# DAC Symposium List - 2022

## Contents

# DAC-1: Control Co-Design

Review Coordinators: Daniel Herber and James Allison

Design of actively controlled dynamic engineering systems presents unique challenges and is playing an increasingly important role in society as active and other smart systems proliferate. This topic encompasses rigorous investigation of systematic control system design methods, as well as integrated methods that simultaneously address dynamic physical and control system design. The latter topic aims to achieve new levels of system performance and understanding through holistic design strategies. Specific topics appropriate for this symposium may include:

- Investigation of systematic methods for control system design.
- Control co-design and other methods that generate system-optimal active system design solutions.
- Comprehensive treatment of physical system design elements in integrated active system design.
- Tradeoffs in shifting complexity between physical and control systems.
- Assessment of design coupling between physical and control system design.
- Dynamic system models appropriate for integrated physical and control system design.
- Optimal control advancements relevant to integrated active system design.
- Integrated design methods that account for the complexities of implementable real-time control systems (digital feedback control, stability, robustness, sensor/actuator dynamics, noise, and other limitations).
- Strategies for managing uncertainty in models, environment, use, manufacturing, and other sources of variation relevant to active dynamic systems.
- Testbeds and physical validation of active system design theory and methods.
- Emerging applications that benefit from integrated active system design.
- Development and validation of active system design guidelines and frameworks.

# DAC-2: Artificial Intelligence and Machine Learning for Challenging Real-World Problems in Design Automation

Organizers: Payam Ghassemi, Philip Odonkor, and Zhibo Zhang

An important and emerging direction in design automation is the integration of the concepts of artificial intelligence (AI) and machine learning (ML) with engineering optimization to solve challenging real-world problems in engineering design and computational synthesis. With this session, the ASME Design Automation Committee thus invites researchers to submit papers that specifically involve solving design or computational synthesis problem(s) of real-world or similar complexity (and not solely toy or simple benchmark problems) through the application of AI and/or ML. The specific application problem and underlying models should be adequately described in these papers, along with a clear summary of why this design/synthesis problem is difficult or unviable to solve using non-ML/non-AI methods. Example application domains include (but are not limited to) aircraft systems, automobile systems, robotic systems, manufacturing systems, metamaterial systems, and clean energy systems. Suggested topic areas covered under this session include:

- Deep-learning (DL) approaches in engineering design (incl. Bayesian DL, geometric DL, and reinforcement learning)
- Reasoning under uncertainty such as fuzzy-logic or Bayesian networks
- Physics infused machine learning for design
- Bio-inspired algorithms (e.g., neuro-evolutionary and developmental systems) for complex system design
- Tree search algorithms applied to design problems
- Rule-based systems, graph or shape grammars systems
- Computational linguistics or logic methods applied to design

# DAC-3: Novel AI or ML Frameworks for Design or Systems Science

Organizers: Daniel Selva, Souma Chowdhury, and Wei Chen

With this session, the ASME Design Automation Committee invites researchers to submit papers that specifically involve the use of AI and Machine Learning (ML) frameworks to advance design or systems science, by presenting new "general" ways for problem representation, formulation, modeling, solution and analysis of solutions. These could include fundamentally advancing the underlying AI/ML methods themselves, as long as those advancements are motivated by problem characteristics of interest to the design automation community. The presented frameworks are expected to apply to at least one or more significant class of design/systems problems, and are expected to be assessed via benchmark cases pertinent to that class of problems (including comparisons to existing approaches is recommended). A few examples of such classes of problems in design/systems science where AI/ML methods provide unique opportunities include computational synthesis, topology optimization, design under uncertainty, multidisciplinary design optimization (MDO), resource allocation, and operations planning and scheduling. Suggested topic areas covered under this session include:

- Deep-learning (DL) approaches in design and systems science (incl. Bayesian DL, geometric DL and reinforcement learning)
- Physics infused machine learning for design and systems science
- Reasoning under uncertainty such as fuzzy-logic or Bayesian networks
- Bio-inspired algorithms (e.g., neuro-evolutionary and developmental systems) for learning and design creativity
- Tree search algorithms applied to design problems
- Rule-based systems, graph or shape grammars systems
- Computational linguistics or logic methods applied to design
- Representation methods that model the rich variety or complexity of engineering problems
- Computational methods for design creativity

