# ASME ISFA 2024

## International Symposium on Flexible Automation

# Program

**CONFERENCE**
**July 21-July 24, 2024**

University of Washington
Seattle, WA

https://event.asme.org/ISFA

The American Society of Mechanical Engineers®
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SETTING THE STANDARD

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## Welcome to ISFA 2024!

On behalf of the Organizing Committee of the 2024 International Symposium on Flexible Automation (ISFA), we cordially welcome you to the ISFA 2024 in Seattle, Washington, USA. Jointly sponsored by the American Society of Mechanical Engineers (ASME) and the Institute of Systems, Control and Information Engineers (ISCIE) in Japan, the conference begins on Sunday, July 21 2024, with a welcome reception. Plenary talks and technical presentations are planned throughout.

ISFA 2024 provides a focused and intimate setting for dissemination and discussion of advanced manufacturing technologies and other related fields such as dynamical systems and control, logistics and informatics, and design and optimization. The conference features synergistic blend of topics encompassing various aspects of manufacturing, under the theme of "Flexible Automation: Augmented Intelligence." The program is distributed into nine technical tracks with 3 parallel sessions on each conference day. The conference tracks include:

- Additive Manufacturing Sensing & Control
- Manufacturing Simulation and Digital Twin
- Sensing and Information Extraction
- Emerging Products & Processes
- Smart/Sustainable Manufacturing
- Cutting and Machine Tools
- Flexible Automation in Manufacturing Systems
- Robotics In Manufacturing and Inspection
- Digital Design and Manufacturing

In addition to high quality technical presentations, the conference includes plenary talks given by leading experts in manufacturing and panel discussions. The conference also holds the best paper competition. The winners of the best paper in theory and the best paper in application will be announced at the end of the conference.

We are especially grateful for the participation of the many volunteers who ensure the high technical standards of the conference and an engaging program. The conference has been made possible by the contributions of our program committee, advisory committee, technical reviewers, and the authors of the papers. We are thankful to our plenary speakers for agreeing to participate and share their expertise and knowledge with the community.

We're looking forward to a great meeting. We hope you enjoy the conference and have a fantastic time sharing ideas and catching up with colleagues.

**Jiong Tang**
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**Soichi Ibaraki**
Organizing Committee General Co-Chair

**Xu Chen**
Program Committee Chair

**Haruhiko Suwa**
Program Committee Co-Chair

**Masayoshi Tomizuka**
Advisory Committee Chair

**Toshiya Kaihara**
Advisory Committee Co-chair

# CONFERENCE INFORMATION

## AMERICAN SOCIETY OF MECHANICAL ENGINEERS INTERNATIONAL

**ASME MISSION STATEMENT** ASME's mission is to advance engineering for the benefit of humanity.

**ASME VISION STATEMENT** ASME's vision is to be the premier resource for the engineering community globally

## AUDIOVISUAL EQUIPMENT IN SESSION ROOMS

All technical sessions are equipped with one projector and one screen. Laptops will NOT be provided in the sessions. Presenters MUST bring their own or make arrangements in advance with the session chairs to share theirs.

## BADGE REQUIRED FOR ADMISSION

All conference attendees must always wear the official ASME 2024 ISFA badge to gain admission to technical sessions, exhibits, and other conference events. Without a badge, you will **NOT** be allowed to attend any conference activities.

## CONFERENCE AWARD LUNCHEON

The Awards Luncheon will take place during the conference to recognize and celebrate a select group of individuals for their contributions and achievements. The award lunch will be held on Tuesday July 23, 2024.

## CONFERENCE APP

ISFA will be utilizing the ASME Events mobile app to enhance the experience for attendees and speakers in place of a printed program. Connect with Attendees, View Speaker Profiles, Access Session Information, and more! Options may vary by event. This will be the main source of up to date information and technical session details.

