COLUMBIA | ENGINEERING
The Fu Foundation School of Engineering and Applied Science

FACULTY AND RESEARCH

TABLE OF CONTENTS

This is a transformational time for Engineering at Columbia and for engineering globally, and I am pleased to be able to share with you the work of our faculty as we tackle many of society's most pressing challenges. The role of engineering in shaping our world for the better has never been more important, and it has never been more recognized by society at large.

From its inception, our School has had a global impact—from surveying a new railroad route from Canton to Hankow and developing the New York City subway system to pioneering long-distance telephony, X-rays, computer punch cards, FM radio, and mass production of antibiotics, our faculty forebears led the way.

Now, our faculty continues that tradition of innovation and impact through interdisciplinary research initiatives that could not have been imagined 150 years ago when our School was founded. We are at the forefront of finding cost-effective methods of decoding the human genome, diagnosing diseases using labs-on-a-chip, and growing new bone and muscle tissue.

At the same time, we are recognized worldwide as one of the leaders in the development of nano-technology, a highly interdisciplinary field that investigates materials and devices—discovering how behaviors change as we reduce in length scale, and then harnessing these new properties in innovative applications that impact medicine, energy, computing, and much, much more.

Through Columbia's Institute for Data Sciences and Engineering, led by our faculty and including the faculties of eight of our sister schools, path-breaking, interdisciplinary research is taking place in the theory and practice of the emerging field of data science. The data revolution is transforming the pace, the scale, and the pattern of discovery, invention, innovation, and entrepreneurship. Columbia research is building the foundational science and engineering needed to extract useful information from massive amounts of data while also transforming health care, urban infrastructure, new media, financial analytics, and cybersecurity.

I invite you to explore these pages, where you will find an overview of the diverse research interests of the creative, innovative, and entrepreneurial faculty of Columbia Engineering whose discoveries and innovations will profoundly impact the present and the future.

Mary Cunningham Boyce

Dean of Engineering
Morris A. and Alma Schapiro Professor

APPLIED PHYSICS AND APPLIED MATHEMATICS

Bailey

WILLIAM E. BAILEY

Associate Professor of Materials Science (Henry Krumb School of Mines) and of Applied Physics and Applied Mathematics

Nanoscale magnetic films and heterostructures, materials issues in spin-polarized transport, materials engineering of magnetic dynamics

Bal

GUILLAUME BAL

Professor of Applied Mathematics

Applied mathematics, wave propagation in random media and applications to time reversal, inverse problems with applications to medical imaging and Earth science

Barmak

KATAYUN BARMAK

Philips Electronics Professor of Applied Physics and Applied Mathematics

Processing and structure (crystal structure and microstructure) relationships to electrical and magnetic properties of metal films; developing transmission electron microscopy automated orientation imaging techniques that can be applied to the study of nanostructured materials; use of differential scanning calorimetry for the study of solid state reactions and phase transformations in thin films

Billinge

SIMON BILLINGE

Professor of Materials Science and of Applied Physics and Applied Mathematics

Nanoscale structure-property relationships in functional nanomaterials studied using novel X-ray, electron, and neutron scattering techniques coupled with advanced computing; solving the nanostructure problem

Boozer

ALLEN BOOZER

Professor of Applied Physics

Plasma theory, theory of magnetic confinement for fusion energy, nonlinear dynamics

Cane

MARK CANE

Professor of Applied Physics and Applied Mathematics and G. Unger Vetlesen Professor of Earth and Climate Sciences

Climate dynamics, physical oceanography, geophysical fluid dynamics, computational fluid dynamics, impacts of climate on society, El Niño forecasting

Chan

SIU-WAI CHAN

Professor of Materials Science (Henry Krumb School of Mines) and of Applied Physics and Applied Mathematics

Nanoparticles, electronic ceramics, grain boundaries and interfaces, oxide thin films

Cole

ANDREW COLE

Assistant Professor of Applied Physics

Theory of toroidal magnetic confinement fusion plasmas, nonideal and kinetic effects on rotation, analytic approximation and modeling for numerical and experimental benchmarking

Du

QIANG DU

Fu Foundation Professor of Applied Mathematics

Applied and computational mathematics; multiscale modeling, analysis and simulations; applications in physical (superfluid, complex-fluid), biological (membrane), materials (phase transition), and information (data, image) sciences

Herman

IRVING HERMAN

Professor of Applied Physics

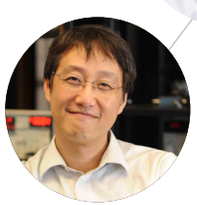
Nanocrystals, optical spectroscopy of nanostructured materials, laser diagnostics of thin film processing, mechanical properties of nanomaterials

Im

JAMES IM

Professor of Materials Science (Henry Krumb School of Mines) and of Applied Physics and Applied Mathematics

Laser-induced crystallization of thin films, phase transformations and nucleation in condensed systems



Kim

PHILIP KIM

Professor of Physics and of Applied Physics

Experimental condensed matter physics with an emphasis on physical properties and applications of nanoscale low-dimensional materials


Létourneau


Marianetti


Mauel


Navratil


Noyan


Pinczuk


Polvani

PIERRE-DAVID LÉTOURNEAU

Chu Assistant Professor of Applied Mathematics

Applied mathematics, mathematical physics, multiple scattering, waves in inhomogeneous and random media, computational wave propagation, numerical analysis

CHRIS MARIANETTI

Associate Professor

Predicting materials properties from first-principles computations; materials with energy-related applications; density-functional theory; dynamical mean-field theory; transition-metal oxides; actinides, energy storage and conversion materials

MICHAEL MAUEL

Professor of Applied Physics

Plasma physics, waves and instabilities, fusion and equilibrium control; space physics; plasma processing, international energy policy

