

AREAS OF RESEARCH



COMMUNICATIONS, SIGNAL PROCESSING, AND NETWORKING

- Investigation and development of communication and signal processing theories
- Algorithms and systems for wireless and network communications
- Video and multimedia technologies



INTELLIGENT SYSTEMS

- Theoretical foundations and applications of computer vision, machine learning, and pattern recognition
- Cyber-physical and autonomous systems
- Intelligent transportation systems, multimedia technologies, and image/video bioinformatics



COMPUTER ENGINEERING

- Design and implementation of hardware and software systems
- Computer architecture, VLSI design, real-time and embedded systems
- Networked systems from small scales (e.g. Internet of Things) to large scales (e.g. data centers)



NANOTECHNOLOGY, ADVANCED MATERIALS, AND DEVICES

- Theoretical, computational, and experimental investigation of nanostructures
- Development of new bio- and opto-electronic materials, devices and circuits
- MEMS



CONTROL AND ROBOTICS

- Theories and methods of modeling, identification and design of highly complex control systems
- Planning and analysis of motion, navigation and control of autonomous vehicles and robotic systems



POWER SYSTEMS AND SMART GRID

- Development and demonstration of smart grid applications
- Power system analysis and optimization
- Electricity market design
- Renewable energy integration
- Power system security

FACULTY



COMMUNICATIONS, SIGNAL PROCESSING, AND NETWORKING

Salman Asif Hamed Mohsenian-Rad
Bir Bhanu Samet Oymak
Roman Chomko Amit Roy-Chowdhury
Basak Guler Ertem Tuncel
*Yingbo Hua

*Lead Faculty



INTELLIGENT SYSTEMS

Nael Abu-Ghazaleh Konstantinos Karydis
Salman Asif Hyoseung Kim
*Matt Barth Hamed Mohsenian-
Bir Bhanu Rad
Jay Farrell Samet Oymak
Basak Guler Shaolei Ren
 Amit Roy-Chowdhury
 Nanpeng Yu

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COMPUTER ENGINEERING

Nael Abu-Ghazaleh Albert Wang
Hyoseung Kim Daniel Wong
Shaolei Ren
*Sheldon Tan
Hung-Wei Tseng

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NANOTECHNOLOGY, ADVANCED MATERIALS, AND DEVICES

*Alexander Balandin Roger Lake
Xi Chen Jianlin Liu
Ran Cheng Ming Liu
Shane Cybart Mihri Ozkan
Elaine Haberer
Sasha Korotkov

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CONTROL AND ROBOTICS

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Bir Bhanu Amit Roy-Chowdhury
Roman Chomko
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Anastasios Mourikis

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POWER SYSTEMS AND SMART GRID

Matt Barth
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[Nael Abu-Ghazaleh](#) (University of Cincinnati): Computer systems (computer architecture support for security, networking, and distributed systems). Parallel computing.

[Salman Asif](#) (Georgia Institute of Technology): Compression sensing. Computational and medical imaging. Machine learning.

[Alexander Balandin](#) (University of Notre Dame): Graphene properties and applications. Nanoelectronics. Thermal transport nanoscale phonon engineering; Photovoltaics. Thermoelectronics.

[Matthew Barth](#) (UC Santa Barbara): Transportation systems and automation technology, and their relationship with energy and air quality issues.

[Bir Bhanu](#) (University of Southern California): Video networks and bioinformatics. Computer vision. Machine Learning and pattern recognition. Image and Video databases. Robotics. Artificial Intelligence.

[Xi Chen](#) (University of Texas at Austin): Nanoscale materials, devices, and circuits. Advanced materials and devices for spin caloritronics, thermoelectrics, thermal management, and lithium ion batteries.

[Ran Cheng](#) (University of Texas at Austin): Fundamental physics and innovative applications in antiferromagnetic thin films and nanostructures.

[Roman Chomko](#) (University of Miami): Atmospheric correction of ocean color imagery: use of Junge power-law size distribution. Communications and Signal Processing. Control and Robotics.

[Shane Cybart](#) (UC San Diego): Nanoscale materials, devices, and circuits. Basic science and research applications of Josephson devices.

[Jay Farrell](#) (University of Notre Dame): Aided inertial navigation for highway applications. Adaptive approximation-based control systems. Online planning and system performance optimization.

[Basak Guler](#) (Pennsylvania State University): Developing scalable, privacy-preserving, and context-aware communication and information processing frameworks for large-scale distributed networks.

[Elaine Haberer](#) (UC Santa Barbara): Bio-template materials for electronic, optoelectronic, and energy applications. Design and fabrication of micro- and nano- cavities on low threshold and sensing applications. Photoelectrochemical and etching processes.