## CONFERENCE PROCEEDINGS AND DIGITAL PAPERS

Each attendee will receive an email with a unique code to access digital copies of all the papers accepted for presentation at the conference. The official conference archival proceedings will be published after the conference and will not include accepted papers that were not presented at the conference. The official conference proceedings are registered with the Library of Congress, submitted for abstracting and indexing, and can be purchased. The proceedings are published in the ASME Digital Library. You will be provided with an individual link to the online papers via email. In the event you do not receive the email, you can message ConferencePubs@asme.org.

## CONFERENCE REFRESHMENT BREAKS

Morning and afternoon breaks will be provided in Alder Commons. Come and meet our exhibitors, Carrier Corporation, Boeing, UMD, UMN, and NREL, and join your fellow attendees for a few minutes of networking and discussion. The schedule is as follows:

Monday July 22: 10:05AM–10:25AM and 3:15PM–3:35PM

Tuesday July 23: 10:05AM–10:25AM and 3:15PM–3:35PM

Wednesday July 24: 10:05AM–10:25AM and 3:15PM–3:35PM

## Opening Reception

Join colleagues and new connections in the Alder Commons for the ISFA Opening Reception on Sunday July 21st from 5:30pm – 7:00pm.

## INTERNET ACCESS

Complimentary basic internet is provided; stop by the registration desk for details

## PRESENTER ATTENDANCE POLICY

According to ASME's Presenter Attendance Policy, if a paper **is not** presented at the conference, the paper will not be published in the official Archival Proceedings, which are registered with the Library of Congress and are abstracted and indexed. The paper also will **not be** published in the ASME Digital Collection and may not be cited as a published paper.

## REGISTRATION INFORMATION

**Alder Commons**

**Hours:**

| | |
|---|---|
| Sunday, July 21 | 3:00PM–6:00PM |
| Monday, July 22 | 8:30AM–5:00PM |
| Tuesday, July 23 | 8:30AM–5:00PM |
| Wednesday, July 24 | 8:30AM–1:00PM |

# Schedule-at-a-Glance:

| **Sunday July 21** | | |
|---|---|---|
| **Time** | **Session** | **Location** |
| 5:00pm–6:30pm | Opening Reception | Alder Commons |
| **Monday July 22** | | |
| **Time** | **Session** | **Location** |
| 9:30am–10:50am | **Opening & Keynote:** Associate Dean Jihul Yang and Tanni Sisco: The Boeing Company | Alder Auditorium |
| 10:50am–11:10am | Refreshment Break | Alder Commons |
| 11:10am–12:10pm | **Keynote:** Professor Mamoru Mitsuishi: Professor Emeritus, University of Tokyo Vice President, NIAD-QE | Alder Auditorium |
| 12:10pm–1:30pm | Lunch | Oak Denny Hall |
| 1:40pm–3:20pm | Technical Sessions | |
| | 01-01 Additive Manufacturing Sensing & Control | Alder 103 |
| | 02-01 Cutting and Machine Tools | Alder 107 |
| | 08-01 Manufacturing Simulation and Digital Twin | Alder 106 |
| 3:20pm–3:40pm | Refreshment Break | Alder Commons |
| 3:40pm–5:20pm | Technical Sessions | |
| | 04-01 Flexible Automation in Manufacturing Systems | Alder 103 |
| | 06-01 Sensing and Information Extraction | Alder 107 |
| | 05-01 Robotics In Manufacturing and Inspection | Alder 106 |
| **Tuesday July 23** | | |
| **Time** | **Session** | **Location** |
| 9:00am–10:00am | **Keynote:** Hideki Aoyama: Professor Emeritus Keio University | Alder Auditorium |
| 10:00am–10:20am | Refreshment Break | Alder Commons |
| 10:20am–12:00pm | Technical Sessions | |
| | 09-01 Emerging Products & Processes, 03-02 Digital Design and Manufacturing | Alder 103 |
| | 02-02 Cutting and Machine Tools | Alder 107 |
| | 05-02 Robotics In Manufacturing and Inspection | Alder 106 |
| 12:00pm–2:00pm | Awards Lunch | Oak Denny Hall |