# DAC-4: Data-Driven Design

Organizers: Faez Ahmed, Souma Chowdhury, and Ali Mehmani

Design is undergoing significant advances with the advent of Big data. Designers now have access to larger and more varied sources of data, with examples ranging from increasingly detailed product usage data to completely new sources of data such as social media and user-generated content. These data trends promise new opportunities to improve the way new products and systems are developed. However, despite the overabundance of digital design data and emphasis on knowledge representation, designers still face tremendous challenges in transforming data into knowledge. Data-Driven Design represents an emerging research area that aims to develop design tools and methods suited to discovering patterns in big data and transforming them into actionable decisions to improve the way products and systems are designed. Such capability will be achieved through statistical and machine learning models to discover and communicate meaningful patterns that influence design decisions and systematically search for innovation. The ASME Design Automation Committee invites researchers to submit papers covering innovative approaches in this area, which may include:

- Machine learning and data mining methodologies in product design
- Design under multi-fidelity and noisy data sources
- Applications of dimensionality reduction of large and complex design spaces
- Supervised and unsupervised data-driven approaches to improve or synthesize products
- Data-driven inverse design
- Data-driven approaches for analysis and design of socio-technical systems
- Crowdsourcing and related mechanisms for collecting user-generated data
- Incorporating social media and user-generated content data in next-generation designs
- Text mining/natural language processing algorithms for large and unstructured data sets
- Integrating design data across company divisions (e.g., marketing, engineering, manufacturing)
- Data mining frameworks that leverage longitudinal data within a single company or across markets/industries
- Visualization methods that lead to the identification of new or latent user needs
- Implications of data security and privacy on the effectiveness of design analytics

## DAC-5: Decision Making in Engineering Design

Organizers: Jesse Austin-Breneman and Venkat Nemani

The ASME Design Automation Committee and the organizers of the Special Session on Decision-Making in Engineering Design invite researchers to submit papers covering innovative approaches to and developments in:

- Structuring design decisions
- Supporting decision making in ill-defined spaces
- Decision variable to performance mapping
- Tradespace exploration support
- Modeling preferences and tradeoffs
- Representing uncertainty in design decisions
- Making decisions in multi-attribute and multi-objective environments
- Managing decisions with multi-scale and multi-disciplinary complexity
- Studying the consistency and validity of decisions and decision support tools
- Managing trustworthiness in decision-making

# DAC-6: Design and Optimization of Energy Systems

Organizers: Jie Zhang, Cong Feng, and Ali Mehmani

The numerous sources of energy and the various ways that humans consume it plays an important role in the design of many engineering systems. Growing concerns in recent years about climate change, predicted scarcity of fossil fuels, and energy security have triggered much interest in efficient energy generation, transmission/distribution, utilization and energy harvesting from sustainable resources. As government agencies and various industries make long term commitments to research and development in sustainable energy technologies, it falls to the design engineering community to promote, develop, and improve the appropriate modeling, design and optimization tools.

The ASME Design Automation Committee and the session organizers invite papers focused on modeling, design and optimization of sustainable energy technologies. Topics of interest include, but are not limited to:

- Multidisciplinary design, analysis, and modeling of energy systems
- Optimal design of energy harvesting, storage and delivery systems
- Design and optimization of renewable energy systems, e.g. wind, solar, wave, tidal, geothermal, and hybrid systems (e.g., wind+storage, solar+storage, nuclear+renewable).
- Design and optimization of electrical-thermal systems
- Uncertainty quantification and resilience enhancement in energy systems
- Development of new/innovative energy technologies
- Socio-economic challenges in transitioning to renewable/sustainable energy technologies
- Economics, planning and project management of sustainable energy systems

# DAC-7: Design for Additive Manufacturing

Organizers: Nicholas Meisel, Fiona Zhao, and Joshua Hamel

The ASME Design Automation Committee and the organizers of this Special Session invite papers that address the challenges of using modeling, simulation, and empirical data to design parts or assemblies for additive manufacturing. Representative topics include:

- Geometric modeling for AM-enabled applications
- Design for AM methods and tools
- Integrated design of AM parts and processes; design-material-process interactions in AM
- Integration of theory, simulation, and experiments in the design of AM parts and processes
- Synthesis and optimization of AM parts or assemblies
- Multiscale design of AM parts
- Additive manufacturing considerations in topology, size and shape optimization
- Design methods for multimaterial parts or parts with functionally graded materials
- Socioeconomic impacts of AM and emerging business models for AM development
- Design for 4D printing
- Design for multifunctionality

# DAC-8: Design for Market Systems

Organizers: Steven Hoffenson and Kate Whitefoot

Design for Market Systems builds on economic and social science foundations to develop and test theories, methods, and findings that help designers improve the success of a product in the marketplace. The ASME Design Automation Committee and the Session Organizers of Design for Market Systems invite papers that deal with the theoretical and/or applied aspects of one or more of the following topic areas, and related topics, as they relate to engineering design:

- Role of markets in design decision-making
- Design for profit
- Design for marketing
- Economics and econometrics
- Distribution channels and supply chains
- Consumer choice and demand modeling
- Survey design and consumer preference elicitation
- Design for market segmentation or consumer heterogeneity
- Product differentiation and/or mass customization
- Product bundling and product portfolios
- Competition and game theory
- Innovation and entrepreneurship
- Disruptive technologies
- Competitiveness considering enterprise planning, cost forecasting, and operations
- Decision-making for dynamic markets
- Design under uncertainty of market volatility
- Risk assessment, analysis and management
- Competitiveness and real options analysis
- Social welfare, externalities, and green design
- Public policy, regulation and infrastructure
- Life cycle assessment and market effects
- Requirements management
- Globalization and off-shoring
- Intellectual property
- Modeling future technology performance
- Predicting the emergence of disruptive technologies
- Predicting impact of future technologies on business, industry, and society

# DAC-9: Design for Resilience and Failure Recovery

Organizers: Zequn Wang, Zhimin Xi, and Christopher Hoyle

Resilience defines the ability of an engineered system to sense and withstand adverse events and recover from the effects of these events. Adapting resilience concepts to engineering design for creating resilient engineered systems is an emerging research area. This session on "Design for Resilience and Failure Recovery" calls for papers addressing a wide range of topics in the design of resilient engineered systems and processes. The interest includes, but is not limited to, the following topics:

- Advanced Systems Engineering research for resilience, such as engineering resilience modeling and quantification, cost-benefit analysis, and social and economic impacts analysis
- New performance measures for resilience, such as reliability, survivability, vulnerability, and recoverability or capability of failure mitigation/recovery
- New design concepts and techniques for autonomous resilience realization through the design of complex engineered systems and processes
- New approaches to integrating post-design failure recovery activities (e.g., condition monitoring, predictive maintenance, reconfiguration, and retrofits) in the early-stage design of engineered systems
- Advanced system performance awareness and management techniques enabling engineering resilience, such as machine learning and deep learning techniques for condition monitoring, fault diagnosis, and failure prognosis, and decision-making methodologies/algorithms for failure mitigation/recovery
- Advanced techniques for design integration towards engineering resilience, such as reliability-based design, sensing system development, advanced failure prediction techniques, failure mitigation/recovery, design considering system retrofits, reconfigurable system design, and open architecture products design
- Successful applications of engineering resilience for complex engineered systems and processes (e.g., critical infrastructure systems and processes, computer networks, energy systems, power systems, transportation systems, and supply chains)

# DAC-10: Design of Complex Systems

Organizers: Beshoy Morkos and Rahul Renu

As the next generation of systems continue to grow in functionality and requirements, it become complex when the elements it is comprised of interact in a way that gives rise to emergent behavior. The objective is to advance the fundamental understanding of complex systems design so that this emergent behavior can be observed, anticipated, predicted and eventually controlled. The ASME Design Automation Committee invites contributions that address topics of complex systems design including, but not limited to:

- Characterization of complex systems
- Design and management of complex systems
- Uncertainty quantification and risk management in complex systems
- Complexity quantification, modeling and management
- Validation of complex system designs
- Bio-inspired studies of complex systems
- Modeling and management of emergent behavior within the context of engineering design
- Economic paradigms for modeling complex systems
- Massive collaboration and crowd-sourcing methods for complex systems design
- Decentralization and self-organization in complex systems
- Network theory and applications in design of complex systems
- Human factors and machine-human interactions in complex systems
- Applications of artificial intelligence to the design of complex systems