[Yingbo Hua](#) (Syracuse University): Signal processing, wireless communications, and sensor networks.

[Konstantinos Karydis](#) (University of Delaware): Modeling and control of nonlinear uncertain and stochastic systems, uncertainty quantification and probabilistic model validation. Motion planning, navigation, and control of underactuated legged and aerial robots under uncertainty.

[Hyoseung Kim](#) (Carnegie Mellon University): Multi-Core OS and virtualization for Embedded and Cyber-Physical systems.

[Alexander Korotkov](#) (Moscow State University): Quantum computing with superconducting qubits. Quantum measurements. Nanoelectronics.

[Roger Lake](#) (Purdue University): Nanoelectronics, molecular electronics, photovoltaics, and sensing. Electron transport through nanostructured materials and interfaces. Electronic functionality from atomistic structure.

[Jianlin Liu](#) (UC Los Angeles): Zinc-Oxide based semiconductors and Van der Waals 2D materials system. Nanophotonic Light Sources (Zinc-Oxide LEDs and lasers, Nanolasers). Nonvolatile memories.

[Ming Liu](#) (UC Berkeley): Near-field scanning optical microscopy. 2D material Optoelectronics. Modified PDMS-stamp transfer for 2D fabrication. Plasmonics.

[Hamed Mohsenian-Rad](#) (University of British Columbia): Power systems: transmission, distribution, and resource management. Smart Grid: sensors, controls, and communications. Electricity market. Optimization Theory and Applications. Game Theory and Applications.

[Anastasios Mourikis](#) (University of Minnesota): Autonomous vehicle localization. Multi-robot systems. Estimation in mobile sensor networks; vision-aided inertial navigation. Simultaneous localization and mapping.

[Samet Oymak](#) (California Institute of Technology): Principled algorithms with a solid theoretical foundation with good trade-offs between speed, accuracy, scalability, and data-efficiency.

[Mihri Ozkan](#) (UC San Diego): Molecular electronics and non-Si based electronics. Bio-nanotechnology for cancer treatment and imaging. Hybrid electronic and optoelectronic devices.

[Shaolei Ren](#) (UC Los Angeles): Security for IT and IT for Security by enhancing the security of computer systems and leveraging computer systems to make cyber-physical systems more secure.

[Wei Ren](#) (Brigham Young University): Cooperative control algorithm design. Networked cyber-physical systems. Autonomous vehicles. Distributed sensor networks. Object-oriented multiple ground robot and UAV experiments.

[Amit Roy-Chowdhury](#) (University of Maryland): Computer Vision and Image Processing. Statistical Signal Processing and Pattern Recognition. Face and soft biometrics. Vision sensor networks. Machine learning. Multimedia. Biomedical image processing.

[Sheldon Tan](#) (University of Iowa): Modeling and analysis for Accelerated Aging Effects for Copper Interconnect ICs. VSLI reliability, resilience, fault-tolerant computing and dynamic reliability management. Dynamic thermal management for multi-core 3D microprocessors.

[Hung-Wei Tseng](#) (UC San Diego): Computer Engineering. Computer Architecture. Storage Systems. Research projects include intelligent data storage, building efficient heterogeneous computers, and machine learning assisted data storage.

[Ertem Tuncel](#) (UC Santa Barbara): Information theory, distributed source coding in sensor networks. Source-channel coding. Retrieval from high-dimensional databases and limits of retrieval performance.

[Albert Wang](#) (SUNY at Buffalo): RF/analog/mixed-signal integrated circuits (IC), design for reliability and ESD protection. System-on-a-chip (SoC). IC CAD and modeling. Nano devices and circuits.

[Daniel Wong](#) (University of Southern California): Computer architecture, spans data centers, micro architecture, parallel architecture and embedded systems.

[Nanpeng Yu](#) (Iowa State University): Smart grid technology. Big data applications in power distribution systems. Restructured electricity market. Renewable energy integration.

M.S. THEMES

Embedded Real-Time Systems

VLSI design, computer architecture, cyber-physical systems, low-latency computing, sensor networks

Internet of Things

Smart devices, intelligent transportation, cyber-physical and networked systems, edge computing

Advanced Materials and Devices

Novel materials; designing and fabricating electronic, optoelectronic, magnetic, spintronic, thermoelectric and other devices based on these materials

Robotics and Computer Vision

Object recognition and tracking, video processing, automated systems, robot navigation and control

Communications and Signal Processing

Fundamentals of wireless and network communications, algorithms for image, video, speech analysis, machine learning and pattern recognition techniques

Smart Grids and Power Systems

Renewable energy, electricity markets, next-generation power systems, optimization and analysis of power networks

Nanoscience and Nanotechnology

Novel electronic, optoelectronic, photonic devices and circuits; application to biomedical devices and renewable energy