SYSTEMS ENGINEERING

impact report

2023-2024

BU

Boston University College of Engineering
Systems Engineering

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A MESSAGE FROM THE DIVISION HEAD

The 2023-24 impact report of the Division of Systems Engineering (SE) highlights the accomplishments of our faculty and student populations and summarizes research funding levels and world-class distinctions for its members. The Division's research activities continue to be in close collaboration with the Center for Information and Systems Engineering (CISE), focusing on a variety of projects that span the modeling, design, analysis, and optimization of human-made and physical systems within a broad array of applications. SE remains a centerpiece of the College of Engineering's convergent research themes across multiple disciplines within Boston University.

The Division currently consists of 21 appointed faculty members with primary appointments in the College of Engineering, the College of Arts and Sciences, the Questrom School of Business, and the Medical School, along with 12 affiliated members. Current enrollment comprises 69 students in our PhD, MS, and MEng programs. There were 7 PhD degrees awarded, along with 14 MS, and 2 MEng degrees. Our students' activities include the CISE Graduate Student Workshop (CGSW), a unique annual event entirely organized and administered by students providing them the opportunity to share the results of their research and practice their communication skills.

The Division continues to provide full financial support to all admitted PhD students through fellowships, while our continuing PhD students remain fully-funded, normally from research grants received by participating and affiliated faculty. Total sponsor commitment for active grants this year was over $30 Million in support of research activities in our primary concentration areas: Automation, Robotics and Control; Communications and Networking; Computational Biology; Information Sciences; and Production, Service and Energy Systems. We continue to engage in exciting collaborative projects that involve faculty across Boston University, consistent with the College of Engineering's commitment to a convergent approach for tackling complex scientific and societal challenges in such cutting-edge research areas as smart cities, energy systems, healthcare, AI-enabled cyber-physical systems, safety-critical systems, robotics, and cybersecurity.

Our graduates are equipped with the unique skills to adapt their knowledge and expertise to different application domains with this flexibility placing them in high demand, including several with summer internships.

I look forward to a new year as Head of the Division and take this opportunity to thank my colleagues, our students, and our dedicated staff who are contributing to its mission and continuing growth.

Christos G. Cassandras
Division Head

SYSTEMS ENGINEERING AT A GLANCE

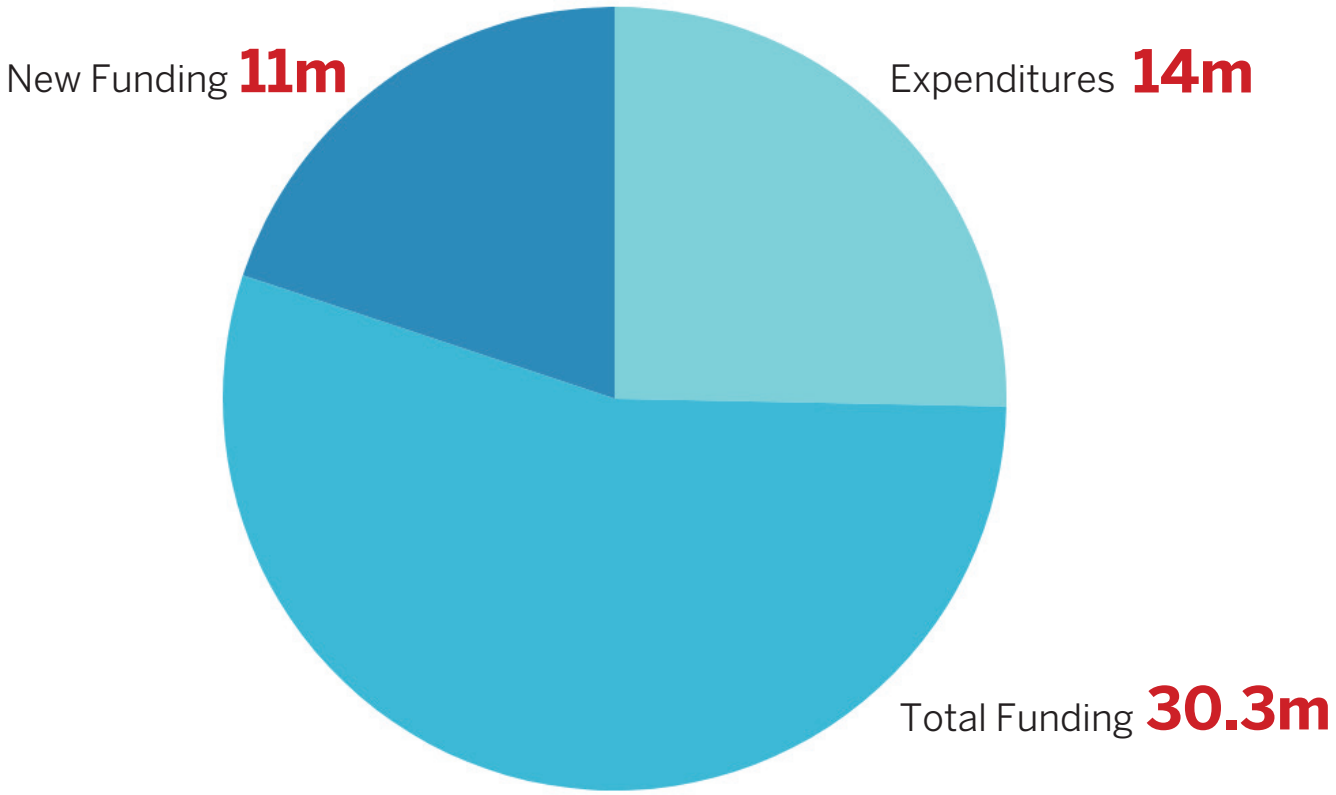
Appointed Faculty

21 Faculty
11 NSF/PECASE Awardees
3 Editors-in-Chief (IEEE)
3 Presidents (IEEE)
9 Fellows (IEEE)
10K Average Citations
38 Average H Index
96 Average i10-Index

