bojoi

*for contributions to control of electrical drives and power electronics*

## 2019 Fellow Newly Elevated Fellows

Silverio Bolognani

*for contributions to permanent magnet synchronous motor technology*

Gabriella Bosco

*for contributions to modeling and design of coherent optical communication systems*

Jill M. Boyce

*for contributions to video coding*

Lucien Breems

*for contributions to over-sampled converters using complementary metal-oxide-semiconductor technology*

Olav Breinbjerg

*for leadership in spherical near-field antenna measurements*

Michael Bronstein

*for contributions to acquisition, processing, and analysis of geometric data*

Walter Buchanan

*for leadership in accreditation activities of engineering technology programs*

Steven Butler

*for technical leadership in aerospace systems*

Bruce Campbell

*for contributions to radar remote sensing for planetary science*

Richard Campbell

*for contributions to millimeter and terahertz wafer-probe technology*

Hui Cao

*for contributions to spatial coherence engineering of lasers*

Antonio Capone

*for contributions to the design and resource management of wireless and Internet Protocol networks*

Richard Carson

*for contributions to quantitative positron emission tomography*

Friedhelm Caspers

*for contributions to charged particle accelerators*

David Castañón

*for contributions to discrete-time stochastic control and information fusion*

## 2019 Fellow Newly Elevated Fellows

Mujdat Cetin

*for contributions to image processing for synthetic aperture radar and sensor array*

Meng-Fan Chang

*for contributions to static and nonvolatile memories for embedded systems*

Patrick Chapman

*for application of power electronics devices and systems for solar energy conversion*

Deming Chen

*for contributions to field-programmable gate array high-level synthesis*

Jie Chen

*for contributions to optimization and control of complex systems*

Jiming Chen

*for contributions to resource allocation and optimization in wireless sensor networks*

Xing Bi Chen

*for contributions to power super-junction metal-oxide-semiconductor field-effect transistors*

Z. Chen

*for contributions to power electronics for wind energy conversion*

Kangguo Cheng

*for contributions to fully depleted Silicon-on-Insulator Complementary Metal-Oxide Semiconductor process technology*

Kin Ping Cheung

*for contributions to plasma process-induced damage in integrated circuits*

Pei-Yu Chiou

*for contributions to optofluidics for high throughput single cell manipulation*

Hyouk Ryeol Choi

*for contributions to robotic interactive sensing*

Jong Choi

*for contributions to debugging and compilers for parallel computing*

Sewan Choi

*for contributions to power converter technologies*

Paul Chow

*for contributions to the programmability of field-programmable gate array based computing*

## 2019 Fellow Newly Elevated Fellows

Tommy Chow

*for contributions to computational intelligence techniques for control systems diagnosis*

Qing-Xin Chu

*for contributions to compact wideband antennas*

Brian Classon

*for contributions to commercial cellular system standardization*

Peter Clout

*for leadership in data acquisition and control in nuclear and plasma sciences*

Jose Cobos

*for contributions to power supply systems*

Michael Condry

*for leadership in the development of semiconductor and computing technologies*

Jose Luis Contreras

*for contributions to brain-machine interfaces and wearable exoskeletons*

Kerstin Dautenhahn

*for contributions to social robotics and human-robot interaction*

Timothy Davidson

*for contributions to optimization of signal processing and communication systems*

Bart De Schutter

*for contributions to optimal control of discrete-event and hybrid systems*

Antonio Della Corte

*for leadership in superconducting magnets*

Xiaotie Deng

*for contributions to computing in partial information and interactive environments*

Tayeb Denidni

*for contributions to frequency selective surfaces and their application to reconfigurable antennas*

Santosh Devasia

*for contributions to feedforward control of nonminimum-phase systems*

Thomas Dionise

*for contributions to mitigation of transients and harmonics in power systems*

## 2019 Fellow Newly Elevated Fellows

Antun Domic

*for technical leadership in the integrated circuits design automation*

David Dorrell

*for contributions to time efficient design methodology of rotating electrical machines*

