



The 20th Annual
**Conference on
Systems Engineering Research**

Systems Engineering Toward a Smart and Sustainable World



MARCH 16-17, 2023

**STEVENS INSTITUTE
OF TECHNOLOGY**

Hoboken, New Jersey

Hosted by:



The 20th Annual
Conference on Systems Engineering Research

MARCH 16-17, 2023
STEVENS INSTITUTE OF TECHNOLOGY
Hoboken, New Jersey



HONORARY GENERAL CHAIRS



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Executive Director, Systems Engineering Research Center (SERC), Professor, School of Systems and Enterprises, Stevens Institute of Technology



AZAD M. MADNI, Ph.D.

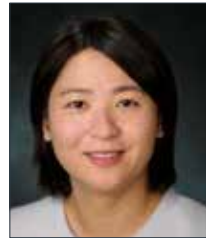
Professor, Astronautical Engineering Executive Director, System Architecting & Engineering Program Director, Distributed Autonomy and Intelligent Systems Laboratory USC Viterbi School of Engineering

CONFERENCE CHAIRS



STEVEN HOFFENSON, Ph.D.

Assistant Professor Stevens Institute of Technology



LU XIAO, Ph.D.

Assistant Professor, Stevens Institute of Technology

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Teaching Associate Professor Stevens Institute of Technology



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Assistant Professor Stevens Institute of Technology



HAO CHEN, Ph.D.

Assistant Professor Stevens Institute of Technology

Systems Engineering Toward a Smart and Sustainable World

The 20th Annual Conference on Systems Engineering Research (CSER 2023) will push the boundaries of systems engineering research and respond to new challenges for systems engineering. CSER 2023 highlights research in alignment with the thematic focus on a smart and sustainable world. CSER was founded in 2003 by Stevens Institute of Technology and the University of Southern California, and in 2023 the conference returns to the Stevens campus in Hoboken, New Jersey.

The 2023 theme emphasizes how the transdisciplinary systems engineering research community plays a pivotal role in creating smart systems and the transition toward a more sustainable society. Smart systems encompass those that apply artificial intelligence, machine learning, digitalization and data analytics to provide performance enhancements, automated insights and informed decisions. Modern systems have profound impacts on economic, environmental and social sustainability, creating complex challenges that demand a transdisciplinary approach.



SEANET

INCOSE Systems Engineering and Architecting Doctoral Student Network (SEANET) 2023

The Systems Engineering & Architecting Research Network (SEANET) is an INCOSE sponsored organizational network of doctoral students working in the field of systems engineering and architecture. SEANET is aimed at fostering doctoral level research in systems engineering and contributing to the evolving intellectual agenda for systems engineering research.

All SEANET participants must be registered to participate in the workshops.

Organizers:

Dr. Erika Palmer, Cornell University

Dr. Alejandro Salado, The University of Arizona



SEANET SCHEDULE WEDNESDAY, MARCH 15, 2023

TIME	ACTIVITY	LOCATION
9:00 AM	WELCOME - Remarks on SEANET and Doctoral Research, and updates on events and topics of interest to doctoral students	UCC Gallery Room
9:15 AM	BRIEF INTRODUCTIONS	UCC Gallery Room
9:30 - 10:30 AM	OPENING KEYNOTE Dr. Ricardo Valerdi , Interim Department Head of Systems and Industrial Engineering, Distinguished Outreach Professor, Faculty Athletics Representative, The University of Arizona TOPIC: Research Lessons from the Father of Software Engineering	UCC Gallery Room
10:30 AM	BREAK	UCC Gallery Room
10:45 AM	The Roads Less Traveled: Journey to a PhD Paul Wach , Assistant Research Faculty, Intelligent Systems Division, Virginia Tech	UCC Gallery Room
12:00 Noon	LUNCH	UCC common lunch area (upstairs)
1:00 - 3:15 PM	RESEARCH ROUNDTABLES with Academic Advisors: - Dr. Alejandro Salado , The University of Arizona - Dr. Erika Palmer , Cornell University - Dr. Ricardo Valerdi , The University of Arizona TOPICS: 1- <i>Scoping, Designing and Applying Research Approach and Methods</i> 2- <i>Performing Data Collection, Interviews, Modeling, Experiments, Validation</i> 3- <i>Research End Game – Committee Meetings, Defending, Publishing, Finding Opportunities</i>	UCC Gallery Room
3:15 - 3:30 PM	BREAK	UCC Gallery Room
3:30 - 4:00 PM	ROUNDTABLE OUTBRIEF Discussion and Feedback	UCC Gallery Room
5:00 - 7:00 PM	CSER WELCOME RECEPTION	Babbio Atrium