Graduate Programs

69 Students
7 PhD Degrees Awarded
11 MS Degrees Awarded
5 MEng Degree Awarded
2 MS Degree with Specialization Awarded
1 MS Degree with Engineering Practice Awarded

Funding



Internship Sponsors

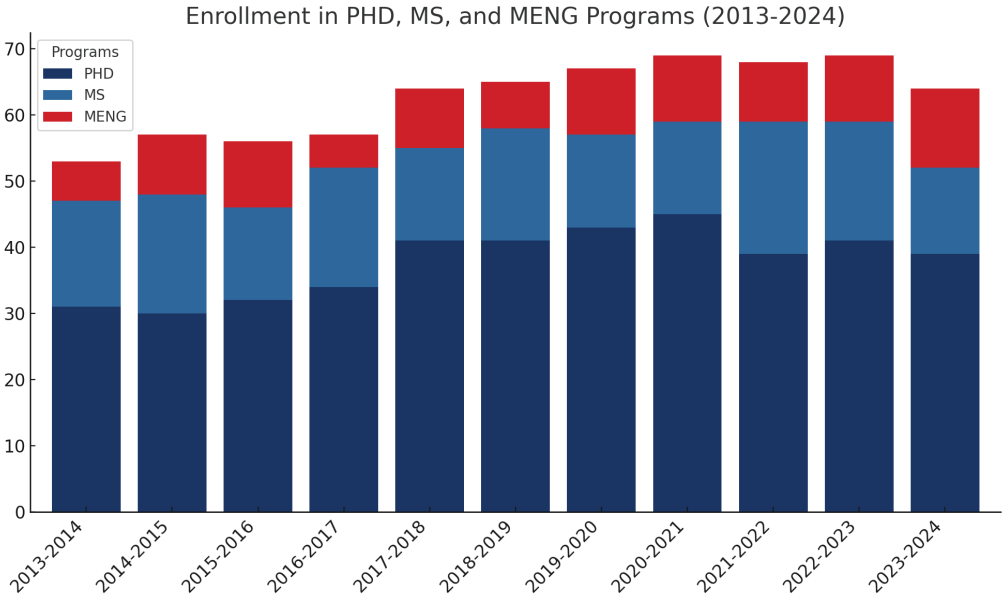
- ByteDance
- Electric Power Research Institute (EPRI)
- Etsy
- Liberty Mutual
- The MathWorks
- Mitsubishi Electric Research Laboratories
- University of Padova
- Wayfair

A VIBRANT ACADEMIC EXPERIENCE

SYSTEMS ENGINEERING (SE) offers a unique interdisciplinary graduate program with select faculty from the College of Engineering departments of Biomedical Engineering, Electrical and Computer Engineering, and Mechanical Engineering; the College of Arts and Sciences departments of Computer Science, Earth & Environment, and Mathematics & Statistics; and the Questrom School of Business.

SE offers PhD, MS and MEng, MS and MEng with Practice degrees and masters degree specializations, as well as an Undergraduate Minor, to students with interest in information, decision, and control sciences, and in all application areas encompassing the modeling, analysis, simulation, control, optimization, and management of complex systems. SE offers research opportunities through the Center for Information and Systems Engineering (CISE).

STUDENT POPULATION



STUDENT INTERNSHIPS

FEISI FU, ByteDance

JONAS HALL, Mitsubishi Electric Research Laboratories

JONAS HALL, University of Padova

YINGQING CHEN, Liberty Mutual

ANDRES CHAVEZ ARMIJOS, the MathWorks

ERHAN OZCAN, Etsy

ASLAM WALEED, Electric Power Research Institute

SAEED MOHAMMADZADEH, Wayfair

PhD DISSERTATIONS

WALEED ASLAM, advised by **Michael Caramanis,** "Provision of Energy and Regulation Reserve Services by Buildings"

FEISI FU, advised by **Wenchao Li,** "Neural Network Editing: Algorithms and Applications"

NASSER HASHEMI, advised by **Pirooz Vakili,** "Enhancing Protein Interaction Prediction Using Deep Learning and Protein Language Models"

ZHIYU ZHANG, advised by **Ioannis Paschalidis,** "Temporal Aspects of Adaptive Online Learning: Continuity and Representation"

JAMES QUEENEY, co-advised by **Christos Cassandras and Ioannis Paschalidis** "Reliable Deep Reinforcement Learning: Stable Training and Robust Deployment"

KAIYUAN XU, advised by **Christos Cassandras,** "Safety-Critical Optimal Control In Autonomous Traffic Systems"

ZIQI YANG, advised by **Roberto Tron,** "Resilient Planning, Task Assignment and Control for Multi-Robot Systems Against Plan-Deviation Attacks"

