MSEC 2024

ASME MED Manufacturing Science and Engineering Conference

NAMRC 52

NAMRI/SME North American Manufacturing Research Conference

June 17-21, 2024

The University of Tennessee, Knoxville

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CONFERENCE SCHEDULE

MONDAY, JUNE 17

Time	Location	Event
8:30-15:00	300A	NAMRI SME Board Meeting
10:00-20:00	Henley Concourse	Registration/ Information
12:00-13:00	ORNL MDF	Welcome and Lunch (Pre-registration required)
13:00-15:00	ORNL MDF	Tutorials (Pre-registration required, parallel sessions)
15:00-16:00	ORNL MDF	Tour
16:00-18:00	ORNL MDF	Tutorials (Pre-registration required, parallel sessions)
15:00-17:00	300A	ASME MED Executive Committee Open Meeting
15:00-17:00	Ballroom DEFG	Awards Rehearsal
16:00-18:00	Ballroom ABC	Exhibitor Booths Set-Up
16:00-18:00	Ballroom ABC	Posters Set-Up
18:30-20:00	Cumberland Concourse	Welcome Reception

TUESDAY, JUNE 18

Time	Location	Event
7:00-17:30	Henley Concourse	Registration/ Information
7:00-8:00	Cumberland Concourse	Breakfast
8:00-8:15	Ballroom DEFG	Welcome Address: Adele Ratcliff
8:15-8:45	Ballroom DEFG	Keynote: Craig Blue
9:00-10:15	301ABCDE, 300BCD, 200ABC	Paper Session I
10:00-15:00	Ballroom ABC	Exhibitor Booths Open
10:15-10:45	Cumberland Concourse	Morning Break
10:30-11:45	301ABCDE, 300BCD, 200ABC	Paper Session II
12:00-13:30	Ballroom DEFG	Lunch
12:00-13:30	200E	NAMRI Scientific Committee Members Meeting
13:30-14:30	300A	Journal of Manufacturing Science and Engineering (JMSE) Editorial Board Meeting
13:45-15:00	301ABCDE, 300BCD, 200ABC	Paper Session III

CONFERENCE SCHEDULE

15:00-15:30	Cumberland Concourse	Afternoon Break
15:15-16:30	301ABCDE, 300BCD, 200ABC	Paper Session IV
15:15-16:30	Ballroom ABC	MSEC Poster Session
16:45-17:30	200D	State of ASME MED Meeting
17:30-18:15	200D	State of NAMRI Meeting
18:30-21:00	TN MADE	Industry Night (Pre-registration Required)

WEDNESDAY, JUNE 19

Time	Location	Event
7:00-17:30	Henley Concourse	Registration/ Information
7:00-8:00	Cumberland Concourse	Breakfast
7:30-9:00	300A	SME Journals Meeting
8:00-8:15	Ballroom DEFG	Welcome address: Chad Duty
8:15-8:45	Ballroom DEFG	Keynote: Merlin Theodore
9:00-10:15	301ABCDE, 300BCD, 200AB	Paper Session V
10:00-17:00	Ballroom ABC	Exhibitor Booths Open
10:15-10:45	Cumberland Concourse	Morning Break
10:30-11:45	200D	NSF Roundtable
10:30-11:45	301ABCDE, 300BCD, 200AB	Paper Session VI
12:00-13:30	Ballroom DEFG	ASME MED Award Luncheon
13:45-15:00	301ABCDE, 300BCD, 200AB	Paper Session VII
13:45-15:00	200C	SME Blue Sky Competition I
13:45-15:00	200E	SME Membership/Student Meeting
15:00-15:30	Cumberland Concourse	Afternoon Break
15:00-17:00	Ballroom DEFG	NAMRC Awards Rehearsal
15:00-17:00	Park Concourse	NSF Program Director One-on-one Meetings (Pre-registration required)
15:15-16:30	301ABCDE, 300BCD, 200AB	Paper Session VIII
15:15-16:30	200C	SME Blue Sky Competition II

CONFERENCE SCHEDULE

16:00-18:00	200D	Blacks in Advanced-Additive Manufacturing (BiAM)
16:45-18:00	301ABCDE, 300BCD, 200AB	Paper Session IX
18:00-19:30	200E	SME Journals and Scientific Committee reception
18:00-21:00	Ballroom DEFG	Early Career Forum