Robert Durham

*for contributions to submersible electrical equipment analysis and multi-point ground methods in hazardous petroleum and chemical environments*

Nicola Elia

*for contributions to networked control systems*

Christian Enz

*for contributions to low-power analog circuit design*

Meng Hwa Er

*for contributions to electronic engineering education*

Joseph Evans

*for contributions to cognitive networks and deployment of defense networks*

Jiyuan Fan

*for leadership in applications for power distribution systems*

Xuejun Fan

*for contributions to the modeling and characterization of electronic packaging design*

Luca Fanucci

*for the contributions to the design of Very-large-scale integration systems for network-on-chip*

Dejan Filipovic

*for contributions to frequency-independent and wideband antennas*

Robert Fish

*for application of visual communications and networking*

Dimitrios Fotiadis

*for contributions to modelling and machine learning in biomedical data processing*

Mark Fox

*for contributions to constraint-directed reasoning and ontologies*

Emilio Frazzoli

*for contributions to motion planning and control of autonomous vehicles*

## 2019 Fellow Newly Elevated Fellows

Emilia Fridman

*for contributions to time-delay systems and sampled-data control*

Yun Fu

*for contributions to manifold learning and face and gesture recognition*

Claudio Fuerte-Esquivel

*for contributions to modeling, analysis and operation of Flexible Alternating Current Transmission Systems*

Christophe Fumeaux

*for contributions to resonant dielectric-loaded antennas*

Alexander Gaeta

*for contributions to quantum and nonlinear photonics*

Jianfeng Gao

*for contributions to machine learning for Web search and natural language processing*

Kaizhong Gao

*for contributions to data storage technologies*

Shichang Gao

*for contributions to low-cost pattern-reconfigurable and broadband printed antennas*

Prof. Julian Gardner

*for contributions to electronic noses and gas sensors*

Simson Garfinkel

*for contributions to digital forensics and computer security*

Anne Gattiker

*for contributions to integrated circuit test and diagnosis*

Guido Gerig

*for contributions to medical image processing*

Maysam Ghovanloo

*for contributions to implantable wireless integrated circuits and systems*

Ali Ghrayeb

*for contributions to modulation design and implementation of multiple antenna wireless systems*

Bruce Gnade

*for contributions to electronic materials and device technologies*

## 2019 Fellow Newly Elevated Fellows

Reuven Gordon

*for contributions to nanoaperture optical manipulation for protein and nanoparticle analysis*

Timothy Green

*for contributions to power electronics for power systems control*

Robert Greenberg

*for the invention and development of the retinal prosthesis for the blind*

Warren Grundfest

*for contributions to the development of minimally invasive surgical techniques*

Venkatesan Guruswami

*for contributions to list error-correction and algorithmic coding theory*

A. Gutierrez Aitken

*for contributions to compound semiconductor devices and heterogeneous microelectronics for space applications*

Qing-Long Han

*for contributions to control and filtering of networked systems*

Mor Harchol-Balter

*for contributions to performance analysis and design of computer systems*

Hossein Hashemi

*for development of radio-frequency and optical phased-array integrated circuits*

Ahmed Hassan

*for contributions to the quality assurance of large-scale software systems*

Xiaodong He

*for contributions to multimodal signal processing in human language and vision technologies*

Ahmed A-G Helmy

*for contributions to routing protocol design and mobility modeling*

Pin-Han Ho

*for contributions to failure restoration in optical backbone networks*

Steven Chu-Hong Hoi

*for contributions to machine learning for multimedia information retrieval and scalable data analytics*

Keum-Shik Hong

*for contributions to adaptive estimation and brain-computer interface techniques*

## 2019 Fellow Newly Elevated Fellows

Zeng-Guang Hou

*for contributions to neural network optimization and control for rehabilitation*