PhD FUNDING SOURCES 2023/2024

Funding Type	Fall 2023	Spring 2024	Summer 2024
Doctoral Research Fellow	22	23	22
Internal Fellow	9	9	9
External Fellow		1	1
Intern/Corp/Other	4		
Total	35	33	32

HONORS & AWARDS

Zhiyu Zhang, SE Outstanding PhD Dissertation Award, "Temporal Aspects of Adaptive Online Learning: Continuity and Representation." Advisors: **Ioannis Paschalidis & Ashok Cutkosky**

Zijian Guo, SE PhD Travel Support, ICML 2024, "Temporal Logic Specification-Conditioned Decision Transformer for Offline Safe Reinforcement Learning", Advisor: **Wenchao Li**

Yingqing Chen, SE PhD Travel Support, ECC 2024, "Adaptive traffic light control for competing vehicle and pedestrian flows." Advisor: **Christos Cassandras**

Erhan Ozcan, SE PhD Travel Support, IEEE Control Systems Society Conference on Decision and Control Advisor: **Ioannis Paschalidis**

Zexin Sun, CISE Graduate Student Workshop 10.0 Organizer, Advisor: **John Baillieul**

Akua Kodie Dickson, SE PhD Travel Support, NDSS VehicleSec & IEEE Control Systems Society Conference on Decision and Control, CISE MRS Registration Award Advisor: **Andrew Sabelhaus**

GLOBAL DUAL DEGREE

SE partners with Tsinghua University in Beijing for a dual master's degree program in Systems Engineering. Students are selected from the Department of Automation at Tsinghua University to enroll in BU's courses for two semesters. Afterwards, they return to Tsinghua University to complete the program. US News & World Report ranks partner Tsinghua University as one of the top global engineering programs.

GRACE HOPPER CONFERENCE

CISE and the Division of Systems Engineering (SE) sponsored five students to represent the College of Engineering at the Grace Hopper Celebration. CISE students had the opportunity to network, increase visibility in their respective disciplines, and engage in discourse with prominent professionals in diverse science, research, and technology disciplines.

DATA SCIENCES MENTORING CIRCLES PROGRAM

The Data Science Mentoring Circles Program connects BU PhD students from relevant fields with BU alumni now in DS jobs in industry. Each year interested students sign up and are assigned in small groups of 3-5 to a mentor. Several workshops are run each year and the students meet with their mentor approximately once a month. Students network, are advised on resume preparation, participate in mock interviews, and learn how to negotiate, evaluate offers. BU CS, ECE, Math & Stats, Biostats, CDS, CISE and SE participate.

CGSW 10.0

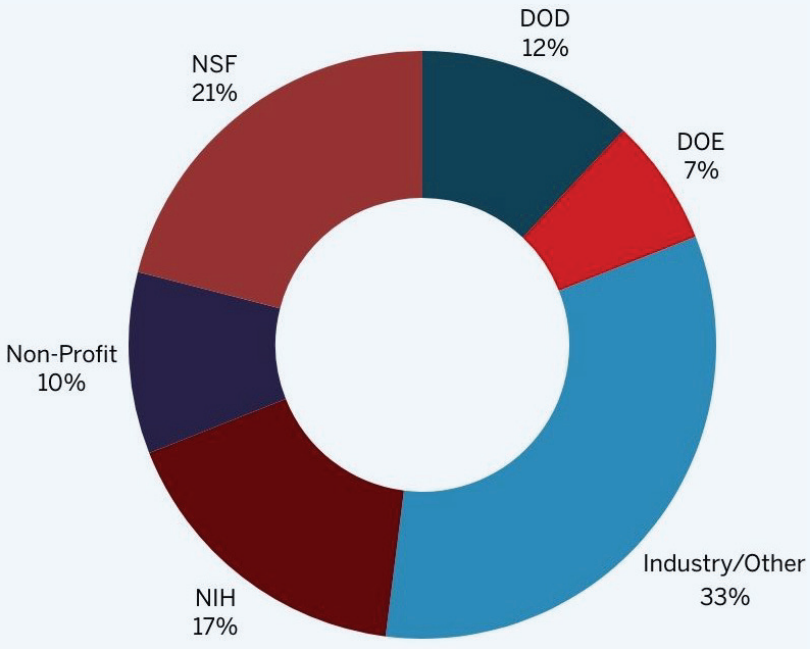
The CISE Graduate Student Workshop (CGSW) is an annual forum that provides students across the twelve departments/divisions the opportunity to share their original research and hone their communication skills in an engaging, collaborative environment. 35 abstracts were submitted, and 18 students were selected to present their work. Two plenary speakers presented, Stephanie Gil, Assistant Professor of Engineering and Applied Science at Harvard, spoke on "Making Multi-Robot Systems Capable and Secure"; and Eshed Ohn-Bar, Assistant Professor in the Department of Electrical and Computer Engineering at BU spoke about "Machine Teaching". The event concluded with an awards reception where students were recognized for best presentations.

Assistant Professor Stephanie Gil, Harvard University

RESEARCH THAT MATTERS

Systems Engineering research funding, **30.3M** in 2023-2024, is closely tied to the Center for Information & Systems Engineering (CISE), providing opportunities for interdisciplinary research in the study and design of intelligent systems with broad societal applications.