DAY 1
THURSDAY, MARCH 16, 2023

TIME	ACTIVITY	LOCATION
8:00 - 9:00 AM	BREAKFAST	UCC pre-function area (downstairs)
9:00 - 9:30 AM	CONFERENCE OPENING AND INTRODUCTIONS Dr. Lu Xiao, <i>Conference Chair</i> Dr. Steven Hoffenson, <i>Conference Chair</i> Dr. Nariman Farvardin, <i>President, Stevens Institute of Technology</i>	Tech Flex B-C
9:30 - 10:30 AM	KEYNOTE Dr. Victoria Coleman, <i>Chief Scientist of the United States Air Force</i> TOPIC: <i>Tactical Autonomy: From S&T to Capability</i>	Tech Flex B-C
10:30 - 11:00 AM	BREAK (refreshments)	UCC pre-function area (downstairs)
11:00 - 12:20 PM	PAPER SESSIONS (See page 5 for detailed information) - Model-Based Systems Engineering - Systems Modularity - Value-Based Engineering Case Studies SPECIAL SESSION 1 (See page 9 for detailed information) SE Modernization Panel	Tech Flex B-C Tech Flex A Pi Kitchen UCC Gallery room
12:20 - 1:30 PM	LUNCH	UCC common lunch area (upstairs)
1:30 - 2:30 PM	KEYNOTE Emily Kagan Trenchard, <i>Vice President, Digital and Innovation Strategy, Northwell</i> TOPIC: <i>Diagnosing Healthcare: Why Is This So Hard?</i>	Tech Flex B-C
2:30 - 3:30 PM	KEYNOTE Dr. Kathryn Jablokow, <i>Program Director, National Science Foundation</i> TOPIC: <i>The Edge of Uncomfortable 2.0</i>	Tech Flex B-C
3:30 - 4:00 PM	BREAK (refreshments)	UCC pre-function area (downstairs)
4:00 - 5:20 PM	PAPER SESSIONS (See page 6 for detailed information) - Digital Engineering - Testing, Verification and Validation - Sustainability Case Studies SPECIAL SESSION 2 (See page 9 for detailed information) Early Career Faculty Awards Workshop	Tech Flex B-C Tech Flex A Pi Kitchen UCC Gallery room
5:20 - 6:20 PM	POSTER SESSION (with refreshments)	Babbio Atrium
6:30 - 10:00 PM	BANQUET (shuttles depart 6:20pm, cruise departs 7pm) Best Paper Award announced during cruise	Cruise Pier 14

DAY 2
FRIDAY, MARCH 17, 2023

TIME	ACTIVITY	LOCATION
8:00 - 9:00 AM	BREAKFAST	UCC pre-function area (downstairs)
9:00 - 10:00 AM	KEYNOTE Dr. Merve Unuvar, <i>Director, AI Platforms and Automation Thomas J. Watson Research Center</i> TOPIC: <i>AI-infused Automation</i>	Tech Flex B-C
10:00 - 10:30 AM	BREAK (refreshments)	UCC pre-function area (downstairs)
10:30 - 11:50 AM	PAPER SESSIONS (See page 7 for detailed information) - Systems Engineering Reviews and Expertise - User Behavior in Complex Systems SPECIAL SESSION 3 (See page 10 for detailed information) Leveraging Adoption Research to Assess Implementation Frameworks for Digital Transformation and Digital Engineering (Interactive Session)	Tech Flex B-C Tech Flex A Pi Kitchen
11:50 - 1:00 PM	SPECIAL SESSION 4 (See page 10 for detailed information) How to Apply for Academic Equivalency (Workshop) LUNCH	UCC Gallery room UCC common lunch area (upstairs)
1:00 - 2:00 PM	KEYNOTE Dr. Rick Kazman, <i>Danny and Elsa Lui Distinguished Professor of Information Technology Management</i> TOPIC: <i>Human-Centric Aspects of Software Architecture</i>	Tech Flex B-C
2:00 - 2:30 PM	BREAK (refreshments)	UCC pre-function area (downstairs)
2:30 - 3:30 PM	PAPER SESSIONS (See pages 7-8 for detailed information) - AI and Smart Systems - Software Engineering - Systems Thinking Case Studies SPECIAL SESSION 5 (See page 10 for detailed information) INCOSE Certification Exam, Part I	Tech Flex B-C Tech Flex A Pi Kitchen UCC Gallery room
3:30 - 4:00 PM	BREAK (refreshments)	UCC pre-function area (downstairs)
4:00 - 5:00 PM	PAPER SESSIONS (See page 8 for detailed information) - Graph/Network Models - Knowledge Management and Verification SPECIAL SESSION 5 <i>continued</i> (See page 10 for detailed information) INCOSE Certification Exam, Part II SPECIAL SESSION 6 (See page 10 for detailed information) A Practical Introduction to Natural Language Processing (Workshop)	Tech Flex B-C Tech Flex A UCC Gallery room Pi Kitchen