| | | |
|---|---|---|
| 2:10pm–3:50pm | Technical Sessions | |
| | 07-01 Smart/Sustainable Manufacturing | Alder 103 |
| | 06-02 Sensing and Information Extraction | Alder 107 |
| | 03-01 Digital Design and Manufacturing | Alder 106 |
| 3:50pm–4:10pm | Refreshment Break | Alder Commons |
| 4:10pm–5:10pm | **ISFA Industrial Panel** | Alder Auditorium |
| **Wednesday July 24th** | | |
| **Time** | **Session** | **Location** |
| 9:00am–10:00am | **Keynote:** Santosh Devasia: Professor and Minoru Taya Endowed Chair Mechanical Engineering University of Washington | Alder Auditorium |
| 10:00am–10:20am | Refreshment Break | Alder Commons |
| 10:20am–12:00pm | Technical Sessions | |
| | 04-02 Flexible Automation in Manufacturing Systems | Alder 103 |
| | 06-03 Sensing and Information Extraction | Alder 107 |
| | 08-02 Manufacturing Simulation and Digital Twin | Alder 106 |
| 12:00pm–1:30pm | Lunch | Oak Denny Hall |
| 1:40pm–3:20pm | Technical Sessions | |
| | 05-03 Robotics In Manufacturing and Inspection | Alder 106 |

# Keynote Speakers

**Monday, July 22, 9:30AM–10:50AM**

**Alder Auditorium**

**Tanni Sisco**

**Technical Fellow**

**The Boeing Company**

**Presentation Title:** Innovative and Flexible Automated Factories

**Abstract:** Strategic approach to drive quality, safety, efficiency, improve user experience and deliver value to the industry through innovative applications and design space expansion of advanced automation and sustainable and repeatable processes is a must.

Flexible collaborative human / machine automation is the key to many future high rate factories where parallel work can take place safely with the highest structural integrity, using advanced automated processes and inspection technologies.

Additionally, as future airplanes are getting smaller, lighter, and better fuel efficient, more Design For Manufacturing (DFM) along with advanced portable or automated tools, One Sided Fasteners, and simplified efficient full OUA processes are needed to minimize confined space work and enable smaller wing box design for hybrid composite/metal airplanes. Innovation and new quality business models are the essential approach for flexible future manufacturing accelerating rate and cycle time safely.

**Monday, July 22, 11:10AM–12:10PM**

**Alder Auditorium**

## Professor Mamoru Mitsuishi

## Professor Emeritus, University of Tokyo

## Vice President, NIAD-QE: National Institution for Academic Degrees and Quality Enhancement of Higher Education in Japan

**Presentation Title:** Engineering Knowledge for Next-Generation Surgical Support Systems which Transcend Scale, Distance, and Time

**Biography:** Professor Mamoru Mitsuishi graduated from the University of Tokyo in 1979 with a Bachelor of Science in Physics. Following this, he earned a second bachelor's degree in Mechanical Engineering in 1981. He received his Master's and doctorate degrees in 1983 and 1986, respectively from the University of Tokyo, after which he joined the university's School of Engineering as an academic staff. He became a professor in 1999. Professor Mitsuishi was the Dean of the School of Engineering from 2014 to 2017 and between 2017 and 2021, he was appointed as an Executive Director and Vice President of the University of Tokyo.

Professor Mitsuishi retired from the University of Tokyo at the end of March 2022 and was awarded the title of Professor Emeritus in June. He is now working as a Vice President at NIAD-QE: National Institution for Academic Degrees and Quality Enhancement of Higher Education, as well as two private universities, Waseda and Teikyo Universities as a Guest Senior Researcher (Guest Professor) and a Specially Appointed Professor, respectively.

He was elected as the President of Science Council of Japan in 2023.

His areas of interest are biomedical robotics, and manufacturing systems. He is a member of various internationally renowned societies, such as the International Academy for Production Engineering (CIRP), where he was its president from 2019 to 2021, and is an Honorary Fellow, and the IEEE Robotics and Automation Society.