Our research is having an impact in areas with broad societal applications in the areas of: Automation, Robotics, and Control; Communications and Networking; Computational Biology; Information Sciences; Production, Service, and Energy Systems.



FUNDING SOURCES

CENTER FOR INFORMATION & SYSTEMS ENGINEERING (CISE)

The Center for Information & Systems Engineering (CISE) is an interdisciplinary research center with the mission of deepening and broadening the study and design of intelligent systems with broad societal applications. CISE supports 54 faculty affiliates and over 100 students from diverse disciplines across the College of Engineering, College of Arts & Sciences, and the Questrom School of Business.

CISE spearheads several activities, including a seminar series, industry workshops, and developmental student events, to facilitate internal and external collaboration, including an annual workshop series to ignite new research in emerging areas related to intelligent systems.
CISE assists faculty in their awards management, preparing and submitting grant proposals, budget preparation, and post-grant management and projections with monthly PI reports. In FY 23-24, CISE supported 76 grant proposals, resulting in a portfolio of $18,694,389 in research expenditures.

CISE kicked off a new series of innovative workshops spanning uncharted topics to catalyze new collaborations and innovative research. This AI for Understanding Earthquakes workshop explored challenges at the intersection of AI and earthquake sciences and simultaneously offered students a hands-on AI challenge. This workshop catalyzed innovative research in earthquake science. CISE affiliate and Associate Professor (ECE, CS, CDS, SE) **Brian Kulis** was awarded an NSF grant in this research area titled "A Large Foundational Model for Earthquake Understanding" and, in collaboration with **Janusz Konrad** and **Prakash Ishwar,** a Hariri Institute Focused Research Program titled "AI for Understanding Earthquakes."

CISE manages the $8.78M **Robotics and Autonomous Systems Teaching and Innovation Center (RASTIC)** grant awarded to Boston University for a new research and development center. Led by Co-Principal Investigators Ioannis Paschalidis and Sean Andersson, and under the directorship of Kenn Sebesta, the project will drive the development of new innovations with private sector partners in Massachusetts and increase student research opportunities in the robotics space. RASTIC will emphasize real-world prototyping projects to integrate new materials, functionality, and artificial intelligence into robotic devices, delivering tools that will allow students to design and launch their own R&D projects. The grant is in collaboration with Boston-based MassRobotics and six initial industry partners, including AETLabs, Ava Robotics, Boston Scientific, GreenSight, Intel, and Ubiros. RASTIC will become a 'neutral space' where companies can work directly with faculty and students, encouraging hands-on projects to design, prototype, and test new robotic devices. The facilities will include four distinct zones that will provide simulated and scaled settings to mimic the complex environments in which robotic devices and systems must operate.

BU RASTIC

Smart Technology: Open Source and Equitable

Between 2012 and 2017, the number of car accidents in Boston rose by 33%. Depending on the year, 25% to 31% of all reported accidents in Boston resulted in non-fatal injuries. **Christos Cassandras**, a Distinguished Professor of Engineering and Head of the Division of Systems Engineering, is working to mitigate this issue through smart technology. By implementing cooperative autonomous vehicles, which can communicate with each other, he aims to improve safety, congestion, and energy consumption.

Cassandras has deep experience in advancing understanding and new technologies for smart cities through the control and optimization of systems. His areas of interest include multi-agent systems, autonomous systems, and cooperative control.

"Within Systems Engineering we look at systems on both the individual level and as a part of a bigger network," explains Cassandras. "My work focuses on large systems (sometimes referred to as "systems of systems") with many dynamic agents, like cars and robots, moving together. I look at how to coordinate these agents so that they cooperate in order to meet specific system-wide objectives."

In many such systems, these agents are competing against each other for a common resource, like cars competing for space on the road. Cassandras' research focuses on the principle that it is more efficient for agents to cooperate than compete and that cooperation results in a more socially optimal equilibrium.

Cassandras is working on a Red Hat Collaboratory Research Incubation project entitled "Creating a global open research platform to better understand social sustainability using data from a real-life smart village" as part of a partnership between Boston University and Red Hat housed at the Hariri Institute of Computing. The goal of the project is to develop open source, smart city infrastructure. This project aims to develop smart traffic lights in Veberöd, Sweden whereby traffic lights will adjust the duration of a red or green light depending on road congestion.

"If you have ever been stuck at a red light when there is no traffic, you might have thought about why the light doesn't just switch to green because the competing road is empty," says Cassandras.

"This technology exists, using cameras to detect when cars are present or not, but it has not yet been widely adopted. In Veberöd, Sweden, we're developing a platform that will act as a digital twin of the town so that we can demonstrate how the traffic lights work. Then, we're going to begin implementing the lights in the real town."

The open source nature of the project is a new phenomenon promoting collaboration between researchers instead of keeping everything confidential. The platform will enable researchers to work together on this problem and study topics regarding smart cities, like mobility and sustainability.

"The nature of open source software for this project is that we're not trying to implement smart traffic lights in only Veberöd," Cassandras explains. "We're developing the solution so that once it is proven in Veberöd, it can be transferred to New York, Boston, or any other city in the world. The concept of open source is becoming more widespread because it promotes sharing and building off of each other's ideas."

by Margo Stanton

Redefining Health Care for Aging America

With adults age 65 and older forming the United States' fastest-growing population segment, more Americans are bound to experience severe and complex health conditions. To meet the needs of the country's graying population, the current health care system must rethink its existing treatment approaches for older patients.