THURSDAY, MARCH 16, 2023

11:00 AM - 12:20 PM PAPER SESSION 1	CHAIR	LOCATION
MODEL-BASED SYSTEMS ENGINEERING	Alejandro Salado	Tech Flex B-C
<i>PySysML2: Building Knowledge from Models with SysML v2 and Python</i> - Thomas Ford, Keith Lucas, Jordan Stern and John Situ		
<i>Model-Based Verification Strategies Using SysML and Bayesian Networks</i> - Joe Gregory and Alejandro Salado		
<i>MBSE-based Design Space Exploration for Productivity Improvement Using Workflow Models</i> - Jozef Hooman, Koen Kanters, Alexandr Vasenev and Jacques Verriet		
<i>Using JSON Schema to Define a System Modeling Vocabulary: The Tradespace Analysis Tool for Constellations (TAT-C)</i> -Paul Grogan and Josue I. Tapia		
SYSTEMS MODULARITY	Hao Chen	Tech Flex A
<i>Modularity Matters – Making Products Open is Only Half the Battle</i> - Whit Matteson		
<i>Modeling Aspects of Dynamically Reconfigurable System of Systems</i> - Anton Hristozov and Eric Matson		
<i>Technology Infusion in U.S. Spacesuits – A Comparative System Analysis</i> - Cinda Chullen, Iser Pena and Hao Chen		
<i>A Framework on Early Decoupling Level Metric Assessment Based on NLP4RE</i> - Lu Xiao, Gengwu Zhao, Maximilian Vierlboeck and Roshanak Nilchiani		
VALUE BASED ENGINEERING CASE STUDIES	Steven Hoffenson	Pi Kitchen
<i>An Interactive Dashboard to Support Design of an Artillery System</i> - Stephanie McDonough, Ariela Litvin, Benjamin Steinwurtzel, Robert Feliciano, Steven Hoffenson and Mark Blackburn		
<i>Tackling Optimization and System Driven Engineering in Coupling Physical Constraints With MBSE: The Case of a Mobile Autonomous Line of Products</i> - Lorraine Brisacier-Porchon and Omar Hammami		
<i>Risk-informed Prioritization for Complex Engineered Systems: Two US Army Corps of Engineers Case Studies</i> - Willie Brown, John Richards, Christopher Morey, Titus Rice and George Gallarno		
<i>Exploring Differences in Value Functions Allowed by Ordinal Validation</i> - Christopher White and Bryan Mesmer		

SPECIAL SESSION 1

SE Modernization Panel (See page 9 for details)

UCC GALLERY ROOM

4:00 - 5:20 PM PAPER SESSION 2	CHAIR	LOCATION
DIGITAL ENGINEERING	Scott Lucero	Tech Flex B-C
<i>Framework for and Progress of Adoption of Digital and Model-Based Systems Engineering Into Engineering Enterprises</i> - Tom Mcdermott, Kaitlin Henderson, Eileen Van Aken and Alejandro Salado		
<i>Towards Developing a Digital-enabled Mission Engineering Framework</i> - Dalia Bekdache and Daniel DeLaurentis		
<i>Digital Twin Use Case for Smart, Sustainable Cities</i> -F P Cardoso and Donna H Rhodes		
<i>Advancing Education on Digital Acquisition Artifacts</i> - Paul Wach, Dalton Clark and Nicole Hutchison		
TESTING, VERIFICATION AND VALIDATION	Bryan Mesmer	Tech Flex A
<i>Introducing Technical Debt link to Leading Indicators in Test and Evaluation Phase of Systems Engineering – a Thought Experiment</i> - Zakaria Ouzzif and Shamsnaz Bhada		
<i>An Integrated Testbed for Supporting Sustained Military Installation Decision Making and Modernization</i> - Randy Buchanan, Mohammad Marufuzzaman, James Stinson, John Richards, Christina Rinaudo, George Gallarno, Brendon Hoch, Natalie Myers and Eric Specking		
<i>Can Measurement Misdirect System Design?</i> - Casey Eaton, Christopher White and Bryan Mesmer		
<i>Technical Concept Development, Testing and Modeling: Development of a Shape Memory Alloy (SMA) Tire-Insert for Flat Tire Prevention and Airless Conversions</i> - Cole Smith		
SUSTAINABILITY CASE STUDIES	Bryan Watson	Pi Kitchen
<i>Ecological Decentralization for Improving the Resilient Design of Urban Water Distribution Networks</i> - Luis Rodriguez, Abheek Chatterjee and Astrid Layton		
<i>Resilient Microgrid Design Using Ecological Network Analysis</i> - Abheek Chatterjee, Amira Bushagour and Astrid Layton		
<i>Optimization of the System of Systems (SoS) Meta-Architecture of Algae Systems for Cost-effective Pollution Remediation</i> - Peter Ofuje Obidi, Cihan H Dagli and David J. Bayless		
<i>Sustainable Design of a Reusable Water Bottle: A Systems Thinking Approach</i> - Hossein Basereh Taramsari and Steven Hoffenson		

SPECIAL SESSION 2

Early Career Faculty Awards Workshop (See page 9 for details)

UCC GALLERY ROOM

FRIDAY, MARCH 17, 2023

10:30 AM - 11:50 AM	PAPER SESSION 3	CHAIR	LOCATION
SYSTEMS ENGINEERING REVIEWS AND EXPERTISE		Jon Wade	Tech Flex B-C
<i>Context-Dependent Research Agenda for Systems Engineering in 2050</i> - Yoram Reich, Miri Sitton, Avner Engel, Uzi Orion, Ami Danielli, Aharon Hauptman, Alex Blekhman and Jacob Shabi			
<i>How to Identify an Engineer with the Appropriate Systems Thinking Skills?</i> - Anat Nissel Miller and Sigal Kordova			
<i>The Emphasis of Design Patterns in Expressing Expert Knowledge from a Technical Solution – A Framework for Continued Research</i> - Samuel Russell, Benjamin Kruse, Robert Cloutier and Dinesh Verma			
<i>Literature Review and Research Design for Systems Integration: Case study in Defense Systems</i> - Gaute Tetlie, Gerrit Muller and Satya Kokkula			
USER BEHAVIOR IN COMPLEX SYSTEMS		Phil Odonkor	Tech Flex A
<i>Identifying and Evaluating the Effects of User Scenarios on the Data Integrity of Wearable Devices</i> - Ruijing Wang and Ting Liao			
<i>An Experimental Study of the Effect of Monetary Incentives and Fees on Consumer Energy Behavioral Intentions</i> - Gina Dello Russo, Ashley Lytle, Steven Hoffenson and Lei Wu			
<i>A Framework for Agent-Based Models to Consider Energy Justice Through Technology Adoption</i> - Danielle Preziuso and Philip Odonkor			
<i>Network-Based Analysis of Heterogeneous Consideration-then Choice Customer Preferences with Market Segmentations</i> - Yaxin Cui, Yinshuang Xiao, Zhenghui Sha and Wei Chen			
SPECIAL SESSION 3 Leveraging Adoption Research to Assess Implementation Frameworks for Digital Transformation and Digital Engineering (Interactive Session) <i>(See page 9 for details)</i>			
PI KITCHEN			
SPECIAL SESSION 4 How to Apply for Academic Equivalency (Workshop) <i>(See page 10 for details)</i>			
UCC GALLERY ROOM			