THURSDAY, JUNE 20

Time	Location	Event
7:00-17:30	Henley Concourse	Registration/ Information
7:00-8:00	Cumberland Concourse	Breakfast
8:00-8:15	Ballroom DEFG	Welcome address: Michael Gomez
8:15-8:45	Ballroom DEFG	Keynote: Martina McIsaac
9:00-10:15	301ABCDE, 300BCD, 200ABC	Paper Session X
10:00-17:00	Ballroom ABC	Exhibitor Booths Open
10:15-10:45	Cumberland Concourse	Morning Break
10:30-11:45	301ABCDE, 300BCD, 200ABC	Paper Session XI
12:00-13:30	Ballroom DEFG	NAMRI/SME Award Luncheon and Founder's Lecture
13:45-15:00	301ABCDE, 300BCD, 200ABC	Paper Session XII
14:00-15:00	300A	Life Cycle Engineering Technical Committee Meeting
15:00-18:00	200DE	Women in Advanced Manufacturing (WIAM) Forum
15:00-15:30	Cumberland Concourse	Afternoon Break
15:15-16:30	301ABCDE, 300BCD, 200ABC	Paper Session XIII
16:45-18:00	301ABCDE, 300BCD, 200ABC	Paper Session XIV
19:00-21:00	Ballroom DEFG	Banquet and Keynote: Mike Molnar

CONFERENCE SCHEDULE

FRIDAY, JUNE 21

Time	Location	Event
7:00-13:00	Henley Concourse	Registration/ Information
7:30-8:30	Cumberland Concourse	Breakfast
9:00-10:15	301ABCDE, 300B	Paper Session XV
10:15-10:45	Cumberland Concourse	Morning Break
10:30-11:45	301ADE, 300B	Paper Session XVI
12:00-13:00	Ballroom DEFG	Boxed Lunch
13:00-15:00	ORNL MDF	Tour 1
13:00-15:00	DENSO Manufacturing Tennessee	Tour
14:00-16:00	ORNL MDF	Tour 2

CONFERENCE RESOURCES

Registration: Registration will be in the Knoxville Convention Center Henley Concourse from Monday-Friday.

Exhibitors: Exhibitor/Sponsor booths will be in the Ballroom ABC.

Coffee Breaks: Coffee, tea, water, and light snacks will be served in morning and afternoon breaks in the Cumberland Concourse.

Name Badges: Please wear your badge at all times and especially to all conference events. Admission to events including meals will be determined by your badge. Your name badge also provides useful information for other attendees.

Conference Program: We are committed to decreasing the environmental footprint and upholding green practices. For this reason, a printed program is not provided. We will instead be providing an electronic copy to all conference attendees online and on a flash drive included with the registration welcome kit.

Wireless Internet Access: Scan for wireless networks. Select the *Convention Center Free Wi-Fi* network. The Visit Knoxville Convention Center free Wi-Fi splash page will pop up. Click on the box to agree to the conditions. Scroll down and click Continue to the Internet. You are now ready to use the Internet. This is an unsecured network.

General Help: Please visit the registration desk for all conference questions.

Downtown Knoxville Area Safety Tips: The University of Tennessee Police Department reminds you to take reasonable safety precautions, including:

- Do not leave personal property such as laptop computers, wallets, cash, jewelry, or bicycles unattended and unsecured
- Do not leave items of value visible in a parked car
- Do not prop open exterior doors
- Stay alert and attuned to people and circumstances around you
- Report suspicious activity or persons to the police immediately.

Transportation:

- Shuttles will be provided for Tutorials on Monday, Industry Night on Tuesday and the tours on Friday. Pre-registration is required for these events.

Tuesday, June 18 Industry Night	
Service to TN MADE (2030 Valley Vista Dr., Knoxville, TN) **From** Knoxville Convention Center	Service to Knoxville Convention Center **From** TN-MADE
17:30	21:00
Service to TN MADE **From** Knoxville Convention Center	Service to Knoxville Convention Center **From** TN-MADE
18:30	21:00
Friday, June 21 Tours	
Service to ORNL MDF **From** Knoxville Convention Center	Service to Knoxville Convention Center **From** ORNL MDF
13:00	15:00

CONFERENCE RESOURCES

Service to DENSO Manufacturing Tennessee **From** Knoxville Convention Center	Service to Knoxville Convention Center **From** DENSO Manufacturing Tennessee
13:00	15:00
Service to ORNL MDF **From** Knoxville Convention Center	Service to Knoxville Convention Center **From** ORNL MDF
14:00	16:00