GERALD NAVRATIL

Thomas Alva Edison Professor of Applied Physics

Plasma physics, plasma diagnostics, fusion energy science

ISMAIL C. NOYAN

Department Chair of Applied Physics and Applied Mathematics and Professor of Materials Science and Engineering (Joint appointment in Earth and Environmental Engineering)

Theoretical and applied X-ray and neutron scattering

ARON PINCZUK

Professor of Applied Physics and of Physics

Spectroscopy of semiconductors and insulators, quantum structures and interfaces, electrons in systems of reduced dimensions, electron quantum fluids

LORENZO POLVANI

Professor of Applied Mathematics and of Earth and Environmental Sciences

Atmospheric and climate dynamics, geophysical fluid dynamics, numerical methods for weather and climate modeling, planetary atmospheres

MALVIN RUDERMAN

Centennial Professor of Physics and Professor of Applied Physics

Problems associated with collapsed objects in astrophysics, especially neutron stars

CHRISTOPHER SCHOLZ

Professor of Earth and Environmental Sciences and of Applied Physics and Applied Mathematics

Tectonophysics, experimental and theoretical rock mechanics, especially friction, fracture, hydraulic transport properties, nonlinear systems, mechanics of earthquakes and faulting

TIFFANY SHAW

Assistant Professor of Earth and Environmental Sciences and of Applied Physics and Applied Mathematics

Atmospheric and climate dynamics; wave–mean flow interaction; Hamiltonian structure of fluid dynamics; general circulation dynamics; transport and mixing; stationary-transient interactions

ADAM SOBEL

Professor of Applied Physics and Applied Mathematics and of Environmental Sciences

Atmospheric science, geophysical fluid dynamics, tropical meteorology, climate dynamics

MARC SPIEGELMAN

Arthur D. Storke Memorial Professor of Earth and Environmental Sciences and Professor of Applied Physics and Applied Mathematics

Coupled fluid/solid mechanics, reactive fluid flow, solid earth and magma dynamics, scientific computation/modeling

MICHAEL TIPPETT

Lecturer in Discipline

Predictability and variability of the climate system, with emphasis on the application of statistical methods to data from observations and numerical models

LATHA VENKATARAMAN

Associate Professor of Applied Physics

Single molecule transport, single molecule force spectroscopy, electron transport in nanowires, scanning tunneling microscopy and spectroscopy


Ruderman


Scholz


Shaw

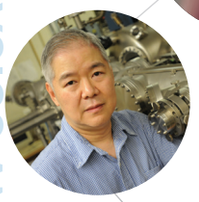

Sobel


Spiegelman


Tippett


Venkataraman


Volpe


Wang


Weinstein


Wiggins


Yu

FRANCESCO VOLPE
Assistant Professor of Applied Physics
Heating, diagnostic and stabilization of magnetized fusion plasmas such as tokamaks and stellarators

WEN WANG
Thayer Lindsley Professor in the Faculty of Engineering and Applied Science and Professor of Applied Physics and Applied Mathematics
Heterogeneous materials integration, quantum semiconductor optoelectronics, photovoltaics, molecular beam epitaxy

MICHAEL WEINSTEIN
Professor of Applied Mathematics
Applied mathematics, partial differential equations, dynamical systems, waves in nonlinear, inhomogeneous, and random media; multiscale phenomena, applications to nonlinear optics, quantum systems and fluid dynamics

CHRIS WIGGINS
Associate Professor of Applied Mathematics
Applied mathematics, mathematical biology, biopolymer dynamics, soft condensed matter, genetic networks and network inference, machine learning

NANFANG YU
Assistant Professor of Applied Physics
Mid-infrared and far-infrared optics and optoelectronic devices, infrared imaging and spectroscopy, nanophotonics, graphene optoelectronic devices

BIOMEDICAL ENGINEERING

X. EDWARD GUO
Professor
Image-based microstructural and finite element analyses of skeletons; in-vitro mechanobiology of osteocytes, osteoblasts, and osteoclasts; and 3D cell mechanics and mechanotransduction

HENRY HESS
Associate Professor
Engineering at the molecular scale, in particular the design of active nanosystems incorporating biomolecular motors, the study of active self-assembly, and the investigation of protein-resistant polymer coatings

ANDREAS H. HIELSCHER
Professor (Joint appointments in Electrical Engineering and in Radiology)
Optical medical instrumentation and image reconstruction algorithms; clinical and preclinical imaging of joint diseases, cancer (breast, kidney, stomach, bone, prostate), cerebral hemodynamics (stroke, epilepsy); and vascular reactivity

ELIZABETH M. C. HILLMAN
Associate Professor (Joint appointment in Radiology)
Development and application of advanced in-vivo optical neuroimaging and microscopy technologies to gain insight into the function and physiology of the living brain, particularly the interrelation between neuronal activity and brain blood flow in health and disease

HAYDEN HUANG
Assistant Professor
General responses of cells to physical stimuli, mechanotransduction, cell mechanical properties and adhesion, with focus on cardiovasculature, development of instrumentation and new techniques for probing cells


Guo


Hess

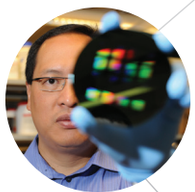

Hielscher


Hillman


Huang


Hung


Jacobs


Kam


Konofagou


Kyle


Laine


Lu

CLARK T. HUNG
Professor
Effects of physical, mechanical, and chemical stimuli on musculoskeletal cells related to cellular and tissue engineering

CHRISTOPHER R. JACOBS
Professor
Understanding the molecular mechanisms that allow cells of the skeletal system to sense and respond to mechanical stimulation