2:30 PM - 3:30 PM	PAPER SESSION 4	CHAIR	LOCATION
AI AND SMART SYSTEMS		Eman Alomar	Tech Flex B-C
<i>Analysis of IoT Privacy Policies in Smart Transportation Systems</i> - Nil Ergin and Adrian Barb			
<i>Product Herding for Intelligent Systems</i> - Niloofar Shadab, Tyler Cody, Peter Beling and Alejandro Salado			
<i>Early Implementation of a Cognitive Assistant for Identifying Requirement Gaps</i> - Nicholas Campagnari, Chris Macholtz, Nicholas Eng, Miguel Rodriguez and Alejandro Salado			
<i>(Paper Session 4 continued on next page)</i>			

2:30 PM - 3:30 PM	PAPER SESSION 4	CHAIR	LOCATION
SOFTWARE ENGINEERING		Zhongyuan (Annie) Yu	Tech Flex A
<i>System Engineering Driven AI Assurance and Trustworthiness</i> - Jyotirmay Gadewadikar, Jeremy Marshall, Zachary Bilodeau and Nfn Vatatmaja			
<i>How is Software System Reuse Discussed in Stack Overflow?</i> - Eman Alomar, Anthony Peruma, Mohamed Wiem Mkaouer, Christian Newman and Ali Ouni			
<i>Smart Base Installations: Applying Systems Engineering Techniques to the Agile Development of Multidisciplinary Systems of Systems Projects.</i> - Tate Hasenclever, Eric Specking, Gregory Parnell, Ed Pohl, John Richards, George Gallarno and Randy Buchanan			
SYSTEMS THINKING CASE STUDIES		Taylan Topcu	Pi Kitchen
<i>Systems Thinking Design in Action - A Duplicated Novel Approach to Define Case Studies</i> - Haytham B. Ali and Gerrit Muller			
<i>A Systems Thinking Understanding of Teamwork Competencies and Their Relationship to Health System Outcomes</i> - Susan Ferreira, Philip Greilich, Paul Componation, Mozhdeh Sadighi, Eleanor Phelps and Gary Reed			
<i>Applying Systems Science to Applied Science</i> - Yaniv Mordecai and Rohit Malshe			
SPECIAL SESSION 5 INCOSE Certification Exam, Part I <i>(See page 10 for details)</i>			
UCC GALLERY ROOM			

4:00 - 5:00 PM	PAPER SESSION 5	CHAIR	LOCATION
GRAPH/NETWORK MODELS		Feng Liu	Tech Flex B-C
<i>Using Graph Theory to Investigate the Role of Expertise on Infrastructure Evolution: A Case Study Examining the Game Factorio</i> - Chase Covello, Hyunjang Jung and Bryan Watson			
<i>Graph Representation of System of Analysis in Determining Well-Formed Construction</i> - Daniel Dunbar, Mark Blackburn, Thomas Hagedorn and Dinesh Verma			
<i>Product Competition Analysis for Engineering Design: A Network Mining Approach</i> - Yinshuang Xiao, Yaxin Cui, Michael Cardone, Wei Chen and Zhenghui Sha			
KNOWLEDGE MANAGEMENT AND VERIFICATION		Alejandro Salado	Tech Flex A
<i>Study of Equivalence in Systems Engineering within the Frame of Verification</i> - Paul Wach, Bernard Zeigler, Peter Adam Beling and Alejandro Salado			
<i>Verification Complexity: An Initial Look at Verification Artifacts</i> - Raphael Jung and Alejandro Salado			
<i>Building a Resilient Systems Engineering Workforce with Knowledge Intelligence Transduction (KIT)</i> - Rock Mendenhall and Steven Simske			
SPECIAL SESSION 5 continued INCOSE Certification Exam, Part II <i>(See page 10 for details)</i>			
UCC GALLERY ROOM			
SPECIAL SESSION 6 A Practical Introduction to Natural Language Processing (Workshop, Virtual) <i>(See page 10 for details)</i>			
PI KITCHEN			

DAY 1 THURSDAY, MARCH 16, 2023

SPECIAL SESSION 1 | SE Modernization Panel

11:00 AM - 12:20 PM

LOCATION:
UCC Gallery Room

Session Chair:
Tom McDermott

ABSTRACT:
Improvements in the traditional systems engineering approach to defense acquisition have been noted in government policy across four separate focus areas, including Digital Engineering and the broader DoD Data Strategy, Mission Engineering, Modular Open Systems Approaches (MOSA), and Agile/DevOps approaches as related to both software and hardware intensive systems. There is a lack of an integrated approach to implementation these Focus Areas across government program offices that is creating a delay in full implementation of the DoD’s desired Digital Transformation. The SE Modernization project is analyzing government policy and guidance, defining an integration framework across these focus areas, collecting lessons learned and a body of knowledge, and defining roadmaps for long-tern transformation of SE practice.