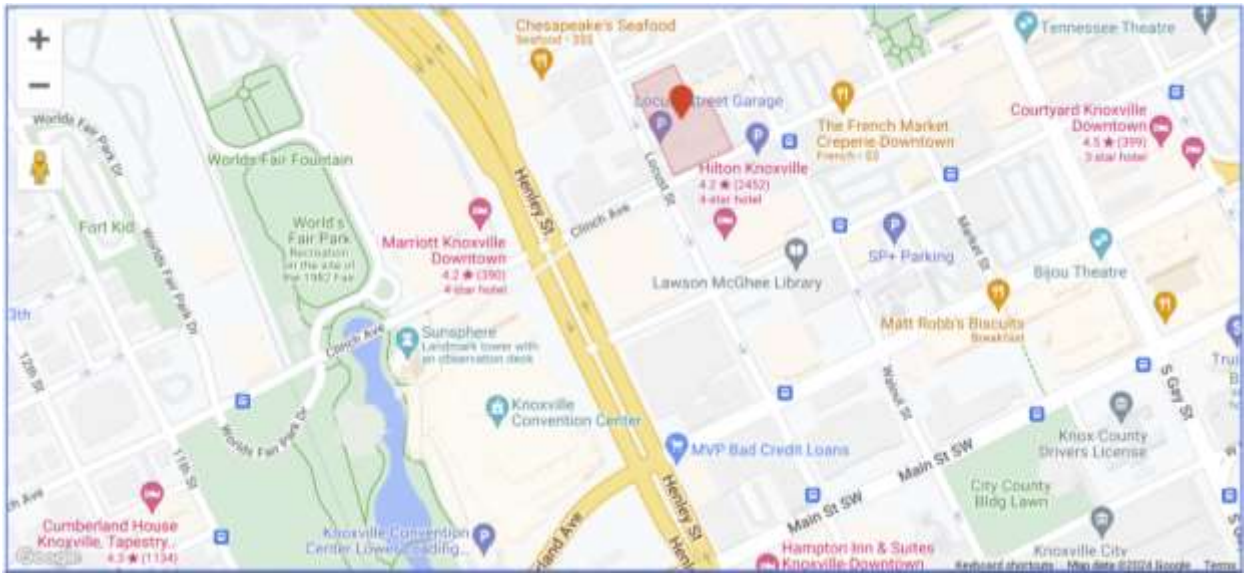
CONFERENCE RESOURCES

Parking

Covered parking near the Marriott Knoxville Downtown and Knoxville Convention Center is available at the Locust Street Garage, 540 Locust St., Knoxville, TN.