# DAC-11: Design of Engineering Materials and Structures

Organizers: Carolyn Seepersad, Xingchen Liu, Hongyi Xu and Yuqing Zhou

The ASME Design Automation Committee and the organizers of this Special Session invite papers that address the challenges of using modeling and simulation to design engineering materials and structures. Representative topics include:

- Simulation-based design methods for enabling accelerated design, development, and insertion of engineering materials
- Integration of theory, simulations, and experiments in the design of materials and structures
- Multiscale and multiphysics modeling and simulation to support the design of advanced materials and structures
- Data-driven design of materials and structures; data mining and informatics for material and structural design
- Integrated design of products, fabrication processes, and materials
- Geometric modeling for design of materials and structures
- Novel materials and structures by design, and their applications
- Topology optimization theory, methods and applications
- Stochastic topology optimization and uncertainty quantification and management for materials and structures
- Manufacturing considerations in topology, size and shape optimization
- High performance computing for large-scale topology optimization
- Machine learning and AI methods for topology optimization

# DAC-12: Engineering for Global Development

Organizers: Natasha Wright, Nordica MacCarty, and Amy Bilton

Today the need for engineered products and solutions for the poor is overwhelming. 880 million people do not have access to clean water, 2.5 billion people do not have a safe toilet, and more than 3 billion cook on an open fire. Consequently, death, disease, and injury are common in the developing world. Each day 25,000 children die from malnutrition and preventable disease. The majority of these children live in extreme poverty in communities that lack medical care and have no access to goods and products that could improve their lives. These are engineering problems, and the failure of engineering and engineers to meet the basic needs of people living in poverty is staggering. The developing world is rapidly becoming a graveyard for well-intentioned but poorly engineered projects and products. For example, the International Institute for Environment and Development reports that in Africa 50,000 rural water points are broken and that an infrastructure investment of $215-360 million intended to improve the lives of the poor has been wasted. Too often a new product is provided to a group of people in the developing world—for example a pump instead of a bucket and rope to retrieve water from a well. It is hoped that the new product will transform the village—children will be healthier, women will have more time, it will increase income. But a year later the new device is broken or abandoned. Our challenge is to build real products that are truly sustainable. That is, products that meet local needs, are consistent with local culture, are affordable, are locally and affordably repairable, and really do change people lives.

Engineering design has a critical role in developing the products, processes, and systems that can sustainably transform the lives of the poor. This is a significant challenge, and we need to develop the underlying patterns, principles, and tools that can help to effectively address the following areas:

- Product development methods focused on the issues of the developing world;
- Sustainable engineering product development for the poor;
- Teaching sustainable engineering development;
- Implementing of engineering products in the developing world;
- Incorporating local culture into the design process;
- Engineering design and appropriate technology;
- Design for extreme affordability;
- Methods to handle the multidisciplinary nature of poverty alleviation.

# DAC-13: Geometric Modeling and Algorithms for Design and Manufacturing

Organizers: Horea Ilies, Saigopal Nelaturi, and Morad Behandish

The ASME Design Automation Committee and the Organizers of the Special Session on Geometric Modeling and Algorithms for Design and Manufacturing invite papers that deal with theoretical and/or applied geometric methods spanning all phases of the design and manufacturing process (i.e., conceptual design to validation), including:

- Geometric representations and algorithms for 3D shapes
- Heterogeneous material representations for design and process planning
- Data driven geometric reasoning and processing
- Generative shape synthesis
- Conceptual design
- Model and feature similarity, matching, retrieval, and reconstruction
- Geometric problems in manufacturing, including:
    - Path planning for NC machining, additive manufacturing
    - Manufacturability analysis and manufacturing process selection.
    - Manufacturing planning, fabrication and inspection
- Geometric modeling and algorithms using high performance/ distributed computing.
- Multi-scale design and modeling
- Visual or haptic geometry rendering
- Geometric dimensioning and tolerancing
- Meshing
- Open problems and emerging issues

# DAC-14: Metamodel-Based Design Optimization (MBDO)

Organizers: [Payam Ghassemi] and [Yuanzhi Liu]

The ASME Design Automation Committee and the Organizer of the Special Session on Metamodel-Based Design Optimization (MBDO) invite papers that deal with the theoretical and/or applied aspects of one or more of the following topic areas.