Gang Hua

*for contributions to facial recognition in images and videos*

Tingwen Huang

*for contributions to dynamical analysis of neural networks*

Mei-Yuh Hwang

*for contributions to speech and language technology*

Daniele Ielmini

*for contributions to nonvolatile semiconductor memories*

Syed Islam

*for contributions to wind energy conversion systems*

Hiroshi Ito

*for contributions to high-speed photodiodes for millimeter and terahertz wave generation*

Hans-Arno Jacobsen

*for contributions to publish subscribe and event processing*

Nitin Jain

*for leadership in the development of physics-based models for mm-wave System-on-Chip Ics*

Mona Jarrahi

*for contributions to terahertz technology and microwave photonics*

Lijun Jiang

*for contributions to broadband computational electromagnetic methods*

Tao Jiang

*for contributions to coding, modulation, and cognitive radio systems design*

Hai Jin

*for contributions to peer-to-peer and cloud computing systems*

Mihalo Jovanovic

*for contributions to modeling, optimization, and control of large-scale distributed systems*

Chia-Feng Juang

*for contributions to data-driven fuzzy systems*



## 2019 Fellow Newly Elevated Fellows

Christoph Jungemann

*for contributions to hierarchical simulation of semiconductor devices*

Wen-Chung Kao

*for leadership in the development of electrophoretic display technology*

Srinivasan Keshav

*for contributions to fair queueing techniques and flow-control algorithms in computer networks*

Ali Khakifirooz

*for contributions to fully depleted silicon-on-insulator complementary-metal-oxide-semiconductor technology*

Chris Hyung-II Kim

*for contributions to on-chip circuit reliability evaluation and characterization*

Dong In Kim

*for contributions to cross-layer design of wireless communications systems*

Lee-Sup Kim

*for contributions to energy-efficient multimedia processor architectures*

Irwin King

*for contributions to the theory and applications of machine learning in social computing*

Farinaz Koushanfar

*for contributions to hardware and embedded systems security and to privacy-preserving computing*

Ioannis Krikidis

*for contributions to full-duplex radio and wireless-powered communications*

Randall Kubena

*for contributions to ion-beam processing and nanofabrication*

Daniel Kuchta

*for contributions to high-speed Vertical Cavity Surface-Emitting Lasers and optical interconnects*

Shrikrishna Kulkarni

*for contributions to transformer engineering education*

Chih-Huang Lai

*for contributions to magnetic information storage and spintronic devices*

Roger Lake

*for contributions to quantum mechanical electronic device modeling*

## 2019 Fellow Newly Elevated Fellows

Mark Lantz

*for contributions to digital magnetic tape recording*

Patrick Lecallet

*for contributions to perceptual optimization of video signal processing*

Jaejin Lee

*for contributions to programming systems of heterogeneous machines*

Juho Lee

*for leadership in standardization of cellular communication technologies*

Seung Jae Lee

*for contributions to power distribution protection and automation*

Frank Leferink

*for leadership in electromagnetic compatibility measurement techniques*

Chih-Peng Li

*for contributions to digital broadcasting and wireless transmission*

Hai Li

*for contributions to neuromorphic computing systems*

Hongbin Li

*for contributions to adaptive radar signal processing with limited data*

Qi Li

*for contributions in speech signal processing and speaker authentication*

Shutao Li

*for contributions to image fusion and classification in remote sensing*

Yonghui Li

*for contributions to cooperative communications technologies*

C. Steven Lingafelt

*for leadership in cybersecurity education and practice*

Alex Liu

*for contributions to firewall design and analysis*

Jinjun Liu

*for contributions to modeling and control of power systems*

## 2019 Fellow Newly Elevated Fellows

Shaoying Liu

*for contributions to the design of Structured Object-Oriented Formal Language*

Xiaoping Liu

*for contributions to system identification and networked teleoperation*

Xin Liu

*for contributions to the design of cross-layer resource allocation algorithms for cellular and cognitive radio networks*