LANCE C. KAM
Associate Professor
Micro- and nanoscale fabrication of biological systems, cell-cell and cell-matrix signaling, engineering of immune and nervous systems, nanomedicine

ELISA E. KONOFAGOU
Professor (Joint appointment in Radiology)
Ultrasonics (imaging and therapy), elasticity imaging, signal and image processing, soft tissue mechanics

AARON M. KYLE
Lecturer
Engineering education and laboratory development, biomedical signal processing and acoustics, electromagnetic field-induced tissue growth and repair

ANDREW F. LAINE
Percy K. and Vida L. W. Hudson Professor of Biomedical Engineering and Department Chair
Mathematical analysis and quantification of medical images, bio-signal and image processing, computer-aided diagnosis, imaging informatics

HELEN LU
Professor
Interface tissue engineering and the formation of integrated complex tissue systems, stratified scaffold design for multi-tissue regeneration and multiscale models to evaluate heterotypic cellular interactions, composite biomaterials for orthopaedic and dental applications

BARCLAY MORRISON III
Associate Professor and Department Vice Chair
Mechanical injury of the central nervous system: (1) universal tissue tolerance criteria, (2) role of the cytoskeleton in injury, (3) application of genomic and proteomic technologies to mechano-transduction, (4) repair strategies using stem cells, (5) electrode design for neural engineering

VAN C. MOW
Stanley Dicker Professor of Biomedical Engineering and Orthopedic Bioengineering
Soft tissue biomechanics (including articular cartilage, meniscus and intervertebral disc), biomechanics of osteoarthritis, cell-matrix interactions, mechano-signal transduction, and functional tissue engineering

PAUL SAJDA
Professor (Joint appointments in Electrical Engineering and in Radiology)
Neurocomputational modeling and neuroengineering, pattern recognition, adaptive processing for biomedical image and signal analysis

MICHAEL SHEETZ
William R. Kenan Jr. Professor of Cell Biology (Joint appointment in Biological Sciences)
Force-dependent signaling; cell spreading, force generation and rigidity sensing; mechanosensing in myofibrillogenesis; mechanotransduction at the immunological synapse

SAMUEL SIA
Associate Professor
Microfluidics, point-of-care diagnostics, 3D tissue engineering, implantable devices

GORDANA VUNJAK-NOVAKOVIC
The Mikati Foundation Professor of Biomedical Engineering and Professor of Medical Sciences
Advanced technologies for functional tissue engineering, regenerative medicine, human stem cell research, and study of disease

QI WANG
Assistant Professor
Neural coding in the somatosensory pathway of the brain, brain-machine interfaces, and biomedical instrumentation for creating engineered tactile sensations


Morrison III


Mow


Sajda


Sheetz


Sia


Vunjak-Novakovic


Wang

CHEMICAL ENGINEERING


Banta


Chen


Durning


Esposito


Hill


Ju


Koberstein

SCOTT BANTA
Associate Professor
Protein engineering, metabolic engineering, and biotechnology

JINGGUANG CHEN
Thayer Lindsley Professor of Chemical Engineering
Experimental and theoretical studies of metal carbides and bimetallic alloys as catalysts and electrocatalysts for energy applications

CHRISTOPHER DURNING
Professor
Transport processes and interfacial properties of synthetic polymer systems, self-assembly and nanoscience modification and functional thin films, macromolecule complexing in solution

DANIEL ESPOSITO
Assistant Professor
Solar energy conversion, solar fuels, catalysis, high-throughput screening of materials, interfacial phenomena, and in-situ micro/nanoscale analysis techniques

MICHAEL HILL
Lecturer in Discipline
Chemical process and product design, process intensification through the application of microfluidics

JINGYUE JU
Samuel Ruben–Peter G. Viele Professor of Engineering
Genomic science and technology, molecular engineering and chemical biology

JEFFREY KOBERSTEIN
Percy K. and Vida L. W. Hudson Professor of Chemical Engineering
Self-assembling photoactive polymer surfaces, DNA and carbohydrate microarrays, surface characterization and modification of nanoparticles, model polymer networks and hydrogels

SANAT KUMAR
Professor and Department Chair
Polymer systems, both biological and synthetic contexts, using a combined theoretical and experimental program

EDWARD LEONARD
Professor
Artificial organs, transport and rate phenomena in biological systems, modeling of organ systems, genomics of stem cell accommodation in adult tissue

V. FAYE MCNEIL
Associate Professor
Atmospheric chemistry, aerosols, environmental chemical engineering

BEN O'SHAUGHNESSEY
Professor
Quantitative cell biology, neurotransmission, membrane fusion, viral infection, cell division, cell migration, cell mechanosensing

VANESSA ORTIZ
Assistant Professor
Multiscale modeling, with applications to biological macromolecules and biomaterials, as well as the stability and dynamics of self-assembled supramolecular structures

VENKAT VENKATASUBRAMANIAN
Samuel Ruben–Peter G. Viele Professor of Chemical Engineering
Risk analysis and management in complex engineered systems, cyberinfrastructure and "big data" analytics for molecular products design and discovery, complex adaptive teleological systems

ALAN C. WEST
Samuel Ruben–Peter G. Viele Professor of Electrochemistry
Electrochemical metallization process, batteries and fuel cells


Kumar


Leonard


McNeil


O'Shaughnessey


Ortiz


Venkatasubramanian


West

CIVIL ENGINEERING AND ENGINEERING MECHANICS


Betti

RAIMONDO BETTI
Professor
Structural mechanics, structural dynamics, system identification of linear and nonlinear structures, damage detection, health monitoring of structures, earthquake engineering, computational mechanics, bridge engineering, seismic analysis of bridges, corrosion processes in high-strength bridge wires


Chang

JULIUS CHANG
Lecturer in Discipline
Graduate and undergraduate courses in civil engineering, primarily in the area of construction engineering and management


