

COMPUTER, ELECTRICAL AND MATHEMATICAL SCIENCE AND ENGINEERING DIVISION FACULTY

Mohamed-Slim Alouini, *Associate Dean, Computer, Electrical and Mathematical Science and Engineering Division; Professor, Electrical Engineering*
Ph.D., California Institute of Technology, U.S., 1998
Research interests: modeling, design and performance analysis of wireless communication systems; cognitive radio systems; cooperative/collaborative communication systems; and multi-hop communication.

Hakan Bagci, *Assistant Professor, Electrical Engineering*
Ph.D., University of Illinois at Urbana-Champaign, U.S., 2007
Research interests: applied and theoretical computational electromagnetics; using time domain integral-equation-based solvers to characterize wave interactions; fast hybrid methods for the analysis and statistical characterization of electromagnetic wave interactions; well-conditioned integral equation formulations; electromagnetic inverse scattering problems using signal processing techniques.

Vladimir Bajic, *Director, Computational Bioscience Research Center; Named Professor, Applied Mathematics and Computational Science*
D. Eng. Sc., University of Zagreb, Yugoslavia, 1989
Research interests: facilitation of biological discoveries through the use of sophisticated bioinformatic systems combined with data modeling methods, and inferences from new information not explicitly present in biomedical data.

James Calvin, *Vice President for Academic Affairs; Professor, Applied Mathematics and Computational Science*
Ph.D., Colorado State University, U.S., 1985
Research interests: linear models; multivariate variance components; statistical methodology and applications.

Elmootazbellah Elnozahy, *Dean, Computer, Electrical and Mathematical Science and Engineering Division; Professor, Computer Science*
Ph.D., Rice University, U.S., 1993
Research interests: fault tolerance, power management, system architecture, distributed computing and operating systems, high performance computing and simulation tools.

Hossein Fariborzi, *Assistant Professor, Electrical Engineering*
Ph.D., Massachusetts Institute of Technology, U.S., 2013
Research interests: energy-efficient integrated circuits and systems design; novel switching devices; fusion of MEMS/NEMS and MOS; energy-aware wireless sensor networks.

Andrea Fratolocchi, *Assistant Professor, Electrical Engineering*
Ph.D., University of Roma Tre, Italy, 2007
Research interests: linear and nonlinear waves in disordered systems, with applications in energy, medicine and materials science.

Xin Gao, *Assistant Professor, Computer Science*
Ph.D., University of Waterloo, Canada, 2009
Research interests: bioinformatics; computational biology; machine learning designing algorithms and developing machine-learning techniques to solve problems in structural biology, systems biology and biological sequence analysis; NMR-based protein structure determination; protein dynamics and function study; and next-generation sequencing.

Marc Genton, *Professor, Applied Mathematics and Computational Science*
Ph.D., Swiss Federal Institute of Technology, Switzerland, 1996
Research interests: statistical analysis, modeling, prediction and uncertainty quantification of spatio-temporal data, with applications in environmental and climate science, renewable energies, geophysics and marine science.

Bernard Ghanem, *Assistant Professor, Electrical Engineering*
Ph.D., University of Illinois at Urbana-Champaign, U.S., 2010
Research interests: image processing, computer vision and machine learning; developing efficient optimization and randomization techniques for largescale computer vision and machine learning problems; involving human judgment in computer vision processing; and developing frameworks for joint representation and classification by exploiting data sparsity and low-rankness.

Diogo Gomes, *Associate Professor, Applied Mathematics and Computational Science*
Ph.D., University of California at Berkeley, U.S., 2000
Research interests: partial differential equations, mean-field games, Hamilton-Jacobi equations and deterministic and stochastic optimal control.

Markus Hadwiger, *Associate Professor, Computer Science*
Ph.D., Vienna University of Technology, Austria, 2004
Research interests: scientific visualization; petascale visualization and scientific computing; volume visualization; medical visualization; interactive segmentation and image processing; GPU-based algorithms; and general-purpose computations on GPUs.

Jr-Hau He, *Associate Professor, Electrical Engineering*
Ph.D., National Tsing Hua University, Taiwan, 2005
Research interests: photon steering to improve light absorption of photovoltaic cells; chip manufacturing using innovative techniques to build new semiconductor nano devices.

Wolfgang Heidrich, *Director, Visual Computing Center; Professor, Computer Science*
Ph.D., University of Erlangen, Germany, 1999
Research interests: computational photography and displays, high-dynamic-range imaging and display, image-based modeling, measuring and rendering.