- Model approximation: Approximation of computation-intensive processes and associated gradient or other properties across the entire design space; innovative metamodeling techniques; flexible metamodeling for variable fidelity models; multi-response metamodeling; uncertainty and validation of metamodels; metamodeling for dynamic systems, high-dimensional metamodeling.
- Fixed and Sequential Sampling: Fixed, adaptive, sequential, or other intelligent sampling methods for metamodeling techniques and MBDO.
- Large-scale/high-dimensional metamodeling techniques: Theoretical studies on large-scale design problems; methods or strategies for large-scale metamodeling; testing of existing methods with large-scale design problems.
- Design space exploration: Design space exploration to enhance the engineers' understanding of the design problem; design visualization; interactive space exploration methods and tools; application in engineering design.
- Problem formulation: Metamodeling strategies that aid the formulation of design optimization problems, such as, reduction in dimensionality and size of the design space, constraint addition or removal, addition or removal of optimization objectives.
- Optimization support: Methods and application of metamodeling techniques to solve global optimization, high-dimensional optimization, multidisciplinary design optimization, and probabilistic optimization problems occurring in industry.
- Other topics as related to MBDO.

# DAC-15: Multidisciplinary Design Optimization, Multiobjective Optimization, and Sensitivity Analysis

Organizers: Hongyi Xu and Mian Li

The ASME Design Automation Committee invites papers on Multidisciplinary Design Optimization (MDO), Multiobjective Optimization, and Sensitivity Analysis theory. Papers submitted to this session should focus on the optimal design of complex engineering systems with consideration of the interactions between multi-disciplinary system components and multiple design objectives. Sample topics of interest include but are not limited to the following:

- Multi-objective, multi-disciplinary optimization
- Multi-objective, multi-disciplinary design under uncertainty
- Surrogate modeling for multi-objective, multi-disciplinary system design
- Local and global multi-objective sensitivity analysis
- Quality metrics for multi-objective solutions
- Multi-fidelity analysis and design
- System design problem formulation and decomposition
- Trade-off analysis
- Distributed/multi-level approaches
- Parallel processing/high performance computing
- Simulation process integration & automation
- Optimization and coordination algorithms
- Engineering design applications of multi-objective optimization and/or sensitivity analysis
- Visualization and software implementation

# DAC-16: Platform Architecture and Product Family Design

Organizers: Eun Suk Suh and Seung Ki Moon

The ASME Design Automation Committee and the Organizers of the Special Session on Platform Architecture and Product Family Design invite papers that deal with the theoretical, computational, and/or applied aspects of one or more of the following topic areas.

- Methods and tools for product family design and platform architecting
  - Module-based product families
  - Scale-based product families
- Top-down and bottom-up approaches to platform design
- Portfolio management and product line structuring
- Product family and product platform assessment
  - Commonality
  - Variety and differentiation
  - Cost-based assessment methods
- Product family and product platform optimization
  - Formulations and algorithms for solving product family optimization problems
  - Data visualization strategies to support product family design optimization
  - Benchmarking studies on product family design problems
- Architecture development of reconfigurable/changeable systems
- Data-driven approaches for platform and product family design
- Assessing the ability of an architecture to meet diverse or unforeseen needs
- New case studies in product family and product platform design

# DAC-17: Design Under Uncertainty

Organizers: Zhen Hu, Xiaoping Du, and Chen Jiang

The ASME Design Automation Committee and the Session Organizers of the Special Session on Simulation-Based Design under Uncertainty invite papers that deal with the theoretical and/or applied aspects of one or more of the following topic areas:

- Theoretical foundations and frameworks for design under uncertainty
- Strategies and methods for uncertainty reduction and risk management in design
- Preference modeling and elicitation in design under uncertainty
- Uncertainty representation and quantification
- Elicitation and aggregation of uncertain information
- Representation and prediction of emergent behavior under uncertainty
- Theoretical foundations for predictive modeling and inference with limited data
- Computational techniques for uncertainty propagation
- Model verification, validation, and uncertainty quantification
- Multi-fidelity and surrogate modeling for design under uncertainty
- Stochastic methods for design of multiscale engineering systems
- Information systems for supporting design under uncertainty
- Communication of uncertainty analysis results
- Teaching design under uncertainty
- Case studies and industrial design applications that illustrate comprehensive treatment of uncertainty
- Modeling, analysis, and design involving stochastic processes and/or random fields
- Lifecycle analysis and design under uncertainty