Teng Long

*for contributions to high resolution radar systems*

Cristina Lopes

*for contributions to ubiquitous and immersive programming*

Marco Lops

*for contributions to radar target detection and estimation in clutter*

Anant Madabhushi

*for contributions in image analysis tools for diagnosis and prognosis of diseases*

Pui-In Mak

*for contributions to radio-frequency and analog circuits*

John Malinowski

*for contributions to motor efficiency manufacturing regulations and standards*

Shiwen Mao

*for contributions to wireless multimedia networking*

Charles Mc Shane

*for leadership in safety, performance, and sustainability of power transformers*

Dale McMorrow

*for contributions to laser-based methodologies for simulating single-event effects in digital devices*

Derek McNamara

*for contributions to antenna synthesis and engineering*

Neelesh Mehta

*for contributions to opportunistic selection in wireless communication systems*

Tao Mei

*for contributions to multimedia analysis and applications*

## 2019 Fellow Newly Elevated Fellows

Erik Meijering

*for contributions to computational methods for biological image analysis*

Tim Menzies

*for contributions to software engineering for artificial intelligence*

Bruno Michel

*for contributions to energy efficiency for computers and solar systems*

Miroslav Micovic

*for contributions to gallium nitride electronics*

Joydeep Mitra

*for contributions to the development of power system reliability methods*

Theodore Moise

*for contributions to ferroelectric memory development and engineering*

Sasan Mokhtari

*for leadership in energy industry technology solutions*

Onur Mutlu

*for contributions to computer architecture research and practice*

Katsufumi Nakamura

*for contributions to integrated circuits for digital imaging*

Jason Nieh

*for contributions to virtualization, scheduling, and mobile computing*

Anibal Ollero Baturone

*for contributions to the development and deployment of aerial robots*

Antonis Papachristodoulou

*for contributions to analysis and design of networked control systems*

Evangelos Papadopoulos

*for contributions to space and field robotics*

Milorad Papic

*for contributions to probabilistic planning methods to mitigate cascading of the bulk power system*

Danilo Pau

*for contributions to the development of memory efficient architectures for advanced multimedia applications*

## 2019 Fellow Newly Elevated Fellows

Jan Peters

*for contributions to robot learning of dexterous motor skills*

Daniel Pitt

*for leadership in networking and of the Open Networking Foundation*

Alessandro Piva

*for contributions to multimedia security*

Maurizio Porfiri

*for contributions to biomimetic robotics*

Yi Qian

*for contributions to wireless communication networks and smart grid communication architectures*

Hong Qiao

*for contributions to robotic manipulation and biologically inspired robotic cognition*

Xianming Qing

*for contributions to antennas for radio frequency identification systems*

Arifur Rahman

*for leadership in 2.5- and 3-dimensional integrated circuits for field programmable gate arrays*

Siddharth Ramachandran

*for contributions to higher-order modes in optical fibers*

Srinivasan Ramani

*for contributions to computer networks for developing countries*

Mary Ellen Randall

*for leadership in the development and commercialization of audio-video decoders*

Stewart Rauch

*for contributions to microelectronics reliability*

Gerhard Rigoll

*for contributions to multimodal human-machine communication*

Robert Rohling

*for contributions to ultrasound for medical diagnosis and intervention*

## 2019 Fellow Newly Elevated Fellows

Joachim Rosenthal

*for contributions to algebraic coding theory and cryptography*

Matthew Roughan

*for contributions to Internet measurement and analysis*

Romit Roy Choudhury

*for contributions to wireless network protocols and indoor localization*

Amit Roy-Chowdhury

*for contributions to video-based tracking and behavior analysis*

Dan Rubenstein

*for contributions to massively distributed networked systems*

Stuart Rubin

*for contributions to computational intelligence*

Roland Ryf

*for contributions to optical switching and multiplexing technology*

Walid Saad

*for contributions to distributed optimization in cooperative and heterogeneous wireless systems*

