



Adaptability: Transdisciplinary Strategies and Solutions

Today's product and services systems are multi-faceted, with distinct levels of implementation that entail complex logic with levels of reasoning in intricate arrangement, organized by webs of connections. These systems increasingly demonstrate self-driven adaptability, autonomy, and emergent behavior. The demand for -- and possibility of -- systems adaptability will impact design, manufacturing, and operations across many sectors, including defense, healthcare, energy, transportation, emergency response, agriculture, and society overall.

At the same time, engineering activity for complex systems challenges is increasingly *transdisciplinary*, from problem framing and concept development to solution implementation. Transdisciplinary engineering is characterized by engagement of multiple technical disciplines along with non-engineering experts and stakeholders. This year's CAS Conference theme is **adaptability of complex systems through transdisciplinary systems and solutions**. *How we engineer as well as the systems we generate* are systems with significant opportunity from adaptability, and risks from lack of adaptability.

CAS 2025 seeks to balance attention to research on advanced methods and domain applications. Domain application studies are invited across a broad range of systems, including mechanical, computational, urban, biological, natural, and services systems. The conference aims to foster innovative methods to address adaptability, including recent advances in autonomy, resilience, AI, complex sociotechnical systems, and system of systems.

The **Complex Adaptive Systems (CAS) Conference** was founded and organized by Missouri University of Science and Technology in 2011, pushing research boundaries over the last thirteen years. From 2025 the conference will be expanded to include a larger community of practitioners and researchers. CAS will be named *INCOSE Complex Adaptive Systems Conference*, with leadership from the INCOSE Adaptability working group and support from Complex Systems, System of Systems, Artificial Intelligence, Risk Management and Resilience working groups. In 2025 the conference will be held on the MIT Campus. MIT System, Design and Management (SDM) will host the conference with support of the INCOSE New England Chapter.

Topics of Interest

Topics relevant to advances in theory and methods for complex adaptive systems are in scope. Topics of interest include but are not limited to the following:

Adaptability Theory and Methods

- System Adaptability
- Adaptive Systems Theory
- Uncertain Requirement Engineering
- Switching Cost Estimation
- Resilient Systems
- Adaptive System Safety and Reliability
- Modeling of Adaptability in Complex Systems
- Adaptable Software & System Interface
- Adaptability Heuristics
- Adaptable Architectures
- Model-Base Adaptable System Design
- Trade-Off Study Theory, Method and Tools
- Risk Management with Adaptation
- Adaptability in INCOSE SE Vision 2035

Complex System, Systems of Systems

- Dynamic complex Systems Architectures
- Socio-technical systems
- Adaptive Control
- Dynamical System Analysis
- Agent Systems Modeling and Simulations
- Adaptive System Complexity
- Complex System Modeling

Systems Domain Studies

- Mechanical Systems
 - Adaptive Vehicle Make
 - Adaptive Engines and Aircraft
 - Meta-X-Complex Systems Architectures
 - Maritime Vessels and Infrastructure
- Computational Systems
 - AI for Systems Adaptability
 - Adaptability for AI
 - Quantum for Adaptive systems
 - Interpreting Adaptation Behaviors
 - Adaptive Big Data Analytics
 - Social network analysis
 - Rules of engagement and emergent behavior
 - Adaptable Cybersecurity
- Urban Systems
 - Smart cities and adaptive city planning
 - Sustainable and Circular Construction
 - Energy
 - Mobility
- Biological Systems and Human Factors
 - Bioinformatics and Bio-inspired
 - Agriculture
 - Healthcare and Medical Devices
 - Human Factors and Adaptability
- Natural Ecosystems
 - Climate
 - Oceans
 - Forests
 - Beyond LEO
- Services Systems
 - Adaptive Acquisition
 - Supply Chain Adaptability
 - Adaptive Logistics
 - Telecommunications

Organizers

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Important Dates

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| Paper Abstract: | October 10, 2024 (round 1) November 1, 2024 (round 2) |
| Abstract Acceptance Notice: | October 17, 2024 (round 1) November 7, 2024 (round 2) |
| Workshop Proposals: | November 15, 2024 |
| Full Paper for Review: | December 2, 2024 |
| Paper Acceptance Notice: | January 10, 2025 |
| Final Manuscript and Copyright Form: | February 21, 2025 |
| Conference Dates: | March 5-7, 2025 |

Conference Website

<https://sdm.mit.edu/cas2025>