This is where **Roberto Tron**, an associate professor at Boston University Division of Systems Engineering, comes in. With core competencies in robotics and automatic control systems, he is pioneering a system that monitors and assesses the movements of post-stroke patients to predict and prevent any functional decline.

"I always wanted to make some project that can help humans, not just robots," he said.

For post-stroke patients, movement can often be challenging as their muscles are too weak or they are unable to control their muscles, which puts them at risk of slower reaction times or falling. But with electrostimulation suits that help activate and coordinate different muscles and accelerometers that help regulate the electrostimulation, these patients can afford synchronized movement.

Together with Lou Awad, a movement scientist at Boston University Neuromotor Recovery Laboratory, and David Levine, a clinical investigator at Brigham and Women's Hospital, Tron concluded two deficiencies with the existing system. First, it only helps enable a limited range of movement. Second, it involves many standardized tests that require trained clinicians to administer.

By leveraging his knowledge in robotics, Tron seeks to automate this system.

"I try to branch out to other fields and find things that are at the intersection of different fields and see if I can bring my tools to problems that I find interesting, make some progress there," he said.

His upgraded, at-home system involves two components.

First, electrostimulation suits and accelerometers are placed on a patient's legs, and the patient is monitored by a deep learning camera positioned where they spend most of their time. The information collected will then be leveraged by robotics to reconstruct 3D poses of the patient's joints.

Second, the technology continually sends data over to a secure server, where scores are measured against pre-determined thresholds. If any score is detected to fall below these thresholds, the system will send an email to the patient's doctor, notifying them to check in with their patient.

Tron and his team are also working to take the current system even further by making the electrostimulation assistance specific to a greater range of different activities.

With this development, patients can be continuously assisted in the comfort of their own homes, instead of having to travel to a rehabilitation facility every week. It may also help them retain some form of muscle memory even when the electrostimulation suits and accelerometers are turned off, which can help with movement in the long run.

This upgrade turns a once-reactive system into a preventative one. Rather than wait for a catastrophic health event to occur before the patient is treated, the system's consistent and extensive data tracking helps health care workers recognize subtle signs of functional decline for early intervention.

The team continues to navigate obstacles in their quest to make the existing system more robust. In the field of robotics, Tron is accustomed to conducting tests only once or twice in the lab to ensure his invention works.

This time, they have to conduct standardized tests in 50 different homes and 17 in the lab. Since the layout of every patient's home is different, they also have to optimize the setup of the deep learning camera.

"There was a lot of trial and error or things we learn in making the system robust enough to be deployed," Tron said.

While Tron brings the knowledge and technology to improve the system, he relies on Awad and Levine for their medical expertise and access to patients to truly make things work.

"It's been a very fruitful collaboration," Tron said. "I think we learned a lot both ways on what's possible, what we need to focus on and how to talk each other's language."

by Emily Tan

SNAPSHOTS

New AI Program from BU Researchers Could Predict Likelihood of Alzheimer's Disease

Boston University researchers say they have designed a promising new artificial intelligence (AI) computer program, or model, that could one day help predict who will develop the dementia associated with Alzheimer's—just by analyzing a patient's speech. To train and build their new model, the researchers turned to data from one of the nation's oldest and longest-running studies—the BU-led Framingham Heart Study. Although the Framingham study is focused on cardiovascular health, participants showing signs of cognitive decline undergo regular neuropsychological tests and interviews, producing a wealth of longitudinal information on their cognitive well-being.

"We wanted to predict what would happen in the next six years—and we found we can reasonably make that prediction with relatively good confidence and accuracy," says **Ioannis (Yannis) Paschalidis**, director of the BU Rafik B. Hariri Institute for Computing and Computational Science & Engineering. "It shows the power of AI."

by Andrew Thurston

A Preemptive Strike on Future Pandemics

According to some disease forecasters, the world could face another COVID-like pandemic within 10 years. To improve our response to future pandemics, it's imperative to strengthen essential systems. Tracking death counts attributed to a fast-moving lethal virus like COVID-19 is fundamental to helping policy makers understand a pandemic's impact and guide the allocation of scarce resources. To determine the total number of uncounted COVID-19 deaths, researchers developed statistical models that assessed the difference between deaths reported as COVID-19, and natural deaths not attributed to COVID-19. The investigators sought to understand the causes for such gaps by analyzing the location, time periods, and causes of deaths reported.

"Rapid detection of non-typical mortality patterns could pinpoint the emergence of local novel disease clusters and become an important tool for more effective pandemic mitigation," says **Ioannis (Yannis) Paschalidis**, distinguished professor of engineering, director of the Hariri Institute, and principal investigator of a National Science Foundation project at Boston University on Predicting and Preventing Epidemic to Pandemic Transitions.

by Maureen Stanton

SE Faculty Receive NSF CAREER Award

Associate Professor **Wenchao Li** (ECE, SE) was awarded a National Science Foundation Faculty Early Career Development (CAREER) award to further his research on specification-guided imitation learning (IL). Li uses a combination of formal methods and machine learning to build safe and trustworthy autonomous systems. The CAREER award is a five-year grant that will support Li's research.

Through this NSF award, Li will develop a novel framework for the process of IL to be guided by theories and algorithms with formal specifications. His research will explore which types of specifications are appropriate for different scenarios and how to incorporate specifications into data-driven learning processes, such as IL.

