Artificial Intelligence (AI) for Manufacturing Workshop

Date: May 27-28, 2026

Location: NIST, Gaithersburg, Maryland

Organizers: Yan LU, Rachael Sexton, Engineering Lab, National Institute of Standards and Technology

Workshop Description:

U.S. manufacturing expects to gain transformative productivity and resilience improvements through AI integration in product development and production processes. Despite AI's potential to transform manufacturing operations and workflows, significant barriers exist against widespread adoption, including technical complexity, organizational resistance, return-of-investment uncertainty and gaps in enabling standards. To accelerate AI-enabled manufacturing, there is an urgent need to collect and document proven best practices, systematically identify developmental and operational challenges, and clarify measurement science and standards requirements that ensure reliable deployment at scale.

The workshop will convene stakeholders from manufacturing, automation, and digital systems integration sectors to gather inputs on: (1) real-world and emerging use cases of AI in manufacturing—with emphasis on foundation models, generative AI, and agentic AI; (2) current challenges and barriers to implementing AI in manufacturing systems and engineering workflows; and (3) measurement science and standards needs to support reliable, resilient, and interoperable AI-enabled manufacturing systems throughout the engineering and production lifecycle. The workshop will also focus on specific measurement science and standards needs to enable productive human-AI teaming in manufacturing.

The workshop will support our research goals of developing AI tools for manufacturing innovation, defining fitness-for-purpose metrics of AI for manufacturing, discovering fundamentals that enable effective human-AI teaming, and contributing to standards development in the area of AI for Advanced Manufacturing.

Workshop Outcome:

A NIST AMS report will be published capturing workshop results.

- A set of documented real-world use cases for AI in advanced MFG and human-AI teaming in manufacturing.
- Identified technical challenges and barriers in development and deployment of AI enabled manufacturing systems.
- Recommendations on measurement science and standards to enable reliable, interoperable, and resilient AI-empowered manufacturing systems

- Recommendations on measurement science and standards for Human-AI Teaming metrics and standards.
- Propose a roadmap in measurement science and standards development for AI in manufacturing

Tentative Agenda

May 27		
7:30-8:30	Registration	
Morning Plenary	**Heritage Room**	
8:30-8:40	Opening Remarks	Joannie Chin, Engineering Lab Director, NIST
8:40-8:50	Introduction of the workshop	Yan Lu, Workshop Chair
8:50-9:20	Beyond the Model: The Standards That Make AI Work in Manufacturing	Mohsen Seifi, ASTM International
9:20-9:50	Trends, Advances, and Challenges of Industrial Physical AI in Smart Manufacturing	Jay Lee, University of Maryland
9:50-10:20	From Engineering Context to Governed Action: Agentic AI for Reliable Manufacturing Workflows	Andre Wegner, Authentise
10:20-10:40	Coffee Break	
10:40-11:10	Functional Safety for Physical AI	Riccardo Mariani, NVIDIA
11:10-12:10	**Panel Session**: AI for Manufacturing: Cross-Sector Perspectives on Progress, Barriers, and Priorities	**Moderator: Paul Witherell** **Panelists:** Brandon Ribic, America Makes Jonathan Wise, CESMII Penny Chen, Yokogawa Alex Rudin, MITRE
12:05-13:30	Lunch Break	
Afternoon Breakout	**Lecture Room A**	**Lecture Room D**
13:30-15:10	Breakout Session 1: **Agentic AI for Manufacturing** **Panelists:** Kentarou YOSHIMURA (Hitachi) Christoph Legat (TUA, Germany) Hyunbo Cho (POSTECH) Clint Nicely (RTX, Vitual) James Zhang (OpsMate AI)	Breakout Session 2: **Industrial Foundation Models: Data and Application Challenges** **Panelists:** Soundar Kumara (Penn State) Amir Kashani (Stanley Black & Decker) Cindy Chang (UVA) Patricia Delafuente (NVIDIA)

15:10-15:30	Coffee Break	
15:30-17:10	Breakout Session 3: **Physical AI in Manufacturing** **Panelists:** Michael Brundage (UMD ARLIS) Nicholas Propes (Seagate) Naichen Shi (Northwestern Uni) Fil Aronshtein (Dirac)	Breakout Session 4: **Human AI Teaming for Manufacturing** **Panelists:** Aoi Minamoto (Toyota) Jamie Goman (ASU) Isabell Shuggi (SAIC USA) Shuchi "SK" Khurana (Addiguru)
17:10-17:30	Wrap up for Day 1 **Heritage Room (4 2-3 minutes)**	
18:00	No-host Social	Dogfish Head, Gaithersburg, MD
May 28	**Heritage Room**	
8:10-8:15	Day 2 Opening	Yan Lu, Workshop Chair
8:15-8:30	The ITL AI Program and its Role in Manufacturing	Craig Schlenoff Chief, Artificial Intelligence Research, Measurement, and Standards Division NIST
8:30-9:10	Day 1 Breakout Session Report	
9:10-10:40	Breakout Session 5: **Standards Needs for AI in Manufacturing** **Panelists:** Arturo Casasa (ISO) Rudy Belliardi (IEC) Anthony Downs (NIST, IEEE) Rick Huff (ASTM) Russell Waddle(MTConnect)	
10:40-11:00	Coffee Break	
11:00-12:15	Breakout Session 6: **Human-Machine Teaming Standards Roadmap** **Panelists:** Arturo Casasa (ISO) Aoi Minamoto (Toyota) Kyoung-Yun Kim (Wayne State Univ.) Hosokawa Nobu (IBM)	
12:15-12:30	Workshop Wrap-up	

Session Description:

Agentic AI for Manufacturing:

As manufacturing shifts from traditional automation to autonomous intelligence, "Agentic AI" has emerged as a critical frontier for engineering and operations. Unlike static models, AI agents can reason, plan, and act independently to solve complex shop-floor disruptions. However, wide-scale

adoption remains stalled by concerns over reliability, safety, and a lack of standardized performance metrics.