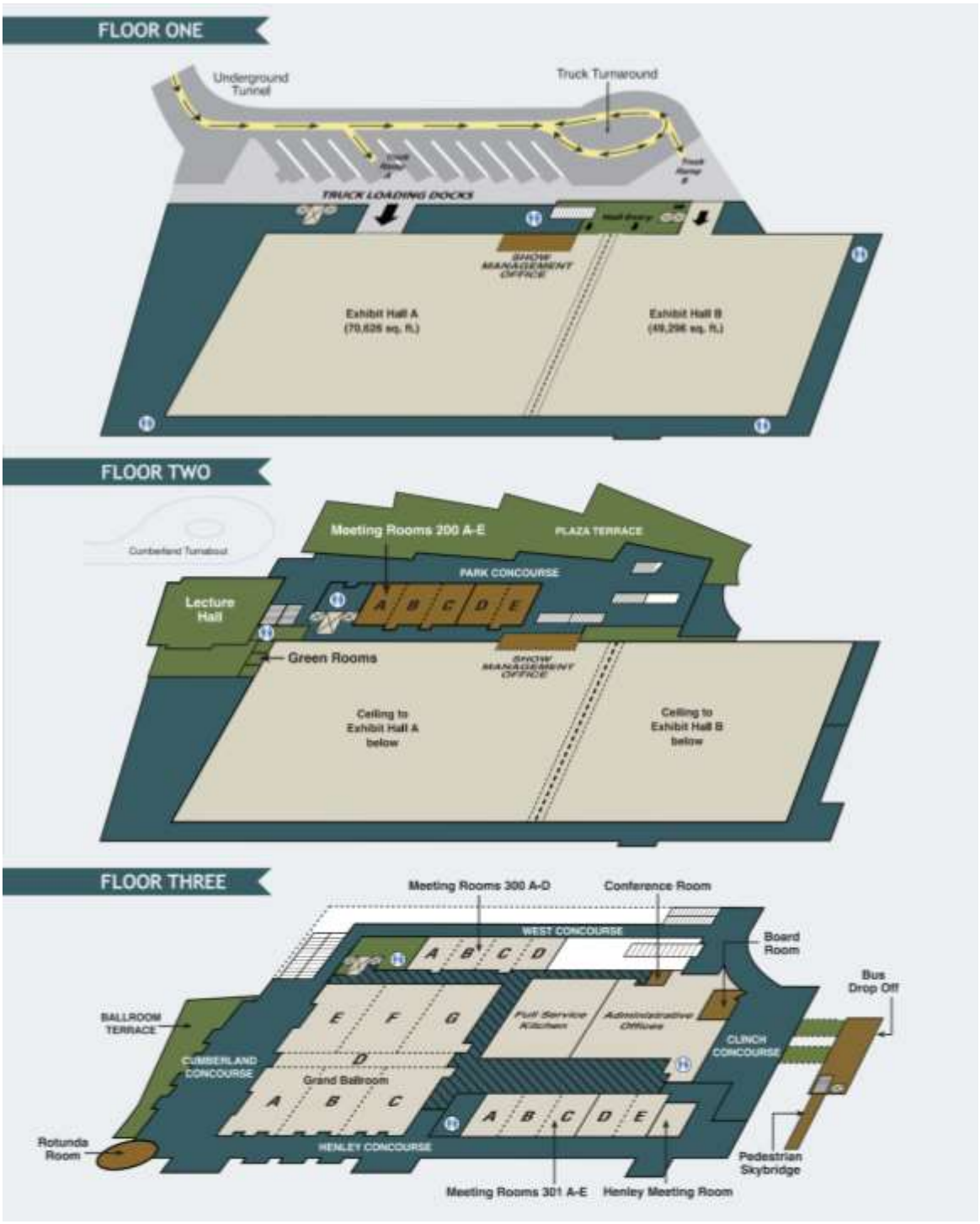
https://www.downtownknoxville.org/locust-street-garage/

Map



CONFERENCE RESOURCES

Knoxville Convention Center Maps



CONFERENCE RESOURCES

Exploring Knoxville

Welcome to Knoxville. To help you find local activities, we invite you to review the Visit Knoxville website, https://www.visitknoxville.com/. It provides information about outdoor activities, restaurants, shopping, and other local activities.