# DAC-18: Computational Design for Biomedical Applications

Organizers: Julián Norato and Paul Egan

The ASME Design Automation Committee and the Organizers of the Session on Computational Design for Biomedical Applications invite papers on design methodology applied to biomedical structures and systems. The session emphasis is on the design methods, including (but not limited to) shape and topology optimization, sensitivity analysis, surrogate modeling, nature-inspired optimization, machine learning and inverse identification, with application to the design of:

- Tissue engineering scaffolds
- Bone cages, plates, and screws
- Surgical instruments (rigid and compliant)
- Implants and replacements
- Cardiovascular stents and bypasses
- Orthoses and prostheses

Contributions on the use of design methodologies for bone adaptation modeling and tissue mechanical characterization are also welcome.

The primary objective of this session is to bring together researchers in the mechanical design and biomedical engineering communities to facilitate the exchange of ideas and promote interdisciplinary collaborations.  The session also aims to disseminate recent advances in the field and foster scholarly discussions.

# DAC-19: Human-Artificial Intelligence Collaboration in Engineering System Design (New / Proposed Session)

Organizers: A. Emrah Bayrak and Namwoo Kang

Powered by state-of-the-art machine learning methods, Artificial Intelligence (AI) systems can support human partners in new ways to address complex challenges in engineering design and systems engineering. These systems have the potential be an integral part of our daily lives or future workforce in a physical form as intelligent vehicles or robots or in a virtual form as decision support systems. These systems can support individual decision-making or work with human partners in a team. The ASME Design Automation Committee and the organizers of this session invite researchers to submit papers that deal with the theoretical development and/or application of AI systems or methods that aim to support or work with human partners. Sample topics of interest include but not limited to:

- Human-AI collaboration architectures
- Adaptive machine learning methods to collaborate with human partners
- Goal setting and goal reasoning for collaborative AI systems
- Decision support systems
- Human factors in human-AI collaboration including trust, workload, cognitive biases, knowledge and awareness
- Division of labor, communication and problem coordination in human-AI collaboration
- Safety in human-AI collaboration
- Design and application of human-AI teams and mixed initiative systems
- Design of AI system characteristics for human use including transparency, robustness, reliability and fairness

# DAC-20: Design of Autonomous Systems (New / Proposed Session)

Organizers: Souma Chowdhury and Ehsan Esfahani

As the world is moving towards increasing autonomy of engineered systems, from transportation to manufacturing to household appliances, there's also an increasing need for understanding how design of these systems should evolve or change radically to allow safe, robust and efficient autonomous operation. In most engineering sectors, infusion of autonomy has often happened at the software level, supported with added sensors and computing hardware, while the fundamental physical design (geometry, structure, actuators, instrument layout etc.) of these systems have remained only mildly altered from their earlier generations that were completely or partly human operated. Hence, there's an important opportunity for design automation researchers to identify, develop and test existing and novel representations and methodologies to design engineered autonomous systems, where the system design deliberately supports autonomous operation. With this new symposium, the ASME Design Automation Committee invites researchers to submit papers that address this opportunity, with application areas of interest including but not limited to advanced manufacturing, autonomous cars, autonomous ground and aerial vehicles, smart appliances (e.g., the robotic vacuums), and cyber physical systems (e.g., smart building and micro-grids). Topic areas of interest include:

- Formal approaches to identifying design specifications of autonomous systems
- Architecture representations of engineered autonomous systems
- Modeling of autonomy of engineered systems (e.g., in terms of independence and task complexity)
- Methods for hardware-software concurrent design (co-design) of robotic systems
- Design for safe human-machine interactions in autonomous co-robotic systems
- Design of self-reconfigurable systems

Review papers covering the design evolution of specific classes of autonomous systems (e.g., autonomous vehicles, smart appliances, etc.) and /or identifying major challenges in "design for autonomy" in such contexts are also of interest.