Culligan

PATRICIA CULLIGAN
Professor
Geo-environmental engineering, urban design and sustainability, high performance green infrastructure, porous media flow and transport


Dasgupta

GAUTAM DASGUPTA
Professor
Engineering mechanics–continuum mechanics, viscoplastic wave propagation, stochastic analysis, bioengineering growth, symbolic computation: Green's functions and boundary elements, and defect-free finite elements, civil engineering–live design: mitigating extreme disasters


Deodatis

GEORGE DEODATIS
Santiago and Robertina Calatrava Family Professor and Department Chair
Probabilistic mechanics, Monte Carlo simulation techniques, infrastructure risk analysis and risk mitigation, structural safety and reliability, hazards analysis, uncertainty quantification


Feng

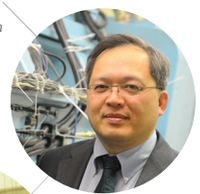
MARIA Q. FENG
Renwick Professor of Civil Engineering and Engineering Mechanics
Sustainability of civil infrastructural systems through multidisciplinary research on sensors, data analytics, smart structures, and structural health monitoring and system control for intelligent maintenance to minimize life-cycle cost and enhance system resiliency to natural and man-made hazards


Fish

JACOB FISH
Robert A. W. and Christine S. Carleton Professor in Civil Engineering
Multiscale science and engineering with applications to aerospace, automotive industry, civil engineering, biological and material sciences


Kawashima

SHIHO KAWASHIMA
Assistant Professor
Rheological behavior and fresh-state microstructure of concrete, nanomodification and nanocharacterization of cementitious materials, sustainable infrastructural materials


Ling

HOE LING
Professor
Geotechnical engineering, geosynthetics, centrifuge modeling, soil behavior, seismic performance


Meyer

CHRISTIAN MEYER
Professor
Structural analysis and design, earthquake engineering, concrete structures, concrete technology


Odeh

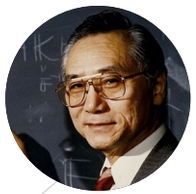
IBRAHIM S. ODEH
Lecturer in Discipline
Studying global construction practices and challenges; program, project, and construction management; project control; project finance; and business and program development


Panayotidi

THOMAS PANAYOTIDI
Lecturer in Discipline
Computational mechanics, constitutive modeling of engineering materials, earthquake engineering, finite elements in geomechanics


Peña-Mora

FENIOSKY PEÑA-MORA
Edwin Howard Armstrong Professor of Civil Engineering and Engineering Mechanics (Joint appointments in Computer Science and in Earth and Environmental Engineering)
Information technology support for collaboration in preparedness, response, and recovery during disasters involving critical physical infrastructures, change management, conflict resolution, sustainable construction, visualization, augmented reality, and processes integration during the design and development of large-scale civil engineering systems


Shinozuka

MASANOBU SHINOZUKA
Professor
Risk assessment of lifeline networks, socioeconomic impact of natural disasters, smart infrastructure systems, remote monitoring and control, nondestructive evaluation of structural safety, stochastic processes and fields, analysis of uncertainty in engineering mechanics, earthquake and wind engineering


Smyth

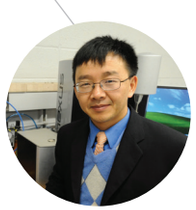
ANDREW SMYTH
Professor
Structural dynamics, analytical dynamics, structural health monitoring and control, nonlinear system identification, random vibrations


Sun

STEVE W. SUN
Assistant Professor
Computational mechanics, poromechanics, multiphysics and multiscale methods with emphases on environment- and resource-related geomechanics applications


Waisman

HAIM WAISMAN
Associate Professor
Computational mechanics, computational fracture and damage mechanics, mechanics of materials, extended finite element methods, multigrid and multiscale methods, impact and blast modeling, contact mechanics, inverse problems, computational nanomechanics, advanced scientific and parallel computing


Yin

HUIMING YIN
Associate Professor
Design and development of modern energy-efficient infrastructure system, characterization and modeling of composite materials through theoretical and experimental approaches cross scales, fabrication and manufacture of civil engineering materials for optimized life cycle cost

COMPUTER SCIENCE


Aho

ALFRED V. AHO
Lawrence Gussman Professor of Computer Science
Compilers, software engineering, algorithms, quantum computing


Allen

PETER ALLEN
Professor
Robotics, computer vision, 3D modeling, human-computer interfaces


Belhumeur

PETER N. BELHUMEUR
Professor
Computer vision, graphics, image-based rendering, face recognition


Bellovin

STEVEN BELLOVIN
Professor
Security, networks, privacy, public policy


Blei

DAVID M. BLEI
Professor
Statistical machine learning; Bayesian statistics; applications to text, images, music, social networks, user behavior, and scientific data


Cannon

ADAM CANNON
Senior Lecturer in Discipline
Computer science education, machine learning, statistical pattern recognition


Carloni

LUCA CARLONI
Associate Professor
Multi-core architectures, embedded systems, computer-aided design, hardware-software integration, cyber-physical systems


Chaintreau


Chen


Collins


Edwards


Feiner


Geambasu


Gravano


Grinspun

AUGUSTIN CHAINTREAU
Assistant Professor
Networked algorithms, social networks, mobile computing, stochastic networks

XI CHEN
Assistant Professor
Algorithmic game theory and economics, complexity theory

MICHAEL COLLINS
Vikram S. Pandit Professor in Computer Science
Natural language processing, machine learning

STEPHEN A. EDWARDS
Associate Professor
Compilers, embedded systems, VLSI, computer-aided design, digital systems, languages