Rajiv Sabherwal

*for contributions to research on management of knowledge and information technologies*

Samar Saha

*for contributions to compact modeling of silicon field-effect transistors*

Tapan Saha

*for contributions to monitoring and assessment of power transformers*

Sayeef Salahuddin

*for contributions to low power electronic and spintronic devices*

Murti Salapaka

*for application of control and systems technology in nano-science*

Venkatesh Saligrama

*for contributions to distributed detection and estimation of structured signals*

Igal Sason

*for contributions to the gaussian interference channel*

## 2019 Fellow Newly Elevated Fellows

Andries Scholten

*for contributions to noise and radio frequency modeling of semiconductor devices*

Venkat Selvamanickam

*for contributions to development and manufacturing of superconductor tapes*

Kyuseok Shim

*for contributions to scalable data mining and database query processing*

Mei-Ling Shyu

*for contributions to multimedia big data analytics and management*

Ramesh Sitaraman

*for contributions to content delivery, internet performance, and distributed systems*

Mikael Skoglund

*for contributions to source-channel coding and wireless communications*

Dawn Song

*for contributions to systems security and privacy*

Lingyang Song

*for contributions to cooperative communication and networking*

Maarten Steinbuch

*for contributions to motion control and mechatronics*

Christoph Stiller

*for contributions to machine vision for automated driving*

Fuchun Sun

*for contributions to neural network control of nonlinear systems with applications to robotic manipulators*

Jonathan Sun

*for contributions to spin-transfer-torque magnetic random access memory*

Yan Sun

*for contributions to trust modeling and statistical signal processing for cyber-physical security*

Kenji Sunagawa

*for contributions to cardiovascular mechanics, baroreflex dynamics, and bionic cardiology applications*

Bruce Suter

*for contributions to data acquisition for aerospace sensory information systems*

## 2019 Fellow Newly Elevated Fellows

Jonathan Sykes

*for leadership in the application and management of reliable protection systems for electric power networks*

Mario Sznaier

*for contributions to identification of switched systems and multiobjective control*

Joseph Tabrikian

*for contributions to estimation theory and Multiple Input Multiple Output radars*

Munehiro Tada

*for contributions to copper interconnects for very-large-scale integration*

Seishi Takamura

*for application of video coding*

HarkHoe Tan

*for contributions to compound semiconductor optoelectronic materials and devices*

Yap-Peng Tan

*for contributions to visual data analysis and processing*

Chi-Keung Tang

*for contributions to interactive segmentation algorithms in computer graphics applications*

Jian Tang

*for contributions to optimization in wireless networks and mobile crowdsourcing systems*

Meixia Tao

*for contributions to resource allocation in broadband wireless networks*

Jan-Ulrich Thiele

*for contributions to magnetic recording*

Ioannis Tomkos

*for contributions to dynamic optical networks*

Carme Torras

*for contributions to learning algorithms for robot perception, planning and manipulation*

David Torrey

*for contributions to modeling, design, and control of electric machines and drives*

Piero Tortoli

*for contributions to ultrasound signal processing hardware and algorithms*



## 2019 Fellow Newly Elevated Fellows

Jean-Yves Tourneret

*for contributions to statistical signal and image analysis*

Hon Tsang

*for contributions to nonlinear silicon photonics and advanced waveguide grating couplers*

Panagiotis Tsiotras

*for contributions to nonlinear control of aerospace systems*

Zhuowen Tu

*for contributions to computer vision, medical imaging, and deep learning*

Deepak Uttamchandani

*for contributions to photonics-based sensing*

Murat Uysal

*for contributions to cooperative and diversity techniques in wireless and optical communications*

Benjamin Van Roy

*for contributions to reinforcement learning and approximate dynamic programming*