Why Modernize systems engineering? This panel will discuss the motivation for SE Modernization, the challenges and pain points collected to date, and the initial definitions of DoD roadmaps for modernization of DoD traditional engineering and acquisition practice. At the center of the panel discussion, the panel will discuss a re-envisioned systems engineering “Vee-model” for today’s digital and continuously adapting systems. For attendees, the project and panel will provide an interesting predictive view of how “digital systems engineering” will likely evolve over time.

AUTHOR:
Tom McDermott (Stevens Institute of Technology)

SPECIAL SESSION 2 | Early Career Faculty Awards Workshop

4:00 - 5:20 PM

LOCATION:
UCC Gallery Room

Session Chairs:
Kathryn Jablokow (NSF),
Paul Grogan (Stevens),
Steven Hoffenson (Stevens),
Alejandro Salado (Arizona),
Ying Wang (Stevens),
Lu Xiao (Stevens)

ABSTRACT:
In this session, National Science Foundation (NSF) program director Dr. Kathryn Jablokow and five faculty awardees of early career research grants from the NSF, DARPA, and NASA will share their experiences with their respective programs. Participants will have the chance to ask questions of the previous awardees, and then develop, share, and discuss their own ideas for future grant proposals. Upon completion of the workshop, participants will have knowledge and feedback to support their development of quality proposals.

AUTHORS:
Kathryn Jablokow (NSF), Paul Grogan (Stevens), Steven Hoffenson (Stevens), Alejandro Salado (Arizona), Ying Wang (Stevens), Lu Xiao (Stevens)

DAY 2 FRIDAY, MARCH 17, 2023

SPECIAL SESSION 3 | Leveraging Adoption Research to Assess Implementation Frameworks for Digital Transformation and Digital Engineering (Interactive Session)

10:30 - 11:50 AM

LOCATION:
Pi Kitchen

Session Chair:
Joseph Campagna

ABSTRACT:
The state of adoption research is mature, particularly when it comes to information technology. Numerous theories and models have been developed and researched over the past fifty years in almost every industry. While much of the empirical research has focused on a single technology-based innovation, we know that the fourth industrial revolution or digital revolution requires multiple innovations that are hyperconnected and transdisciplinary across an entire digital ecosystem, as well as a transformed workforce to operate in this new environment. The gaps in the literature make evident the need for implementation frameworks that can lead to a new type of strategic adoption that characterizes not just a single technology-based innovation, but rather strategically guides an organizational entity towards digital transformation and digital engineering in order to achieve the significant benefits that come from a “revolution”. Leveraging a systematic literature review on adoption research, this paper proposes an interactive session for validating the affinization of close to 200 unique determinants of adoption into a dozen or so categories that can be used to assess implementation frameworks that positively influence adoption leading to the strategic goals of digital transformation and digital engineering. The interactive session will then discuss, identify and characterize potential implementation frameworks by name (e.g. Maturity Model, Portfolio Management, Change Management, etc). This session will directly contribute to the dissertation research being done by the author to evaluate implementation frameworks that have the potential to accelerate strategic adoption by organizational entities that leads to digital transformation and digital engineering.

AUTHOR:
Joseph Campagna (Worcester Polytechnic Institute)

DAY 2 FRIDAY, MARCH 17, 2023

SPECIAL SESSION 4 | How to Apply for Academic Equivalency (Workshop)

10:30 - 11:50 AM

LOCATION:
UCC Gallery Room

Session Chairs:
Nicole Hutchison
and Courtney Wright

ABSTRACT:
The International Council on Systems Engineering (INCOSE) offers three levels of individual credentialing, two of which require participants to pass a standardized test. INCOSE’s Academic Equivalency (AcEq) Program allows university coursework to replace the standardized test. The standard test is offered only in English and is a timed, multiple-choice test. AcEq assessments may be offered in any language, any assessment format, and need not be timed. INCOSE sets the requirements for a university to apply for its courses to be recognized with AcEq. Once AcEq is recognized, students who do well in those courses are credited with having met the knowledge requirement. The students must still apply for certification through the standard path.

The process of applying for AcEq involves a university documenting how their course (or courses) assess students against INCOSE’s testing objectives. Describing how they assess knowledge is challenging for faculty members who are more accustomed to documenting teaching and content delivery. INCOSE does not require that universities teach the content within the recognized course(s). This allows for thesis or final project courses, often taught to a wide range of undergraduate students, to qualify for AcEq.

AUTHORS:
Courtney Wright (INCOSE)
Nicole Hutchison (Stevens Institute of Technology)

SPECIAL SESSION 5 | INCOSE Certification Exam, Part I

2:30 - 3:30 PM
(Part II continues at 4:00 PM, see below)

LOCATION:
UCC Gallery Room

Session Chairs:
Nicole Hutchison
and Courtney Wright

ABSTRACT:
The International Council on Systems Engineering (INCOSE) offers three levels of individual credentialing, two of which require participants to pass a standardized test. The standardized test is offered online, with remote proctors, as well as on paper in classroom settings. It is a timed, multiple-choice test.