STEVEN FEINER
Professor
Human-computer interaction, graphics and user interfaces, 3D user interfaces, augmented reality, virtual environments, knowledge-based design of graphics and multimedia, mobile and wearable computing, computer games, information visualization

ROXANA GEAMBASU
Assistant Professor
Distributed systems, operating systems, security and privacy, cloud computing, mobile computing

LUIS GRAVANO
Professor
Databases, information retrieval, web search, social media, information extraction

EITAN GRINSPUN
Associate Professor
Graphics, animation, simulation, computational mechanics, geometry processing, discrete differential geometry, interactive design software

JONATHAN GROSS
Professor
Computational aspects of low-dimensional topology—topological graph theory, Celtic knots, 3D shape modeling

JULIA HIRSCHBERG
Percy K. and Vida L. W. Hudson Professor of Computer Science and Department Chair
Computational linguistics/natural language processing, prosody, emotional speech, spoken dialogue systems, deceptive speech, entrainment/alignment in dialogue, text-to-scene generation, speech summarization, code-switching

DANIEL HSU
Assistant Professor
Algorithmic statistics and machine learning

TONY JEBARA
Associate Professor
Machine learning, social networks, graph algorithms, spatio-temporal data, vision

GAIL KAISER
Professor
Social software engineering, collaborative work, privacy and security, software reliability, self-managing systems, parallel and distributed systems, web technologies, information management, and software development environments and tools

JOHN KENDER
Professor
Computer vision, video understanding, visual user interfaces, artificial intelligence

ANGELOS KEROMYTIS
Associate Professor
Security, cryptography, networks, operating systems, distributed systems

MARTHA KIM
Assistant Professor
Computer architecture, parallel systems, hardware-software integration, code generation and optimization


Gross


Hirschberg


Hsu


Jebara


Kaiser


Kender


Keromytis


Kim


Lee


Lewko


Malkin


McKeown


Misra


Nayar


Nieh


Nowick

JAE WOO LEE
Lecturer in Discipline
Computer science education, networks, software engineering, cloud computing

ALLISON LEWKO
Assistant Professor
Cryptography, harmonic analysis, combinatorics, and distributed computing

TAL MALKIN
Associate Professor
Cryptography, complexity theory, security, randomized algorithms

KATHLEEN MCKEOWN
Henry and Gertrude Rothschild Professor of Computer Science
Natural language processing, summarization, multimedia, digital libraries

VISHAL MISRA
Associate Professor
Networking, modeling and performance evaluation, information theory

SHREE NAYAR
T. C. Chang Professor of Computer Science
Computer vision, computer graphics, robotics, human-computer interfaces

JASON NIEH
Professor
Operating systems, mobile computing, cloud computing, networking, security

STEVEN NOWICK
Professor (Joint appointment in Electrical Engineering)
Asynchronous and mixed-timing digital circuits and systems, computer-aided design, networks-on-chip, interconnection networks for parallel processors, ultra-low-power digital design

ITSIK PE'ER
Associate Professor
Computational biology, genomics, bioinformatics

MICHAEL RABIN
Professor
Theory of computation, privacy and security

KENNETH ROSS
Professor
Database systems, query processing, declarative languages, genetics

DAN RUBENSTEIN
Associate Professor
Computer networks, network robustness and security, multimedia networking, performance evaluation, algorithms

HENNING SCHULZRINNE
Julian Clarence Levi Professor of Mathematical Methods and Computer Science (Joint appointment in Electrical Engineering)
Computer networks, multimedia systems, mobile and wireless systems, ubiquitous and pervasive computing

ROCCO SERVEDIO
Associate Professor
Computational learning theory, computational complexity theory, randomness in computing, sublinear time algorithms, combinatorics, cryptography

SIMHA SETHUMADHAVAN
Associate Professor
Computer architecture, security, VLSI design, high-performance computing

SALVATORE STOLFO
Professor
Computer security, intrusion and anomaly detection, embedded device security, data mining/machine learning


Pe'er


Rabin


Ross


Rubenstein


Schulzrinne


Servedio


Sethumadhavan


Stolfo

JOSEPH TRAUB
Edwin Howard Armstrong Professor of Computer Science
Quantum computing, information-based complexity, financial computation

VLADIMIR VAPNIK
Professor
Machine learning, empirical inference, statistical learning theory

HENRYK WOZNIAKOWSKI
Professor
Computational complexity of continuous problems, tractability of multivariate problems

JUNFENG YANG
Associate Professor
Operating systems, programming languages, security, distributed systems, software engineering, networks

MIHALIS YANNAKAKIS
Percy K. and Vida L. W. Hudson Professor of Computer Science
Algorithms, complexity theory, combinatorial optimization, databases, testing, and verification

CHANGXI ZHENG
Assistant Professor
Computer graphics, physically based multisensory animation, computational acoustics, scientific computing, robotics

EARTH AND ENVIRONMENTAL ENGINEERING

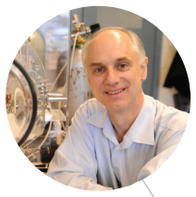
KARTIK CHANDRAN
Associate Professor
Environmental microbiology and biotechnology, re-engineering the global nitrogen cycle, sustainable sanitation, public health microbiology, water and wastewater treatment, bioenergetics (including biofuels), biorefining

XI CHEN
Associate Professor
Novel energy absorption and harvesting materials, advanced materials addressing challenges in energy and environment, morphogenesis, mechanobiology, nano- and micromechanics, mechanical self-assembly, nanoindentation, thin films and small material structures, multiphase and multiscale computational mechanics

PAUL DUBY
Professor and Department Chair
Extractive metallurgy, electrochemical and hydrometallurgical processes, corrosion of metals, fuel cells, wastewater treatment and material recycling