Robert Hoehndorf, *Assistant Professor, Computer Science*
Ph.D., University of Leipzig, Germany, 2009
Research interests: developing intelligent systems that integrate biological and biomedical data across domains and levels of granularity; developing methods for the analysis of integrated datasets using ontologies, semantic web technologies and large-scale data mining.

Raphaël Huser, *Assistant Professor, Applied Mathematics and Computational Science*
Ph.D., Swiss Federal Institute of Technology, Switzerland, 2013
Research interests: interests lie at the intersection between statistics of extreme events, risk assessment, spatio-temporal statistics, and statistical approaches for large datasets, with a particular focus on environmental applications such as the prediction of extreme flooding, droughts and wind gusts; also focuses on developing statistical models for rare events, as well as efficient inference methods to fit them to data.

Muhammad Mustafa Hussain, *Associate Professor, Electrical Engineering*
Ph.D., University of Texas at Austin, U.S., 2005
Research interests: Heterogeneous electronic materials and high-performance CMOS based flexible-stretchable-reconfigurable wearable interactive electronics and systems.

Panos Kalnis, *Associate Professor, Computer Science*
Ph.D., Hong Kong University of Science and Technology, China, 2002
Research interests: database outsourcing; cloud computing; mobile computing; peer-to-peer; online analytical processing; data warehousing; spatial-temporal and high-dimensional databases; GIS; security-privacy anonymity.

Aslan Kasimov, *Assistant Professor, Applied Mathematics and Computational Science*
Ph.D., University of Illinois at Urbana-Champaign, U.S., 2004
Research interests: analysis and numerical solutions of partial differential equations related to compressible flow; shock and detonation dynamics; combustion; fluid dynamics; nonlinear waves; hydrodynamic instability; traffic flow and congestion phenomena; multi-phase flow.

David Ketcheson, *Associate Professor, Applied Mathematics and Computational Science*
Ph.D., University of Washington, U.S., 2009
Research interests: numerical analysis and hyperbolic partial differential equations; development of efficient time integration methods; wave propagation algorithms; modeling of wave phenomena in heterogeneous media.

David Keyes, *Director, Extreme Computing Research Center; Professor, Applied Mathematics and Computational Science*
Ph.D., Harvard University, U.S., 1984
Research interests: scientific computing; parallel algorithms; parallel performance analysis; computational aerodynamics; computational radiation transport; computational combustion; optimization.

Omar Knio, *Professor, Applied Mathematics and Computational Science*
Ph.D., Massachusetts Institute of Technology, U.S., 1990
Research interests: computational fluid mechanics, oceanic and atmospheric flows, turbulent flow, physical acoustics, chemically reacting flow, energetic materials, microfluidic devices, dynamical systems, numerical methods, asymptotic and stochastic techniques.

Jürgen Kosel, *Assistant Professor, Electrical Engineering*
Ph.D., Vienna University of Technology, Austria, 2006
Research interests: sensors for biological and technical applications, microsystems, biomedical engineering, magnetism, and materials science.

Taos-Meriem Laleg-Kirati, *Assistant Professor, Applied Mathematics and Computational Science*
Ph.D., INRIA, France, 2008
Research interests: applied mathematics, control systems and signal analysis; new methods for signal analysis based on semi-classical approaches to the analysis of arterial blood pressure; modeling, identification, control, fault detection and inverse problems, especially seismic inversion.

Peter Markowich, *Distinguished Professor, Applied Mathematics and Computational Science*
Dr. Techn. . Vienna University of Technology, Austria, 1980
Research interests: partial differential equations in applications; mathematical analysis; numerical analysis; computational mathematics; and mathematical modeling.

Mikhail Moshkov, *Professor, Applied Mathematics and Computational Science*
Ph.D., Saratov State University, Russia, 1983
Research interests: time complexity of algorithms; machine learning; and discrete optimization.

Boon S. Ooi, *Professor, Electrical Engineering*
Ph.D., University of Glasgow, U.K., 1994
Research interests: optoelectric devices, including LEDs and semiconductor lasers; solid-state lighting; photonics integrated circuits.

Helmut Pottmann, *Named Professor, Applied Mathematics and Computational Science*
Ph.D., Vienna University of Technology, Austria, 1983
Research interests: computer aided geometric design; geometric modeling; geometry processing; geometric computing for manufacturing; architectural geometry; and robot kinematics.