This 90-minute session brings together industry leaders to present real-world agentic use cases—ranging from autonomous process optimization to intelligent supply chain orchestration. Participants will engage in a collaborative deep dive to identify technical and cultural barriers to adoption, specifically focusing on the Measurement Science required to define agentic system performance and to validate agentic decisions.

By the end of this session, we aim to define a roadmap for the metrics, benchmarks, and verification protocols necessary to build trust in autonomous industrial agents.

Industrial Foundation Models: Data and Application Challenges

The emerging capabilities of large foundation models have sparked interest in leveraging them for transforming manufacturing systems. Trained on various data modalities, industrial foundation models (IFM) can be adapted to improve or refine the execution of a wide range of industrial operations. Exploration into the industrial use of foundation models requires identifying key enabling technologies, such as data pipeline integration and agent communication protocols; potential use cases in manufacturing product design, operations, and maintenance; and the data-level and model-level challenges of integrating the industrial foundation model into the manufacturing system.

This 90-minute session brings together experts across industry and academia to discuss the capabilities and technologies of IFMs, as well as the role these tools can play in improving industrial operations and manufacturing applications.

Participants will engage in a deep dive discussion of challenges to IFM integration, best practices for measuring the engineering impact of IFM integration, and real-world use cases.

By the end of this session, we aim to identify key technology transfer challenges among academic, industrial, and governmental organizations, leading to a roadmap from cutting-edge IFM research to industry integration.

Physical AI in Manufacturing

This tract invites submissions on the latest advancements and applications of Artificial Intelligence (AI) in manufacturing as it interacts with physical processes, equipment, and assets. During this time we will explore the integration of AI with machining equipment and related devices for planning, control, monitoring, digital twins, and the critical aspects of user trust and reliance on these systems. Topics of interest include, but are not limited to: the development and validation

of AI-driven operations, maintenance, or control strategies; the assessment of trust, safety, or trustworthiness of AI systems in manufacturing environments; and the measurement and evaluation of the impact of AI on physical processes and assets. We welcome contributions that address the challenges and opportunities arising from the increasing deployment of AI in manufacturing, and that provide insights into the development of reliable, efficient, and trustworthy AI systems that can effectively interact with and augment physical assets.

Human-AI Teaming in Manufacturing

Human+AI Teaming is creating a good deal of excitement in the manufacturing world, with the promise of better workflows and productivity on the horizon. How this will look, in practice, is still taking shape. This session will bring together experts in team cognition, human-machine collaborative design, manufacturing operations, and the impacts of AI use on the workplace to bring us up-to-date on challenges and possibilities in the field.

Through case studies and thought experiments that touch process optimization, system design, error quantification, and organizational practices, panelists will guide our audience through the key frameworks and pain points of this field. Participants can expect a candid glimpse at what Human+AI teaming can get right, where things can easily go awry, and what things we don't know how to measure yet.

AI for Manufacturing Standards

Artificial intelligence is rapidly reshaping manufacturing — from generative design and foundation model-driven optimization to agentic and multi-agent systems that autonomously coordinate production workflows — yet the standards infrastructure supporting reliable and trustworthy deployment of these technologies remains fragmented and incomplete. This session brings together manufacturing practitioners, automation engineers, AI developers, and standards experts to systematically identify the most pressing measurement science and standards gaps for AI in manufacturing. Building on a landscape analysis of existing horizontal AI standards (ISO/IEC JTC1/SC42, ITU) and domain-specific standards under development in ISO TC184, IEC TC65, and IEEE, participants will assess where existing standards can be extended, where new standards are urgently needed, and where foundational measurement science must be established before standardization can proceed. Discussions are organized around six thematic clusters: generative AI and foundation models; agentic AI behavior and autonomy; multi-agent system coordination and safety; physical AI and digital twin integration; data infrastructure and interoperability; and cross-SDO roadmap prioritization. The session will produce a consolidated set of prioritized recommendations — organized by gap, proposed action, and suggested SDO home — to directly inform a forthcoming NIST Advanced Manufacturing Series report.

Human-Machine Teaming Standards

This session examines the future of Human-Machine Teaming (HMT) in manufacturing as a forward-looking conversation about what teaming between human manufacturing experts and machine agents could enable over the next five years. The session opens with a short presentation framing HMT in manufacturing as providing human-facing agentic AI able to collaborate in long-running scenarios. Manufacturing digital twins, organizational learning, and the use of domain-specific languages are among the areas where the relationship between such AI and production experts is beginning to take shape. A panel discussion follows, drawing on participants' experience to identify where the opportunities are greatest and what the standards community needs to do — and to avoid doing — to support rather than constrain the field as it matures.