# DAC-21: Evolving Cyber-Physical-Social Systems (New / Proposed Session)

Organizers: Farrokh Mistree, Janet K. Allen, Jia Hao, and Zhenjun Ming

Cyber-Physical-Social Systems (CPSS) are a natural extension of Cyber-Physical Systems (CPS) that add the consideration of human interactions and cooperation with cyber systems and physical systems. CPSS are typically viewed as the integration of three concepts, namely, the Internet of Things, the Internet of Services, and the Internet of People. One of the key features of CPSS is that the form, structure and interaction of these systems are constantly changing to meet changing needs, that renders them as *evolving* CPSS. Design of *evolving* CPSS include the tradeoffs between the cyber, the physical, and the social system.
We hypothesize that

- ALL grand challenges (for example, health care, climate change, food insecurity, transportation, manufacturing systems, low carbon economy, etc.) can be modeled as *evolving* CPSS.
- Solutions to ALL grand challenges involve a partnership between Industry, Government and Community.
- Public policy is foundational for addressing a grand challenge that involves a partnership between Industry, Government and Community.

Our goal in this session is to foster dialog amongst those who are interested in contributing to the development of CPSS. Hence, preference will be given to short papers that are written with the intent to foster dialog in the DAC community.
To get a handle on evolving CPSS we invite **short papers** (less than 5000 words) in which authors seed the conversation on research issues associated with the realization of evolving CPSS. Topics of interest include, but are not limited to **research questions** associated with:

- Decision-making framework for reconfiguring existing cyber-physical systems to cope with the uncertainty associated with future events.
- The mathematical framework of evolving cyber-physical-social systems.
- Tradeoffs between cyber, physical, social systems as complexity increases.
- Design of local interaction strategies/policies among agents for expected global behavior.
- Data driven predication of the future state of evolving cyber-physical-social systems.
- Prediction and simulation modelling to assess the impact of policies and the evolving interests of multiple stakeholders.
- Smart autonomous agents for designing self-organizing CPSS.
- Exploring context-sensitive design for evolving user needs that vary with time, place, person, a combination of (diseases/ conditions).
- Modeling social motivations, risk management and mitigation, behavioral economics and public policy.

We are open to dialog with authors prior to submission of the manuscript.

# DAC-22: Multi-fidelity Modeling Under Uncertainty (New / Proposed Session)

Organizers: Ramin Bostanabad and Leifur Leifsson

The recent technological advancements in software and hardware have provided designers with a wide range of data sources on engineered systems. For instance, we can now design tough alloys using high-throughput experiments, direct numerical simulations, reduced-order models, or physics-informed emulators. In this regard, multi-fidelity modeling (aka data assimilation or data fusion) plays an increasingly important role as it allows to leverage low-fidelity data sources to accelerate the design process while keeping high-fidelity sources in the loop to establish accuracy or convergence guarantees. Multi-fidelity modeling has many benefits in engineering design such as rapid prototyping, identification of error sources in simulations, inverse estimation of unknown simulation parameters, improved convergence rates in optimization, uncertainty quantification, and optimal resource allocation. Correspondingly, the ASME design automation committee and the organizers of this session invite researchers to submit papers covering innovative approaches that include but are not limited to:

- Multi-fidelity data assimilation under uncertainty
- Inverse parameter and model discrepancy estimation with small, heterogeneous, or big data
- Physics-informed multi-fidelity modeling
- Meta-modeling for data fusion
- Manifold learning for data assimilation in high dimensions
- Resource allocation for balancing costs and accuracy
- Multi-fidelity optimization under uncertainty
- Theoretical developments for multi-fidelity design under uncertainty: addressing identifiability issues, heterogenous noises, or highly imbalanced data
- Diagnostics for detecting model form discrepancy

# DAC-23: Special Session with DFMLC: Modeling and Optimization for Sustainable Design and Manufacturing

Organizers: Bryony DuPont, Bill Bernstein, and Daniel Cooper

The ASME Design Automation Committee and the Session Organizers of the Special Session on Sustainable Design invite papers that deal with the theoretical and/or applied aspects of environmental or social sustainability in engineering. Paper topics of interest include:

- Sustainable design principles
- Multidisciplinary factors in sustainable design
- Modeling and simulation methods for sustainable design
- Resilient and sustainable systems
- Trade-offs in sustainable design
- Uncertainty in sustainable design
- Sustainable design of complex systems
- Economic, environmental, and social metrics in design
- Socio-economic systems in sustainable design
- Socio-technical systems in sustainable design