Khaled Nabil Salama, *Associate Professor, Electrical Engineering*
Ph.D., Stanford University, U.S., 2005
Research interests: electronic circuit design and semiconductor fabrication; development of devices, circuits, systems and algorithms to enable inexpensive analytical platforms for industrial, environmental and biomedical applications.

Atif Shamim, *Assistant Professor, Electrical Engineering*
Ph.D., Carleton University, Canada, 2009
Research interests: personal area networks; automotive radars; wearable and implantable wireless sensors; wireless powering; renewable energy; RF system-on-chip design; on-chip antenna integration; miniaturization and characterization techniques; and 3D system-on-package design.

Jeff Shamma, *Professor, Electrical Engineering*
Ph.D., Massachusetts Institute of Technology, U.S., 1988
Research interests: control and systems theory; game theory and decision making for multiagent models in engineered and societal networked systems.

Basem Shihada, *Assistant Professor, Computer Science*
Ph.D., University of Waterloo, Canada, 2007
Research interests: optical networks; optical burst switched networks; network congestion control; transmission control protocol; wireless mesh networks; cognitive radios; mobility.

Victor Solovveyv, *Professor, Computer Science*
Ph.D., Institute of Cytology & Genetics, Russia, 1985
Research interests: developing computational platforms and bioinformatics algorithms for biological big data analysis including genome functional annotation, protein and RNA structure prediction and modeling genetic networks to gain insights into the static and dynamic behavior of complex biological systems and apply it for rational design of biological systems for useful purposes.

Ying Sun, *Assistant Professor, Applied Mathematics and Computational Science*
Ph.D., Texas A&M University, U.S., 2011
Research interests: visualization and diagnostics, space-time covariance models, computational methods for large datasets and statistics of extremes.

Ganesh Sundaramoorthi, *Assistant Professor, Electrical Engineering*
Ph.D., Georgia Institute of Technology, U.S., 2007
Research interests: computational methods information imaging; medical image analysis; and visual recognition systems.

Raul Tempone, *Associate Professor, Applied Mathematics and Computational Science*
Ph.D., Royal Institute of Technology, Sweden, 2002
Research interests: a posteriori error approximation and related adaptive algorithms for numerical solutions to deterministic and stochastic differential equations; development and analysis of efficient numerical methods for uncertainty quantification.

Athanasios Tzavaras, *Professor, Applied Mathematics and Computational Science*
Ph.D., Brown University, U.S., 1985
Research interests: nonlinear partial differential equations with applications in fluid and solid mechanics, hyperbolic conservation laws, mathematical modeling of materials.

Antoine Vigneron, *Associate Professor, Computer Science*
Ph.D., Hong Kong University of Science and Technology, China, 2002
Research interests: algorithms design and analysis for motion planning; computational geometry; data structures; geometric optimization; combinatorial optimization; graph algorithms; and computational biology.

Peter Wonka, *Associate Director, Visual Computing Center; Professor, Computer Science*
Ph.D., Vienna University of Technology, Austria, 2001
Research interests: visualization; remote sensing; computer graphics with a focus on modeling and analysis of urban and geospatial data.

Ying Wu, *Assistant Professor, Applied Mathematics and Computational Science*
Ph.D., Hong Kong University of Science and Technology, China, 2008
Research interests: computational physics; effective medium theories; artificial materials; transport theory; time reversal imaging; super resolution; implementation of fast algorithms in solving classical wave propagation problems.

Xiangliang Zhang, *Assistant Professor, Computer Science*
Ph.D., INRIA and Université Paris-Sud 11, France, 2010
Research interests: data mining; machine learning; artificial intelligence; complex systems modeling; large-scale data processing and analysis; streaming data mining and analysis; autonomic, high performance distributed computer systems; grid and cloud management; and bioinformatics.



COMPUTER, ELECTRICAL AND MATHEMATICAL SCIENCES AND ENGINEERING DIVISION

<http://cemse.kaust.edu.sa>



KAUST – *Through inspiration, discovery*

King Abdullah University of Science and Technology (KAUST) attracts top international faculty, scientists, engineers and postgraduate students to conduct curiosity driven and goal-oriented research to address the world's pressing scientific and technological problems.

The University is committed to cutting-edge research in the areas of food, water, energy and the environment (including the Red Sea), with a strong emphasis on computational science.