Museums and Galleries

https://www.visitknoxville.com/things-to-do/arts-culture/museums-galleries/

Maker City Guide

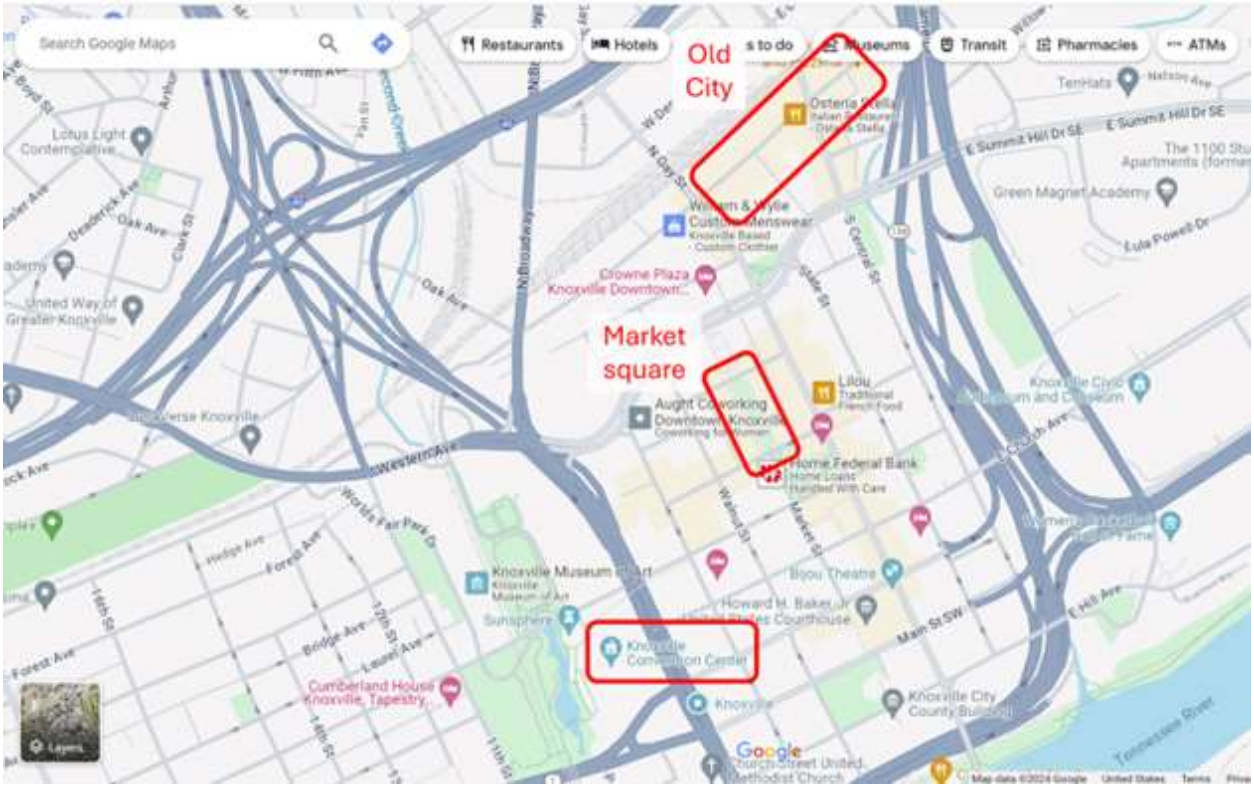
https://www.visitknoxville.com/blog/post/guide-to-things-to-do-in-the-maker-city/

Market Square

https://www.visitknoxville.com/things-to-do/popular-spots/market-square/

Old City

https://www.visitknoxville.com/things-to-do/popular-spots/old-city/



WELCOME FROM THE UNIVERSITY OF TENNESSEE, KNOXVILLE

Welcome from the MSEC 2024 | NAMRC 52 Organizing Committee

We extend a warm and enthusiastic welcome to the co-located 2024 ASME MED Manufacturing Science and Engineering Conference (MSEC 2024) and 52nd NAMRI/SME North American Manufacturing Research Conference (NAMRC 52) hosted by The University of Tennessee, Knoxville. It is our honor to welcome you to this annual celebration of manufacturing research and education. Conference topics include manufacturing processes, materials, systems, equipment, automation, and metrology. Fundamental and applied research presentations will be provided by students, faculty, industry professionals, and government staff. We are honored to host our keynote speakers from the Department of Defense, Oak Ridge National Laboratory, MSC Industrial Supply, and the Advanced Manufacturing National Program Office. We are also pleased to offer tutorials from manufacturing research leaders on key topics. We trust you will enjoy the conference as much as we have enjoyed preparing for your arrival!

Organizing Committee

Dr. Tony Schmitz
Committee Chair
Professor, UTK MABE,
Joint Faculty, ORNL

Dr. Suresh Babu
UT-ORNL Governor's Chair and Professor,
UTK MABE

Dr. Chad Duty
Professor, UTK MABE,
CEO, IACMI

Marc Gibson
Associate Vice Chancellor for Research, Innovation and Economic Development, UTK

Dr. Bradley Jared
Associate Professor,
UTK MABE

Dr. Chris Tyler
Group Leader,
Advanced Machining and Machine Tool Research Group, ORNL

WELCOME FROM CHAIRS OF MSEC 2024 TECHNICAL PROGRAM AND NAMRC 52 SCIENTIFIC COMMITTEE

On behalf of the Scientific and Technical Program Committees, we welcome you to this joint International Manufacturing Conference hosted by the University of Tennessee, Knoxville from June 17th to June 21st, 2024 in Knoxville, Tennessee. The joint conference consists of the 52nd North American Manufacturing Research Conference (NAMRC 52), sponsored by the North American Manufacturing Research Institution of SME (NAMRI/ SME), and ASME International Manufacturing Science and Engineering Conference (MSEC 2024), sponsored by the Manufacturing Engineering Division (MED) of ASME. As a leading international conference on Manufacturing research, NAMRC and MSEC act as a global bridge between industries, government laboratories, and academic institutions. The two co-located conferences symbolize the continued collaboration between SME and ASME, two esteemed organizations in research exchange and knowledge dissemination for the advancement of manufacturing. While the two conferences are held jointly, the paper submission, review, and acceptance processes were conducted separately for NAMRC and MSEC.