ROBERT FARRAUTO
Professor of Professional Practice
Heterogeneous catalysis for controlling gaseous emissions from automotive and stationary engines, alternative energy using catalytic reforming of gaseous and liquid fuels to hydrogen for fuel cells, catalytic processes for upgrading carbon dioxide to useful products

PIERRE GENTINE
Assistant Professor
Land-atmosphere interactions, hydrometeorology, convection, ecohydrology, remote sensing, data assimilation of remote sensing measurements to estimate soil moisture and surface heat fluxes, land-surface models


Lackner

KLAUS LACKNER

The Maurice Ewing and J. Lamar Worzel Professor of Geophysics

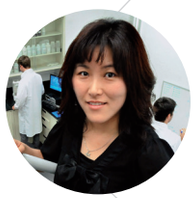
Energy-environment system dynamics, managing carbon in the environment, scientific underpinnings of infrastructure for sustainable and plentiful energy, system analysis and development of energy and mineral resource infrastructures, making science and engineering relevant to business and policy


Lall

UPMANU LALL

Alan and Carol Silberstein Professor of Earth and Environmental Engineering (Joint appointment in Civil Engineering and Engineering Mechanics)

Hydroclimatology, nonlinear dynamics, and applied statistics; natural hazards, water systems, and risk management; water technologies for developing countries; major research initiatives: global flood risk, global water sustainability, America's water


Park

AH-HYUNG (ALISSA) PARK

Lenfest Associate Professor in Applied Climate Science

Carbon capture, utilization, and storage (CCUS) and sustainable energy extraction and conversion from wastes, biomass, and shale based on novel hybrid nanomaterials and advanced carbonate chemistry


Schlosser

PETER SCHLOSSER

Vinton Professor of Earth and Environmental Engineering

Tracer studies of the dynamics of ocean, continental waters, and groundwater and its variability, air/sea gas exchange, paleoclimate, Arctic environmental change, impact of human activities on Earth systems, and sustainable development


Somasundaran

PONISSERIL SOMASUNDARAN

LaVon Duddleson Krumb Professor of Mineral Engineering

Surface/colloid chemistry of materials/nanoparticles, greener chemicals, sustainability in underground resources exploration, molecular interactions at interfaces using advanced spectroscopy, polymers/surfactants/proteins adsorption, flocculation/dispersion, biosurfaces, sunlight-powered synthesis of fuels from CO_2/water


Yegulalp

TUNCEL YEGULALP

Professor

Mineral economics, systems analysis, extreme value statistics applications, zero-emission power plant modeling and design, CO_2 sequestration, hydrogen production with CO_2 capture

ELECTRICAL ENGINEERING

DIMITRIS ANASTASSIOU

Charles Batchelor Professor of Electrical Engineering

Systems biology: data mining of cancer data sets to discover molecular signatures representing biological mechanisms in cancer, use of these signatures as building blocks in molecular diagnostic biomarker products


Anastassiou

KEREN BERGMAN

Charles Batchelor Professor of Electrical Engineering and Department Chair

Optical interconnection networks for advanced computing systems, data centers, optical packet-switched routers, and chip multiprocessor nanophotonic networks-on-chip


Bergman

SHIH-FU CHANG

Richard Dicker Professor of Telecommunications and Senior Vice Dean of Columbia Engineering (Joint appointment in Computer Science)

Multimedia, signal processing, computer vision, machine learning, multimedia search and retrieval


Chang

PAUL DIAMENT

Professor

Electromagnetics, microwaves, antennas, fiber optics, electromagnetics for medical applications, stochastic processes in financial economics


Diament

DANIEL P. ELLIS

Professor

Computational models of human sound processing and organization, automatic speech recognition in real-world environments, music audio signal processing, mining, and retrieval, environmental sound organization and classification


Ellis

JAVAD GHADERI

Assistant Professor

Mathematical modeling and analysis of large-scale networks, primarily to study current problems in communication networks, wireless systems, social networks, and cloud computing


Ghaderi


Heinz


Hendon


Jelenkovic


Kinget


Krishnaswamy


Kymissis


Lavaei

TONY HEINZ

David M. Rickey Professor of Optical Communications in the Faculty of Engineering and Applied Science and Professor of Physics

Optical and electronic properties of nanoscale materials, including graphene and other 2D systems, nonlinear, ultrafast, and THz optics

CHRISTINE HENDON

Assistant Professor

Optical coherence tomography, near infrared spectroscopy, cardiovascular imaging, cardiac electrophysiology, medical image and signal analysis

PREDRAG JELENKOVIC

Professor

Mathematical foundations of complex information networks and systems, wireless networks, biological networks, information ranking, average case analysis of algorithms, heavy tails, queueing theory, applied probability

PETER KINGET

Professor

Analog, RF, and power-integrated circuits and the applications they enable in wireless communications, sensing, energy harvesting, and power management; focus on low-voltage and low-power techniques for nanoscale devices

HARISH KRISHNASWAMY

Assistant Professor

Theory, implementation and experimental verification of RF, millimeter-wave and terahertz devices, circuits and systems, with applications in communications, radar, imaging, and sensing

JOHN KYMISSIS

Associate Professor

Investigations into device performance, fabrication, packaging, and device driving

JAVAD LAVAEI

Assistant Professor

Power systems, optimization theory, distributed computation, control systems, and communication networks

AUREL A. LAZAR

Professor

Neural computing engines and massive parallel neural computation *(in silico),* reverse engineering the fruit fly brain *(in vivo),* big data in neuroscience

NICK MAXEMCHUK

Professor

Routing and flow control, energy conservation in wireless networks, application of network fairness to energy distribution and traffic light control, and application of formal methods in protocols to safe, intelligent vehicles

NIMA MESGARANI

Assistant Professor

Reverse engineering the neural computations involved in speech processing in the brain, neural engineering, speech and audio signal processing

DEBASIS MITRA

Professor

Scientific foundations of policies that impact engineers and engineering systems, network economics, science and management of innovations and knowledge creation, cooperative inter-networking, network traffic engineering, network planning and resource sharing

RICHARD OSGOOD JR.