The University engages students, researchers and faculty in advancing science and technology through collaborative inquiry of regional and global significance. The University's unique matrix structure supports both basic and goal-oriented research to benefit Saudi Arabia and beyond.

KAUST offers its students rich opportunities for learning, discovery and research. With a student body representing 70 nations, the University is committed to attracting and educating the world's most gifted and inspired scholars. Students, faculty and researchers cultivate a dynamic and collaborative environment of bold scientific research and innovation. KAUST is where adventurous and imaginative individuals engage in a journey of intellectual and cultural discovery.

WHY CHOOSE KAUST?

KAUST is a graduate-level research university located on the shores of the Red Sea in Saudi Arabia. The University offers master's (M.S.) and doctoral (Ph.D.) degrees in three academic divisions: Biological and Environmental Science and Engineering; Computer, Electrical and Mathematical Science and Engineering; and Physical Science and Engineering. The University's new facilities with state-of-the-art technology offer an ideal setting in which to study and conduct high-impact research

- World-class faculty directs the University's talented postgraduate students, researchers and postdoctoral fellows
- Research Centers provide an environment that promotes targeted goal-oriented research
- Guaranteed funding ensures continuity and the highest quality research in food, water, energy and the environment
- Core facilities include Advanced Nanofabrication, Imaging and Characterization (microscopy, NMR, thin films); Bioscience (genomics, proteomics, bioinformatics); Supercomputing (IBM Blue Gene, Cray XC40, and other systems); and Visualization (3D immersive CAVE, powerwall, 4K surround-sound theater)
- Extensive collaboration with industrial partners encourages internships that lead to job opportunities for graduates
- Attractive residential campus enhances research and quality of life

KAUST FELLOWSHIP

All students receive the benefits of the KAUST Fellowship (the University's scholarship program):

- Full tuition support
- Competitive monthly living allowance
- Housing
- Private medical and dental coverage
- Relocation support

KAUST consists of three major components: Academic Divisions, Research Centers and Core Labs. In addition, the University encompasses a wide array of facilities and programs, an academic library, a science museum and administrative support offices. KAUST hosts over 6,500 people, including students, researchers, faculty, staff, administrative and service personnel.

COMPUTER, ELECTRICAL, AND MATHEMATICAL SCIENCE AND ENGINEERING DIVISION

Computer, Electrical and Mathematical Science and Engineering (CEMSE) is one of the three academic Divisions of KAUST. CEMSE offers graduate programs at M.S. and Ph.D. level, as well as scientific research programs and initiatives carried out in the CEMSE Core Labs and Research Centers, which are equipped with the ultimate technological development in terms of research facilities and infrastructures.

- The CEMSE mission is to contribute to society through science by:
- Providing the best education to the next generation of scientists
 - Supporting world-class researchers
 - Tackling global issues with a multidisciplinary approach
 - Translating research into entrepreneurial activities and economic opportunities

- CEMSE follows two research orientations:
- Goal-oriented research consisting of large-scale efforts aimed at solving specific problems and developing marketable solutions.
 - Curiosity-based research where researchers and scientists are granted with complete freedom in pursuing their passions and intuitions.

EDUCATION

The CEMSE Division has developed a curriculum of remarkable depth offering degree programs (M.S. and Ph.D.) in Computer Science (CS), Applied Mathematics and Computational Sciences (AMCS) and Electrical Engineering (EE). These degrees programs are designed to train students through education and research.

The M.S. degrees have been designed to offer a unified and coherent program for future science leaders interested in pursuing a career in industry. For the M.S., a minimum of 36 credits are required from a selection of mandatory core courses, elective courses, short-term research projects, industrial internships and a master's thesis.

The Ph.D. degrees programs prepare students for a research-oriented careers in advanced development positions both in academia and industrial research centers. To obtain a Ph.D. degree, students are required to conduct research under the supervision of a faculty member, culminating in the defense of an original dissertation and publications in top-tier journals or conferences.

CEMSE offers the opportunity of studying with international and world-class professors and having a research experience in a unique environment endowed with a cutting-edge technical infrastructure and unmatched resources. CEMSE's professors and researchers are internationally recognized as the world's leading scientific minds, and have been honored with prestigious academic awards, including AAAS, IEEE and SIAM Fellows. In addition, CEMSE students have been honored with prizes such as the IEEE fellowship and the Google Fellowships for female students, and are frequently invited to elite events such as the Lindau Nobel Laureate meetings.