Professor **Alyssa Pierson** (ME,SE) was awarded a National Science Foundation CAREER award which will enable her to study new types of robot interactions to create more complex behavior among multi-robot systems. She will explore Decentralized and Online Planning for Emergent Cooperation in Multi-Robot Teams.

She envisions robot teams that adapt and cooperate with others, ultimately making for safer and more complex teams of mobile service bots. There's a long way to go and a lot of ground to cover with single robots before we see a multi-robot world.

Assistant Professor **Andrew Sabelhaus** (ME, SE) was awarded a prestigious Faculty Early Career Development Program (CAREER) award from the National Science Foundation. Sabelhaus will use the funds to further his lab's mission: to build safety smarts into soft robots for health care applications.

Sabelhaus sees soft robotics as potentially filling a gap. In the future, low-income patients with chronic diseases such as diabetes could visit a local pharmacy or community health center and head to a self-serve kiosk for routine blood draws, blood pressure checks, flu shots or nasal swabs. Theoretically, these procedures could be performed by robots made of soft materials.

LABORATORIES

ANDERSSON LABORATORY
Sean Andersson
bu.edu/anderssonlab
The lab explores the dynamics in nanometer-scale systems with fundamental theory, applied mathematics, and physical experiments. The work applies to nanobioscience, nanotechnology, and robotics.

COLLABORATIVE AUTONOMY GROUP
Alyssa Pierson
https://sites.bu.edu/pierson/research/
Our research designs new capabilities for collaborative robotic teams by integrating trust, cooperation, and competition. By exploring the nuances in interaction we enable richer control policies with proven performance guarantees for fast and decentralized decision-making.

CONTROL OF DISCRETE EVENT SYSTEMS LABORATORY (CODES)
Christos Cassandras
christosgcassandras.org/codes
The lab conducts research on modeling, design, analysis, performance evaluation, control and optimization of a variety of discrete events and hybrid systems.

DATA SCIENCE & MACHINE LEARNING LABORATORY
Venkatesh Saligrama
sites.bu.edu/data/
Projects related to vision and learning, decision and control machine learning and structured signal processing.

DEPENDABLE COMPUTING LABORATORY
Wenchao Li
sites.bu.edu/depend/
The research spans dependable computing, particularly the development of computational proof methods and machine learning techniques to aid the construction of safe, reliable and secure systems.

INFORMATION & DATA SCIENCES LABORATORY
C. Cassandras, D. Castañón, E. Dall'Anese, W. Karl, B. Kulis, W. Li, T. Little, P. Ishwar, B. Nazer, A. Olshevsky, I. Paschalidis, V. Saligrama, D. Starobinski, A. Trachtenberg
bu.edu/iss
The lab designs and synthesizes secure networked systems for optimum decision-making and control.

INTELLIGENT MECHATRONICS LABORATORY
J. Baillieul, S. Andersson, H. Wang
bu.edu/iml
Projects explore limited-bandwidth control problems, cooperative systems and control, symbolic control and animal-inspired agile flight control.

LABORATORY OF NETWORKING & INFORMATION SYSTEMS
D. Starobinski, A.Trachtenberg
nislab.bu.edu
The lab offers a perspective on modern networking with emphasis on scalability, heterogeneity and performance.

MULTI-DIMENSIONAL SIGNAL PROCESSING LABORATORY
W. Clem Karl
mdsp.bu.edu
The lab applies computational imaging to develop statistical models to extract information from diverse and vulnerable data sources.

LABORATORIES MULTIMEDIA COMMUNICATIONS LABORATORY
Thomas Little
hulk.bu.edu
Projects focus on ubiquitous distributed computing, specifically in the area of distributed multimedia information systems emphasizing time-dependent and continuous media data.

NETWORKS RESEARCH GROUP
A. Bestavros, M. Crovella, A. Matta
bu.edu/cs/nrg/
Research encompasses network measurement, architectures and protocols. Projects span from the design and implementation to the analysis of networked applications and systems.

NETWORK OPTIMIZATION & CONTROL LABORATORY
Ioannis Paschalidis
sites.bu.edu/paschalidis/
Research deals with fundamental problems in the fields of optimization, control, stochastic systems and data science.

RELIABLE COMPUTING LABORATORY
Lev Levitin
bu.edu/reliable
Projects span from the design of computer chips to efficiency testing in hardware, software, signal processing and networks.

ROBOTICS LABORATORY
S. Andersson, J. Baillieul, C. Cassandras, A. Pierson, A. Sabelhaus, R. Tron
sites.bu.edu/robotics
Research spans several areas of robotics, including motion planning, control, machine learning and computer vision.

SOFT ROBOTICS CONTROL LAB
Andrew Sabelhaus
sites.bu.edu/srclab/
Combines the benefits of softer robots, like safer contact with the environment and humans, with algorithms and control systems that allow them to perform practical tasks, focusing on both robotic manipulation and locomotion.

SPIRA-LENBURG LABORATORY
Avrum Spira
bumc.bu.edu/compbiomed/labs/spira-lenburg
The lab utilizes post-genomic technologies and computational tools to improve the diagnosis, treatment and prevention of lung disease.

VAJDA LABORATORY
Sandor Vajda
vajdalab.org
The lab focuses on the recognition of proteins and small molecules by protein receptors. The work applies to metabolic control, signal transduction, gene regulation, rational drug and vaccine design.