Paul Vanoorschot

*for contributions to applied cryptography and authentication*

Dragica Vasileska

*for contributions to computational electronics and simulation of nanoscale devices*

Namrata Vaswani

*for contributions to dynamic structured high-dimensional data recovery*

Jelena Vuckovic

*for contributions to experimental nano and quantum photonics*

Jeffrey Walker

*for contributions to airborne and satellite remote sensing of soil moisture*

Liang Wang

*for contributions to video-based human identification and motion analysis*

Shuo Wang

*for contributions to reduction of electromagnetic interference in electronic systems*

Xiaofeng Wang

*for contributions to system security and genomic privacy*

## 2019 Fellow Newly Elevated Fellows

Yuanxun Wang

*for contributions to time-varying and nonlinear electromagnetic devices and systems*

Simon Warfield

*for contributions to medical imaging*

ShaoJun Wei

*for leadership in Integrated Circuits engineering of smart cards and reconfigurable devices*

John Turner Whitted

*for contributions to computer graphics*

Chee Wei Wong

*for contributions to silicon nanophotonics*

Robert Wood

*for contributions to small-scale and soft robotics*

Guangning Wu

*for contributions to traction power supply equipment diagnostics for high-speed electrified railways*

Min Wu

*for contribution to control and automation for complex systems*

Naiqi Wu

*for contributions to discrete-event production systems*

Zhaohui Wu

*for contributions to intelligent service computing*

Shengli Xie

*for contributions to blind source separation and its applications*

Eric Xing

*for contributions to machine learning algorithms and systems*

Zeshui Xu

*for contributions to decision-making methodologies*

Fan Yang

*for contributions to surface electromagnetics for antennas*

Ming-Hsuan Yang

*for contributions to object tracking and face recognition*

## 2019 Fellow Newly Elevated Fellows

Xiaokang Yang

*for contributions to perceptual modeling and processing of visual signals*

Steve Yao

*for leadership in opto-electronic oscillator and optical polarization devices*

Hiroto Yasuura

*for contributions to energy-efficiency and dependability of Very Large Scale Integration designs*

Minerva Yeung

*for leadership in multimedia signal processing*

Eiichi Yoshida

*for leadership in the development of modular reconfigurable robotic systems*

Marwan Younis

*for contributions to digital beam-forming techniques for spaceborne radar systems*

Moustafa Youssef

*for contributions to wireless location tracking technologies*

Yizhou Yu

*for contributions to geometric and image-based modeling*

Pericle Zanchetta

*for contributions to the control of complex power electronics systems*

Jared Zerbe

*for contributions to the development of high performance serial interfaces*

Bao-Hui Zhang

*for contributions to power system transient stability prediction*

Cha Zhang

*for contributions to machine learning for image and video data processing*

Daqing Zhang

*for contributions to context-aware mobile and pervasive systems*

Liangpei Zhang

*for contributions to image processing of remote sensing data*

Mengjie Zhang

*for contributions to evolutionary learning and optimization methodologies*

## 2019 Fellow Newly Elevated Fellows

Ping Zhang

*for leadership in theory, standardization, and application of wireless technologies*

Richard Zhang

*for leadership in development of power electronic converters*

Yanchao Zhang

*for contributions to wireless and mobile security*

Yimin D. Zhang

*for contributions to high-resolution direction finding and radar signal processing*

Weisheng Zhao

*for contributions to spintronic integrated circuit design*

Lin Zhong

*for contributions to the development of energy-efficient driver circuits for organic light-emitting diodes*

Donghua Zhou

*for contributions to reliability and maintenance of dynamic systems*

Jingren Zhou

*for contributions to cloud computing and query processing*

Lidong Zhou

*for contributions to trusted distributed computing*

Qifa Zhou

*for contributions to medical ultrasound transducers and multimodal imaging*

Michael Zyda

*for contributions to game design and networking*