**Tuesday, July 23, 9:00AM–10:00AM**

**Alder Auditorium**

**Dr. Hideki Aoyama**

**Professor Emeritus**

**Keio University**

**Presentation Title:** Novel Generation Method of Cutting Tool Paths for High Speed and Accuracy Machining of Curved Surfaces" and "Automated High Accuracy and Quality Modeling System Using 3D-Printer (DED)

**Biography:** Dr. Hideki Aoyama is a professor emeritus at Keio University. He served as the president of the Japan Society for Die and Mould technology (JSDMT) in 2016 and 2017. He was the chairman of the International Committee for Abrasive Technology (ICAT) in 2016 and 2017. He also served as a vice president of the Japan Society for Precision Engineering (JSPE) in 2018 and 2019. In research activity, he developed digital design methodology that automatically create aesthetic design based on mathematical models of natural phenomena. He also developed many automation systems including manufacturing inspection with AI, process planning and NC program generation for multi-axis machine tools, and femtosecond laser processing simulation/CAM.

**Wednesday, July 24, 9:00AM–10:00AM**

**Alder Auditorium**

**Dr. Hideki Aoyama**

**Professor Emeritus**

**Keio University**

**Presentation Title:** Inverse Dynamics for Cohesive Decentralized Robotic Networks

**Biography:** Santosh Devasia received the B.Tech. (Hons) from the Indian Institute of Technology, Kharagpur, India, in 1988, and the M.S. and Ph.D. degrees in Mechanical Engineering (ME) from the University of California at Santa Barbara in 1990 and 1993 respectively. He is the Minoru Taya Endowed Chair from 2018-2024 at UW, Seattle. He joined the faculty of the UW Mechanical Engineering (ME) Department in 2000 after teaching from 1994 to 2000 in the ME Department at the University of Utah, Salt Lake City. He is a fellow of ASME and IEEE. His current research interests include control of multi-agent systems and precision human-machine systems.

# Industry Panel

**Tuesday, July 23, 4:10PM–5:10PM**

**Alder Auditorium**

Join us for an exciting and informative session at our industrial panel discussion focused on startup companies! Discover the latest trends, insights, and success stories from entrepreneurs in the industry. Gain valuable knowledge and network with like-minded individuals. Don't miss this opportunity to be inspired and learn from the innovative minds shaping the future of startup culture.

The panel will be moderated by Judy Bridges, Innovation Manager, Physical Sciences, CoMotion at the University of Washington

**Professor Arka Majumdar**
**Associate Professor, Electrical and Computer Engineering and Physics**
**University of Washington (UW)**

**Biography:** Prof. Arka Majumdar is an Associate Professor in the departments of Electrical and Computer Engineering and Physics at the University of Washington (UW). He received B. Tech. from IIT-Kharagpur (2007), where he was honored with the President's Gold Medal. He completed his MS (2009) and Ph.D. (2012) in Electrical Engineering at Stanford University. He spent one year at the University of California, Berkeley (2012-13), and then in Intel Labs (2013-14) as postdoc before joining UW. His research interests include developing a hybrid nanophotonic platform using emerging material systems for optical information science, imaging, and microscopy. Prof. Majumdar is the recipient of multiple Young Investigator Awards from the AFOSR (2015), NSF (2019), ONR (2020) and DARPA (2021), Intel early career faculty award (2015), Amazon Catalyst Award (2016), Alfred P. Sloan fellowship (2018), UW college of engineering outstanding junior faculty award (2020), iCANX Young Scientist Award (2021), IIT-Kharagpur Young Alumni Achiever Award (2022), DARPA Director's Award (2023) and Rising star of light award (2023). He is Optica Fellow and is co-founder of Tunoptix, a startup commercializing software defined meta-optics.

**Dr. Fredrik Ryden**
**Co-Founder and CEO**
**Olis Robotics**

**Biography:** Dr. Fredrik Ryden is the co-founder and CEO of Olis Robotics, a company that specializes in remote monitoring, control, and error recovery technology for industrial robots. He holds a Ph.D. & M.S degree in Electrical Engineering from the University of Washington with 15+ years experience in remote controlling subsea/space/industrial robots. During his leadership, Olis Robotics has developed an innovative solution that significantly improves overall Equipment Effectiveness (OEE) by addressing costly robot downtime.

# Acknowledgments

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