INCOSE would like to host the exam at CSER. There would be no fee for participants. Those who pass the exam would be allowed to use their passing results as part of the requirements for Associate Systems Engineering Professional (ASEP) or Certified Systems Engineering Professional (CSEP) certification.

SPECIAL SESSION 5 continued | INCOSE Certification Exam, Part II

4:00 - 5:00 PM

LOCATION:
UCC Gallery Room

Session Chairs:
Nicole Hutchison
and Courtney Wright

ABSTRACT:
The International Council on Systems Engineering (INCOSE) offers three levels of individual credentialing, two of which require participants to pass a standardized test. The standardized test is offered online, with remote proctors, as well as on paper in classroom settings. It is a timed, multiple-choice test.

INCOSE would like to host the exam at CSER. There would be no fee for participants. Those who pass the exam would be allowed to use their passing results as part of the requirements for Associate Systems Engineering Professional (ASEP) or Certified Systems Engineering Professional (CSEP) certification.

SPECIAL SESSION 6 | A Practical Introduction to Natural Language Processing (Workshop, Virtual)

4:00 - 5:00 PM

LOCATION:
Pi Kitchen

Session Chair:
Carlo Lipizzi

ABSTRACT:
Natural Language Processing (NLP) is quickly becoming an essential skill for modern-day organizations to gain a competitive edge. By enabling services from chatbots, intelligent search to sentiment analysis, threat detection and question answering systems NLP tools are being used to help us draw useful insights from unstructured data and operate more effectively. For this reason, it has become an essential tool for many new business functions.

This practical workshop introduces NLP tools and its real-world applications.

Following: NLP Today, Language and knowledge, Building NLP systems, Supervised and Unsupervised approaches to NLP, Graphs for NLP, Text vectorization, Large Language Models/ChatGPT, Knowledge-based systems, NLP low-hanging fruits - Python toolbox

AUTHOR:
Carlo Lipizzi (Stevens Institute of Technology)



Dr. Victoria Coleman
*Chief Scientist of the
United States Air Force*

Thursday, March 16
9:30 - 10:30 AM
Location: Tech Flex B-C

TACTICAL AUTONOMY: FROM S&T TO CAPABILITY

ABSTRACT: With the advancement of AI/ML capabilities in recent years, autonomy is quickly becoming realizable in many fields, from self-driving cars to autonomous aircraft. The Secretary of the Air Force has named un-crewed autonomous combat aircraft as key components defining the NGAD and the B-21 families of systems in his operational imperatives. This requires the development of Tactical Autonomy, which the DAF defines as autonomous systems acting with delegated and bounded authority of humans in support of tactical, short-term actions associated with a longer-term strategic vision. This talk will address the role of S&T in achieving Tactical Autonomy and the work needed to move this from the lab environment to a capability in the hands of Warfighters.

BIOGRAPHY: **Dr. Victoria Coleman** is the Chief Scientist of the United States Air Force, Arlington, Virginia. She serves as the Chief Scientific Adviser to the Secretary of the Air Force, Air Force Chief of Staff, and Chief of Space Operations. She provides assessments on a wide range of scientific and technical issues affecting the department's mission. In this role, she identifies and analyzes technical issues, bringing them to the attention of department leaders. She interacts with other principals, operational commanders, combatant commands, acquisition, and science and technology communities to address cross-organizational issues and provide solutions. Dr. Coleman also interacts with other services and the Office of the Secretary of Defense on issues affecting the Department of the Air Force's technical enterprise. She serves on the Executive Committee of the Air Force Scientific Advisory Board and is the Principal Science and Technology Representative of the Air Force to the civilian scientific and engineering community and to the public at large. Dr. Coleman is on leave from University of California, Berkeley. Since 2016, Dr. Coleman has held an academic research appointment at the Berkeley Center for Information Technology in the Interest of Society where she leads science and technology policy on microelectronics and efforts to develop tools for countering digital authoritarianism. Dr. Coleman has more than 35 years of experience in computer science and technology, including as both an academic leader and industry executive. Before DARPA, she served as the Chief Executive Officer of Atlas AI P.B.C, a Silicon Valley start-up that brings world-class artificial intelligence solutions to sustainable development. By combining satellite data with other data sets, Atlas AI's proprietary deep-learning models create actionable insights for governments, non-governmental organizations and commercial companies.



Emily Kagan Trenchard
*Vice President, Digital
and Innovation Strategy,
Northwell*

Thursday, March 16
1:30 - 2:30 PM
Location: Tech Flex B-C

DIAGNOSING HEALTHCARE: WHY IS THIS SO HARD?

ABSTRACT: At every step of a patient's care journey, from finding a doctor on through to the moment when the bill arrives, a complex set of forces interact to make experiences feel at times miraculous and compassionate, and at other times infuriating and heartless. It's left patients and providers alike demanding to know: why can't we just fix this already? In an industry where the stakes are high, the tech is old, and the processes are byzantine, how can we effectuate change? And now how can we do so with an employee base still reeling from being on the frontlines of the pandemic? By pairing behavioral science and human-centered design with the tools of digital transformation, we can begin to heal the complexities that plague our health systems. In this conversation I'll share examples of large-scale initiatives to redefine the digital patient experience at New York's largest private health system, using multi-disciplinary teams to diagnose the underlying issues, identify solutions, and choose strategies to bring iterations of value through people, processes and technology.