CEMSE RESEARCH

Research topics in CEMSE are defined according to study programs, and offer the ability to develop interdisciplinary research projects that lead applicants into almost any scientific field. Current CEMSE projects include:

COMPUTER SCIENCE (CS)

Artificial Intelligence, Big Data and Analytics, Bioinformatics, Computing Systems, Databases, Networking, Theory, and Visual Computing.



APPLIED MATHEMATICS AND COMPUTATIONAL SCIENCE (AMCS)

Computational Sciences, Game Theory, Mathematical Physics, Mean Field Theory, Numerical Analysis, Partial Differential Equations, Statistics, Stochastic Processes, and Uncertainty Quantification.



ELECTRICAL ENGINEERING (EE)

Circuits, Computer Vision, Control Systems and Robotics, Electromagnetics, Image Processing, MEMS, Nanotechnology, Photonics, Sensors, Solid State Devices, and Wireless Communications.



RESEARCH CENTERS

The Division also includes three Research Centers pursuing goal-oriented research:

- Computational Bioscience Research Center (CBRC) is a grand challenge problem-oriented facility for bioinformatics and computational biology focusing on the latest technological developments in experimental biology. Most CBRC research lines envisage futuristic applications, such as the development of innovative edible products, the design of low-impact energy plants and CO2 sequestration solutions for climate change mitigation purposes.
 - Extreme Computing Research Center (ECRC) is the ultimate technological tool for dealing with complex situations involving Big Data are involved. ECRC's current focus is on pushing forward the frontier of computing by designing algorithms for giant-scale systems at the dawn of the exa-scale computing era. Extreme Computing applications include meteorology, genomics, environmental research, finance, health and social sciences, and other applications.
 - Visual Computing Center (VCC) is a forefront facility supporting research that needs information to be sensed, elaborated and displayed in a visual form. Visual Computing has become the key technology for applications in cultural heritage, urban planning, digital entertainment, consumer electronics and medicine, and in other areas.
- Research projects carried out at CEMSE include one of the Top 10 World-Changing Ideas of 2014 (Scientific American).

CEMSE also benefits from close collaboration with the King Abdulaziz City for Science and Technology (KACST). Activities there support research during the initial stages of idea commercialization. An example of this collaboration is the Efficient Lighting project, an initiative aimed at doubling current light production efficiency in lighting systems.



CORE LABORATORIES AND OTHER FACILITIES

CEMSE teaching and research activities take advantage of KAUST's cross-divisional Core Laboratories and Computing facilities that independently collaborate with several interdisciplinary initiatives.

The KAUST supercomputer Shaheen will reach 5PF by the first quarter of 2015, placing KAUST among the top 20 institutions worldwide in terms of single-system supercomputing capability. Additionally, the Noor computing cluster provides ample computing and storage capacity to support computational-oriented research. Cornea, a six-wall immersive CAVE considered to be world-class in terms of density of pixilation power of illumination, is a forefront facility used in visual computing activities. KAUST's Nanofabrication facility enables in-house prototyping of novel electronic and photonic devices and microsystems. In addition, the Core Laboratories provide analytical facilities for electron microscopy measurements, high-frequency NMR and a laboratory equipped for DNA sequencing.



COMMERCIALIZATION

Faculty and students who work on research projects with market potential have access to competitive seed funding that can be used as the precursor to creating startup companies. KAUST's Innovation Cluster provides scientists with economic support, financial training and management and know-how transfer. Faculty and students interested in creating a joint venture with a well-established company may choose to develop their ideas with one of KAUST's selected industrial partners. Professional support is available from KAUST's Innovation and Economic Development at all stages of project development.

AFTER KAUST

After graduating from KAUST, students pursue career pathways in industry or academia. Recent positions taken by our M.S. alumni include a research position at GE Laboratories, engineer positions with Saudi Aramco, and other opportunities.

Positions offered to KAUST's Ph.D. graduates include an instructor position at MIT, two postdoctoral positions at UC Berkeley, a research scientist position with Saudi Aramco, and others.

Whether you a prospective student or faculty member, KAUST offers the ideal environment and facilities to pursue a research career.

JOIN US



ENGLISH LANGUAGE REQUIREMENT

All courses are taught in English and students must meet the minimum language requirement: 79 on the TOEFL iBT (internet-based test) or 6.0 on the IELTS test.

FOR APPLICATIONS OR INQUIRIES

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