VISUAL INFORMATION PROCESSING LABORATORY
J. Konrad, P. Ishwar
vip.bu.edu/
Projects relate to technology transfer in the broad areas of image, video and multimedia processing. This visual information processing research applies to visual surveillance, 3D video and human-computer interfaces.

APPOINTED FACULTY

SEAN ANDERSSON
Professor of ME & SE
Chairperson of ME
Robotics, control theory, scanning probe microscopy, single molecule tracking
PhD, University of Maryland, 2003
NSF CAREER Award, 2009

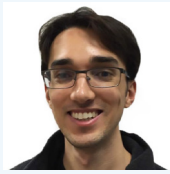
PANAGIOTIS ANDRIANESIS
Research Associate Professor SE
Electricity distribution network economics – aiming at developing, evaluating, and transferring to practice a robust framework for the future electricity distribution grid.
PhD, University of Thessaly, Greece
BU Institute for Sustainable Energy, Senior Fellow

JOHN BAILLIEUL
Distinguished Professor of Engineering
Professor of ME, ECE & SE
Robotics, control of mechanical systems, mathematical system theory, information-based control theory
PhD, Harvard University, 1975
IEEE, IFAC & SIAM Fellow

MICHAEL CARAMANIS
Professor of ME & SE
Mathematical programming, control and stochastic systems
PhD, Harvard University, 1976

CHRISTOS CASSANDRAS
Distinguished Professor of Engineering
Professor of ECE & SE
Head of Division of SE
Discrete event/ hybrid systems, stochastic optimization, simulation, manufacturing systems, communication/ sensor networks, multi-agent systems
PhD, Harvard University, 1982; IEEE & IFAC Fellow; IEEE Control Systems Society President, 2012

DAVID CASTAÑÓN
Professor of ECE & SE
Stochastic control, estimation optimization, image understanding and parallel computation
PhD, Massachusetts Institute of Technology, 1976; IEEE Fellow; IEEE Control Systems Society President, 2008



ASHOK CUTKOSKY
Assistant Professor of ECE, CS & SE
Machine learning, stochastic optimization, online learning
PhD, Stanford University, 2018

EMILIANO DALL'ANESE
Assistant Professor of ECE & SE
Optimization, control, online learning, network systems, energy
PhD, University of Padova, 2011

PRAKASH ISHWAR
Professor of ECE & SE
Statistical signal processing, machine learning, information theory, secure multi-party computation, visual information processing and analysis
PhD, University of Illinois Urbana, Champaign, 2002

BRIAN KULIS
Associate Professor of ECE & SE
Machine learning, statistics, large-scale data analysis
PhD, University of Texas at Austin, 2008

WENCHAO LI
Associate Professor of ECE & SE
AI safety, human cyber physical systems, formal methods, design automation
PhD, University of California, Berkeley, 2013

ALEX OLSHEVSKY
Associate Professor of ECE & SE
Control and algorithms for multi-agent systems, sensor networks, distributed optimization, control of large-scale systems
PhD, Massachusetts Institute of Technology, 2010

IOANNIS PASCHALIDIS
Distinguished Professor of Engineering
Professor of ECE, BME & SE
Director of the Hariri Institute
Systems and control, networking, applied probability, optimization, operations research, computational biology, medical informatics, bioinformatics
PhD, Massachusetts Institute of Technology, 1996; IEEE Fellow; IEEE Transactions on Control of Network Systems Founding Editor-in-Chief

JAMES PERKINS
Associate Professor of ME & SE
Real-time scheduling and control of manufacturing systems, supply chain management, resource pricing and congestion control in communications networks
PhD, University of Illinois, Urbana-Champaign, 1993

ALYSSA PIERSON
Assistant Professor of ME, SE & CS
Machine learning and optimization
PhD, Boston University, 2017
Faculty Early Career Development Program (CAREER) award, National Science Foundation (NSF); MassRobotics Rising Star in Robotics Medal, 2023; NSF CAREER Award, 2023

ANDREW SABELHAUS
Assistant Professor of ME & SE
Nonlinear control systems, soft robotics, robot locomotion, motion planning, safe human-robot interaction
PhD, University of California Berkeley, 2019, Intelligence Community Postdoctoral Research Fellowship (2020), NASA Space Technology Research Fellowship (2015)

VENKATESH SALIGRAMA
Professor of ECE & SE
Machine learning, computer vision, information theory, and statistical signal processing
PhD, Massachusetts Institute of Technology, 1997; IEEE Fellow

DAVID STAROBINSKI
Professor of ECE & SE
Wireless and vehicular networks; QOS and traffic engineering; network economics; cybersecurity
PhD, Technion, Israel Institute of Technology, 1999

ROBERTO TRON
Associate Professor of ME & SE
Intersection of automatic control, robotics and computer vision, with a particular emphasis on applications of Riemannian geometry and on distributed problems involving teams of multiple
agents
PhD, Johns Hopkins University, 2012
2021 Boston University College of Engineering Early Career Research Excellence Award

PIROOZ VAKILI
Research Associate Professor of ME & SE
Monte Carlo simulation, optimization, computational biology, computational finance
PhD, Harvard University, 1989