BIOGRAPHY: **Emily Kagan Trenchard** offers a unique perspective from within the American medical system: A spoken-word-poet-turned-healthcare-executive, she is on a mission to remix the human in healthcare, challenging entrenched assumptions about what it means to give and receive care in the digital age.



Dr. Kathryn Jablokow
*Program Director, National
Science Foundation*

Thursday, March 16
2:30 - 3:30 PM
Location: Tech Flex B-C

As Vice President of Digital and Innovation Strategy for New York state's largest health system, Northwell Health, Emily leads teams that push the limits of how we use technology to make healthcare seamless and steeped in humanity, while keeping the company competitive at a time of radical change. She is a big believer that innovation is an ongoing process, not just a box to check, and launched Northwell's first UX department to ensure that patient perspectives and needs drove the design of digital tools and systems.

Emily also spearheaded the transition of Northwell's website platform to an open source stack, a move that helped the company save hundreds of thousands of dollars in software licensing costs; transitioning to open source also enabled the growth of an award-winning software development group whose applications include one of the first-ever healthcare uses of an Amazon Alexa skill.

Prior to joining Northwell Emily led web systems for New York City's Lenox Hill Hospital where she drove the development of many early consumer health tools, including the first-ever implementation of the ZocDoc scheduling platform for a hospital.

Emily's career is a continual exploration of the effects of technology, language, and design on the ways we care for one another. Outlets ranging from The Wall Street Journal to TechRepublic and CMS Wire turn to her for a fresh perspective on emerging technologies and the future of healthcare.

She is also a nationally recognized poet, essayist, and speaker; recent speaking engagements include the Cleveland Clinic's Empathy and Innovation conference and WebSumit in Lisbon. Emily holds a master's degree in science writing from MIT and a bachelor's degree from the University of California at Berkeley.

THE EDGE OF UNCOMFORTABLE 2.0

ABSTRACT: Whether the context is research, industrial application, or education, innovation is often described as searching for (and possibly stepping over) the leading edge of a domain. In charting this kind of unknown territory, we are challenged in choosing the best metrics to assess whether we have traveled far enough – and in the right directions. Are standard metrics like feasibility, desirability, efficiency, quality, usefulness, and novelty appropriate and sufficient when moving beyond existing boundaries is the goal? How might we leverage the natural human capacity to sense when something is pushing us beyond our “comfort zone”? And how far beyond that comfort zone should we go? In this conversation, we'll consider the challenges of measuring progress and success when transformative innovation toward a smart and sustainable future is the goal.

BIOGRAPHY: **Dr. Kathryn Jablokow** is currently serving as Program Director for the Engineering Design and Systems Engineering (EDSE) program in the Civil, Mechanical, and Manufacturing Innovation (CMMI) Division at the National Science Foundation (NSF). In her academic life, Dr. Jablokow is a Professor of Engineering Design and Mechanical Engineering at Penn State University, where her research focuses on design cognition, high performance design teams, advanced manufacturing, and design education. She has been part of the engineering design and systems engineering community for over 30 years and is a co-developer of a Massive Open Online Course (MOOC) on creativity that has attracted more than 300,000 learners since 2013. Dr. Jablokow is a Fellow of ASME and a Senior Member of IEEE, as well as the recipient of ASME's Ruth and Joel Spira Outstanding Design Educator Award.

Keynote Speakers continued on next page



Dr. Merve Unuvar
*Director, AI Platforms
and Automation*
*Thomas J. Watson
Research Center*

Friday, March 17
9:00 - 10:00 AM
Location: Tech Flex B-C

AI-INFUSED AUTOMATION

ABSTRACT: The intersection of AI and foundation models with automation is poised to revolutionize the way businesses operate and drive unprecedented growth and efficiency. In today's rapidly changing landscape marked by increased digitization, complex processes, and mounting pressure on cost structures, AI-infused intelligent automation is more relevant than ever. This keynote will explore the latest trends and innovations in the field and delve into the transformative potential of AI-infused automation.

The focus will be on the ways in which AI-infused automation can elevate the workforce, foster collaboration between business, IT, and AI, eliminate data and process silos, enhance speed and agility, and usher in new digital business models. By reducing skill barriers and proactively aligning company and individual goals, AI-infused intelligent automation has the capacity to drive the next era of business growth and efficiency. At IBM Research, we exploring the potential of low code no code solutions, goal oriented integration , Business and IT process optimization, AIOps and digital employees as key drivers of growth and efficiency.

BIOGRAPHY: **Merve Unuvar** is Director of AI Platforms and Automation team in IBM Research AI. She is also leading the global research strategy for Business and IT Automation, partnered with the IBM Hybrid Cloud Automation business with a focus on bringing AI infusion across IBM's Cloud Paks for automation, and integration. Her team consists of research and data scientists, engineers and designers building platforms, tools and programming models that enable data scientists and developers to create and operate AI models and applications faster and better. Merve's team is developing cutting edge technology in the intersection of core AI, distributed systems, cloud computing, human computer interaction and visualization.