Higgins Professor of Electrical Engineering (Joint appointment in Applied Physics and Applied Mathematics)

Integrated optical devices and design, surface physics of oxide, 2D materials, and semiconductors, new laser sources, advanced oxides, and optical physics and simulation

JOHN PAISLEY

Assistant Professor

General area of statistical machine learning, probabilistic modeling and inference techniques, Bayesian nonparametric methods, dictionary learning and topic modeling


Lazar


Maxemchuk


Mesgarani


Mitra


Osgood Jr.


Paisley

Sen

AMIYA SEN

Professor (Joint appointment in Applied Physics)

Novel magnetic confinement devices for controlled thermonuclear fusion, plasma waves and instabilities and their feedback control, plasma turbulence and anomalous transport

Seok

MINGOO SEOK

Assistant Professor

Low power/ultra-low power digital VLSI systems, adaptive design techniques and methodologies, VLSI architecture and circuit design for digital signal processing, analog circuits in VLSI systems

Shepard

KENNETH SHEPARD

Professor (Joint appointment in Biomedical Engineering)

Design tools for advanced CMOS technology, on-chip test and measurement circuitry including on-chip sampling oscilloscopes, low-power design techniques for digital signal processing, circuits for low-power intrachip communications, and CMOS gene chips

Tsividis

YANNIS TSIVIDIS

Charles Batchelor Professor of Electrical Engineering

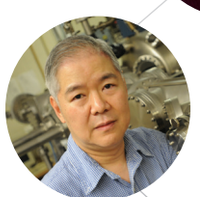
Analog and mixed-signal (analog-digital) integrated circuits, signal processing, and computing

Vallancourt

DAVID VALLANCOURT

Senior Lecturer

Analog and mixed-signal integrated circuit design for communications applications



W. Wang

WEN WANG

Thayer Lindsley Professor in the Faculty of Engineering and Applied Science (Joint appointment in Applied Physics and Applied Mathematics)

Ultrahigh-speed electronics, heterogeneous materials integration, semiconductor optoelectronics, including lasers and photodetectors

X. Wang

XIAODONG WANG

Professor

Bayesian Monte Carlo signal processing, multiuser communication theory, wireless communications, bioinformatics

Wright

JOHN WRIGHT

Assistant Professor

Robust modeling and analysis of high-dimensional data, efficient data representations, signal and image processing and computer vision

Zukowski

CHARLES ZUKOWSKI

Professor and Department Vice Chair

Design and analysis of digital VLSI circuits, circuit simulation, communication circuits

Zussman

GIL ZUSSMAN

Associate Professor

Wireless and mobile networks and systems (including cellular, local area, energy harvesting, and mesh networks), resilience of communication and power networks, cross-layering in communication networks

INDUSTRIAL ENGINEERING AND OPERATIONS RESEARCH


Bienstock


Blanchet


Chudnovsky


Derman


Gallego


Goldfarb


Goyal

DANIEL BIENSTOCK
Professor (Joint appointment in Applied Physics and Applied Mathematics)
Combinatorial optimization and integer programming, computational modeling of power grids

JOSE BLANCHET
Associate Professor
Applied probability, computational finance, MCMC, queueing theory, rare-event analysis, simulation methodology, and risk theory

MARIA CHUDNOVSKY
Professor
Graph theory and combinatorial optimization

EMANUAL DERMAN
Professor of Professional Practice
Quantitative finance, derivatives valuation, volatility models, risk management, philosophy of modeling

GUILLERMO GALLEGO
Liu Family Professor of Industrial Engineering and Operations Research
Dynamic pricing, discrete choice modeling, assortment optimization, design and pricing of bundles, real options

DONALD GOLDFARB
Alexander and Hermine Avanessians Professor of Industrial Engineering and Operations Research
Algorithms for linear, quadratic, semidefinite, convex, and general nonlinear programming, network flows, large sparse systems, and applications in robust optimization, finance, and imaging

VINEET GOYAL
Assistant Professor
Dynamic optimization under uncertainty, robust optimization, combinatorial optimization, applications in electricity markets and revenue management

MARTIN HAUGH
Lecturer in Discipline
Financial engineering and risk management, Markov decision processes and duality based on information relaxations, machine learning for operations research

XUEDONG HE
Assistant Professor
Behavioral finance, portfolio choice, asset pricing, and risk management when investors are not fully rational, applied probability topics such as stochastic control and optimal stopping

GARUD IYENGAR
Professor and Department Chair
Convex optimization, robust optimization, combinatorial optimization, computational finance, complex systems, systemic risk, information theory

SOULAYMANE KACHANI
Professor of Professional Practice and Vice Dean of The Fu Foundation School of Engineering and Applied Science
Pricing and revenue management, logistics, supply chain management, traffic flow modeling, airline operations, transportation analysis, and algorithmic trading

STEVEN KOU
Professor
Quantitative finance, asset pricing, derivatives, risk measures, real estate, applied probability, empirical finance

TIM LEUNG
Assistant Professor
Financial engineering: (i) derivatives pricing, e.g., employee stock options, exchange-traded funds, credit derivatives, (ii) optimal dynamic/static strategies for hedging, trading, and risk management

MARIANA OLVERA-CRAVIOTO
Assistant Professor
Applied probability, stochastic systems, and heavy-tailed phenomena, including applications to the analysis of ranking algorithms, random graphs, and queueing theory

JAY SETHURAMAN
Professor
Discrete optimization, market design, scheduling, applied probability