HUA WANG
Associate Professor of ME & SE
Associate Head of Division of Systems Engineering
Control of nonlinear phenomena, intelligent systems and control, complex networks, cooperative control, robotics, applications in biological, energy and aerospace systems
PhD, University of Maryland at College Park, 1993

AFFILIATED FACULTY

AYSE COSKUN
Interim Associate Dean for Research and Faculty Development, Professor ECE, SE; Director, Center for Information and Systems Engineering
Energy-efficient computing, cloud computing, high performance computing, computer architecture, embedded systems
PhD, University of California, San Diego, 2009

MARK CROVELLA
Professor of ECE, CS & SE
Performance evaluation, focused on parallel and networked computer systems, detecting and understanding anomalies in IP networks, efficient network monitoring, network security
PhD, University of Rochester, 1994

MICHAEL GEVELBER
Associate Professor of ME & MSE & SE
Development of control and sensing systems for electrospinning of nanofibers, plasma spray, ebeam deposition, crystal growth, CVD, and intelligent building HVAC systems
PhD, Massachusetts Institute of Technology, 1988

W. CLEM KARL
Professor of ECE & BME & SE
Chairperson of ECE
Computational imaging, detection and estimation, inverse problems, biomedical signal and image
processing
PhD, Massachusetts Institute of Technology, 1991

LEV LEVITIN
Distinguished Professor of ECE & SE
Information theory, physics of communication and computing, complex and organized systems, quantum theory of measurement, reliable communication and computing, bioinformatics
PhD, Gorky University, 1969

THOMAS LITTLE
Professor of ECE & SE
Associate Dean of COE Educational Initiatives;
Associate Director NSF Smart Lighting ERC
Computer networking, mobile computing, distributed systems, multimedia streaming and storage, visible light communications PhD, Syracuse University, 1991

ABRAHAM MATTA
Professor of CS
Chairperson of Computer Science
Design of network protocols and architectures based on a range of computer science principles, mathematical techniques, and performance evaluation tools
PhD, University of Maryland at College Park, 1995

BOBAK NAZER
Associate Professor of ECE & SE
Information theory, communications, signal processing, and neuroscience
PhD, University of California, Berkeley, 2009

AVRUM SPIRA
Alexander Graham Bell Professor of Healthcare Entrepreneurship,
Chief of the Division of Computational Biomedicine,
Director of Translational Bioinformatics Program
Lung cancer and COPD genomics, smoking and airway gene expression, bioinformatics
MD, McGill University, 1996

ARI TRACHTENBERG
Professor of ECE
Cyber security, algorithms, error-correcting codes
PhD, University of Illinois, 2000

SANDOR VAJDA
Professor of BME & Chemistry
Director of BMERC
Scientific computing, primarily optimization, computational chemistry and biology, including protein and peptide structure determination, protein engineering, and drug design
PhD, Hungarian Academy of Science, 1983

POST-DOCS

APOSTOLOS RIKOS
Distributed control systems, distributed algorithms, discrete mathematics and structures, probability and Markov chain analysis
PhD in Electrical Engineering, University of Cyprus, 2018

VISITING RESEARCHERS

KASRA GHASEMI
Dr. Kasra Ghasemi graduated with a PhD from the Division of Systems Engineering, under the supervision of Professor Calin Belta, in January 2023. His PhD dissertation is titled Compositional Synthesis via Convex Optimization of Assume-Guarantee Contracts.

YIKE LI
Yike Li, a PhD student at the University of Cagliari, Italy, working with Professor Alessandro Giua, joined the CODES lab and CISE for six months as a visiting scholar.

GRADUATE COMMITTEE
Hua Wang, Chair
Wenchao Li,
Alyssa Pierson,
Drew Sabelhaus,
David Starobinski,
James R. Perkins (LEAP)

ADMINISTRATIVE TEAM

CHRISTOS G. CASSANDRAS
Division Head

HUA WANG
Associate Division Head

ELIZABETH FLAGG, ED.M.
Division Director

LEA SABRA
Communications Manager
starting August 2024

ALISON KRASNOR
Graduate Programs Manager
starting December 2024

1.3M NASA AWARD:
Multi-Agent Systems
ROBERTO TRON (SE, ME) and Sheryl Grace (ME) for research on Safe, Low-Noise Operation of UAM in Urban Canyons via Integration of Gust Outcomes and Trim Optimization.

1.2M NSF AWARD:
Energy Systems
ALEXANDER OLSHEVSKY (SE, ECE), MICHAEL CARAMANIS (SE, ME), IOANNIS PASCHALIDIS (ECE, BME, SE), VENKATESH SALIGRAMA (ECE, SE)
CPS: Medium: Federated Learning for Predicting Electricity Consumption with Mixed Global/Local Models.

600K NSF AWARD:
Robotics for Healthcare
ANDREW SABELHAUS (SE, ME) for work on safe robot-human interactions in health care.

3 NSF CAREER AWARDS
Robotics & Cybersecurity
ALYSSA PIERSON (SE, ME), ANDREW SABELHAUS (SE, ME), WENCHAO LI (SE, ECE).
Read more on p.17

450K DOE GRANT:
Computational Epidemiology
IOANNIS PASCHALIDIS (ECE, BME, SE), ALEX OLSHEVSKY (ECE/SE), HELEN JENKINS (SPH).
Emerge: ExaEpi for Elucidating Multiscale Ecosystem Complex for Robust Generalized Epidemiology

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