Prior to this, Merve worked as Strategy Lead for the AI Platforms and Runtimes org. Merve helped create the strategic collaboration program that reimagined how IBM Research does business with both clients and business units. Together with the team, she made foundational contributions to Cloud Pak for Automation & Integration business units. Before this, Merve was the Lead Offering Manager of the Blockchain Solutions team where she helped build IBM Food Trust from concept to product, expanding the team from 4 to 100+. Merve Was Technical Assistant (TA) to the VP of Cloud Architecture and Technology and RSM in the Cloud Research team where she worked in machine learning for business process management and invented new techniques on multi-cloud scheduling featured in Fortune.

Prior to IBM, Merve worked in Dun and Bradstreet's, Global Analytics division as a Data Scientist. In this position, she was responsible for building financial specific models constructed from multiple analytics and big data. Here she utilized, existing and novel self-discovered modeling methods to generate predictive scores for business ratings used to influence billions of dollars in global commerce. In this role she contributed to process improvements in coding, in data audits and in feasibility analytics.

Merve is Adjunct Professor at Boston College, Carroll School of Management, teaching 'Machine Learning for Business Intelligence', serves on the board of Stevens Institute of Technology, School of Systems and Enterprises and holds a PhD in Operations Research from Rutgers University.

Merve's research interests include: Machine Learning, Business Process Management, Stochastic Modeling & Programming, Probabilistic Network Design such as bounding the reliability of a power system, Optimization with Discrete Random Variables, Data Mining/ Management and Predictive Analytics.



Dr. Rick Kazman
*Danny and Elsa
Lui Distinguished
Professor of
Information Technology
Management*

Friday, March 17
1:00 - 2:00 PM
Location: Tech Flex B-C

HUMAN-CENTRIC ASPECTS OF
SOFTWARE ARCHITECTURE

ABSTRACT: In 1992 the political consultant James Carville coined the much-quoted phrase "It's the economy, stupid". I shamelessly borrow and adapt Carville's line, in the context of software architecture to be: "It's the people, stupid". A software architecture is not merely a technical artifact; it is a socio-technical artifact. Architects who forget or neglect this critical aspect of their architecture are doomed to failure. An architect is the fulcrum between the world of technology on the one hand, and the world of individuals, groups, and business needs on the other hand. An architect therefore needs to be not just a technical leader, but also a community shepherd. In this talk I will outline some of the non-technical dimensions of a software architect's job, and describe some of the ways in which these can cause a project to succeed or fail. In addition I will show how a socio-technical ecosystem—a network representation of the technical artifacts as well as the human artifacts—can be captured, modeled, and analyzed, and the ways in which a project can be made better through this analytic lens.

BIOGRAPHY: **Rick Kazman** is the Danny and Elsa Lui Distinguished Professor of Information Technology Management at the University of Hawaii and a Visiting Researcher at the Software Engineering Institute of Carnegie Mellon University. His primary research interests are software architecture, design and analysis tools, software visualization, and technical debt. Kazman has been involved in the creation of several highly influential methods and tools for architecture analysis, including the ATAM (Architecture Tradeoff Analysis Method) and the Titan and DV8 tools. He is the author of over 250 publications, co-author of three patents and eight books, including Software Architecture in Practice, Technical Debt: How to Find It and Fix It, Designing Software Architectures: A Practical Approach, Evaluating Software Architectures: Methods and Case Studies, and Ultra-Large-Scale Systems: The Software Challenge of the Future. His research methods and tools have been adopted by many Fortune 1000 companies and has been cited over 27,000 times, according to Google Scholar. He is currently a member of the IEEE Computer Society's Board of Governors, an Associate Editor for IEEE Transactions on Software Engineering, and a member of the ICSE Steering Committee.



CSER History:

- 2022** – 19th Annual CSER – Norwegian University of Science and Technology, Virtual
- 2020** – 18th Annual CSER – University of Southern California, Los Angeles, CA
- 2019** – 17th Annual CSER – Stevens Institute of Technology / Virginia Tech
- 2018** – 16th Annual CSER – University of Virginia
- 2017** – 15th Annual CSER – University of Southern California, Los Angeles, CA
- 2016** – 14th Annual CSER – University of Alabama in Huntsville, AL
- 2015** – 13th Annual CSER – Stevens Institute of Technology, Hoboken, NJ
- 2014** – 12th Annual CSER – University of Southern California, Los Angeles, CA
- 2013** – 11th Annual CSER – Georgia Institute of Technology, Atlanta GA
- 2012** – 10th Annual CSER – Missouri University of Science and Technology, St. Louis, MO
- 2011** – 9th Annual CSER – University of Southern California, Los Angeles, CA
- 2010** – 8th Annual CSER – Stevens Institute of Technology, Hoboken, NJ
- 2009** – 7th Annual CSER – Loughborough University, UK
- 2008** – 6th Annual CSER – University of Southern California, Los Angeles, CA
- 2007** – 5th Annual CSER – Stevens Institute of Technology, Hoboken, NJ
- 2006** – 4th Annual CSER – University of Southern California, Los Angeles, CA
- 2005** – 3rd Annual CSER – Stevens Institute of Technology, Hoboken NJ
- 2004** – 2nd Annual CSER – University of Southern California, Los Angeles, CA
- 2003** – Inaugural CSER – Stevens Institute of Technology, Hoboken NJ