Haugh


He


Iyengar


Kachani


Kou


Leung


Olvera-Cravioto


Sethuraman


Sigman

KARL SIGMAN
Professor
Queueing theory, stochastic networks, point processes, insurance risk, economics, stochastic simulation, modeling of U.S. presidential elections


Stein

CLIFFORD STEIN
Professor (Joint appointment in Computer Science)
Combinatorial optimization, scheduling, green computing, network and internet algorithm, the development of efficient algorithms for computationally hard problems with both provable guarantees and practical impact, algorithms for managing energy consumption in scheduling and network systems


Truong

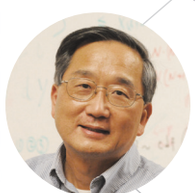
VAN-ANH TRUONG
Assistant Professor
Health care policies, health care operations, scheduling of diagnostic and surgical resources, control of medical formularies, pricing and designing of supply contracts for pharmaceuticals, management of public vaccine stockpiles


Webster

ANTHONY WEBSTER
Lecturer in Discipline
Accounting, corporate finance, real estate finance, decision models, and construction economics


Whitt

WARD WHITT
Wai T. Chang Professor
Applied probability, queueing systems, stochastic networks, stochastic-process limits, performance approximations and numerical transform inversion with applications to communications, computer, production, and service systems


Yao

DAVID YAO
Piyasombatkul Family Professor of Industrial Engineering and Operations Research
Stochastic systems and applied probability, resource control in stochastic networks, financial systemic risk, risk hedging in production systems, health care operations, hospital resource planning


Zhong

YUAN ZHONG
Assistant Professor
Modeling and analysis of large-scale stochastic systems, with business and engineering applications in areas such as communication networks, data centers, cloud computing and health care

MECHANICAL ENGINEERING


Agrawal

SUNIL AGRAWAL
Professor
Design, dynamics, control of intelligent robots and machines, kinematic analysis and synthesis, underactuated robots, orthotics, prosthetics, novel devices for functional rehabilitation, training studies with robots for neural impaired adults and children


Akbari

PEJMAN AKBARI
Lecturer in Discipline
Energy system design, computational fluid mechanics, advanced propulsion engine and turbomachinery aerothermodynamics, green automobile engine designs


Ateshian

GERARD A. ATESHIAN
Andrew Walz Professor of Mechanical Engineering and Department Chair (Joint appointment in Biomedical Engineering)
Theoretical and experimental analysis of articular cartilage mechanics, lubrication, tissue engineering and bioreactor design, growth and remodeling of biological tissues, cell mechanics, mixture theory


Boyce

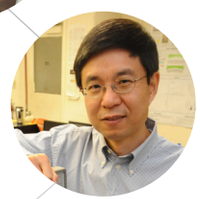
MARY C. BOYCE
Dean of Engineering and Morris A. and Alma Schapiro Professor
Mechanics of materials, molecular and nanomechanics of man-made and natural polymers and soft composites


Burke

MICHAEL P. BURKE
Assistant Professor
Mixed-experimental-and-computational investigations of advanced combustion and energy systems that utilize multiscale modeling, automation, and data sciences


Hone


Kysar


Lin


Longman


Modi


Myers


Narayanaswamy

JAMES C. HONE

Professor

Carbon nanotubes, graphene, self-assembled nanostructures, and textured substrates to explore new applications in nano-electro-mechanical systems, biomechanical systems, nanoscale and molecular electronics, and opto-electronics

JEFFREY KYSAR

Professor

Analyze and predict the mechanical behavior of materials and objects of all sizes; describe how mechanical behavior couples with other properties such as optical or electrical

QIAO LIN

Associate Professor

Controlling, sensing, and characterizing biomolecules and cells by micro-electro-mechanical systems (MEMS) technology

RICHARD LONGMAN

Professor (Joint appointment in Civil Engineering and Engineering Mechanics)

Iterative learning control design for high-precision control in repetitive operations, repetitive control for eliminating influence of repeating disturbances, system identification generating mathematical models from input-output data

VIJAY MODI

Professor

Engineering software solutions to help make development planning smarter and to improve the delivery of critical services like health and energy in the developing world

KRISTIN MYERS

Assistant Professor

Experimental and theoretical soft tissue mechanics, growth and remodeling of the uterine cervix during pregnancy, finite element models of pregnancy, mechanics of collagenous materials

ARVIND NARAYANASWAMY

Associate Professor

Theoretical and experimental investigations of nanoscale and microscale effects in thermo-fluid transport phenomena

FRED STOLFI

Senior Lecturer

Mechatronics (electronic and microcomputer control of mechanical systems), mechanical design, dynamics, vibration and control, system modeling, mechanical laboratory instrumentation

ELON TERRELL

Assistant Professor

Thermal-fluid sciences, energy, and tribology

SINISA VUKELIC

Lecturer in Discipline

Ultrafast laser processing of transparent dielectrics, mechanical response of transparent dielectrics, material properties of biomaterials, spectroscopic analysis for optical diagnostics and analysis of targeted molecular pathways

CHEE WEI WONG

Associate Professor

Physics, applied physics, and engineering of optics at the nanoscale

Y. LAWRENCE YAO

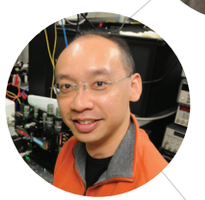
Professor

Manufacturing and design; laser materials processing; laser-assisted material removal, shaping, joining, and property modification, laser applications in renewable energy, biomedical, and art restoration; robotics in industry and health care


Stolfi


Terrell


Vukelic


Wong


Yao

COLUMBIA | ENGINEERING

The Fu Foundation School of Engineering and Applied Science

1864–2014