NAMRC 52 received 261 technical paper submissions from authors in 33 countries across six continents in the world. The papers were put through a rigorous peer review process, with each paper receiving at least three reviews. At the end of the process, a total of 198 papers were accepted for publication in the journal "Manufacturing Letters" as the Proceedings of NAMRI | SME and presentation at the conference in 74 technical sessions. These papers address a wide range of basic and applied manufacturing research topics in seven Tracks: (1) Manufacturing Systems, (2) Manufacturing Processes, (3) Material Removal, (4) Additive Manufacturing, (5) Smart Manufacturing and Cyber-Physical Systems, (6) Manufacturing Education and Case Studies, and (7) Sustainable Manufacturing. We are grateful to members of the Scientific Committee and all the reviewers for their critical assessment of the large number of submissions within a short period of time between the end-of-the-year holidays and the new year. Furthermore, a total of 19 papers submitted to NAMRC 52 have been recommended for fast-tracking to the SME Journal of Manufacturing Systems (JMS) or Journal of Manufacturing Processes (JMP), based on the outcome of the review process.

NAMRC 52 continues to feature the annual NSF Manufacturing Blue Sky Competition, funded by the National Science Foundation (NSF). The winner of the Competition will receive the NAMRI | SME Dornfeld Manufacturing Vision Award, named in honor of the late Professor David Dornfeld. As in the past, NAMRC 52 continues to sponsor the Student Research Presentations (SRP) Competition, with 9 student-led papers selected by the Scientific Committee for participation in the competition this year. New to the NAMRC 52 technical program this year are the five Special Sessions featuring contributions from the NSF Engineering Research Center: Hybrid Autonomous Manufacturing, Moving from Evolution to Revolution (ERC HAMMER).

New to the MSEC technical program this year is the *introduction of brief papers*, in addition to full length papers. Brief papers undergo full peer review and are published in the conference proceedings, in the same manner as full papers. However, they are shorter in length than full papers and, therefore, can be used to report preliminary research results for early feedback from the manufacturing community. Each brief paper is accompanied by a 15-minute technical presentation (as opposed to 25 minutes for a full paper), as well as an optional poster presentation.

MSEC 2024 received 238 technical paper submissions, of which 102 (42%) were brief papers and 136 (57%) were full papers. After the peer review process, 204 papers were accepted, of which 91 (45%) were brief papers and 113 (55%) were full papers. In addition, we had a record-breaking 84

WELCOME FROM CHAIRS OF MSEC 2024 TECHNICAL PROGRAM AND NAMRC 52 SCIENTIFIC COMMITTEE

poster submissions, of which 23 (27%) were accompanied by brief papers. We also received 42 presentation-only abstracts, of which 21 were for journal papers recently published in the Journal of Manufacturing Science and Engineering and the Journal of Micro and Nano-Manufacturing, and 11 were for the Doctoral Symposium featuring current senior PhD students and recently graduated PhD students.

The conference program is the result of the outstanding efforts of many people. We would like to thank all the symposium organizers, technical committee members, track chairs and co-chairs, authors, and reviewers for their technical contributions and dedication to supporting this joint conference. Our sincere gratitude goes to the members of the Scientific Committee and the ASME MED Executive Committee for their leadership and guidance in preparing the program. Last but not least, we thank the staff of SME, ASME, and the Host Organizing Committee for doing an outstanding job in managing all aspects of the two co-located conferences – from maintaining/updating conference information on the websites to handling the many logistic issues. We also extend our gratitude to the sponsors for their financial support. We are grateful to the Civil, Mechanical, and Manufacturing Innovation (CMMI) Division of NSF for sponsoring the Women in Advanced Manufacturing Forum, and for providing registration and accommodation support for more than 60 selected students and early-career participants from across the United States.

We wish you a productive and enjoyable conference experience at the University of Tennessee in Knoxville, and a long-lasting affiliation with the future of NAMRC/ MSEC.

Robert Gao
Case Western Reserve University, USA
NAMRI/SME Scientific Committee Chair

Chinedum Okwudire
University of Michigan, USA
MSEC 2024 Technical Program Chair

WELCOME FROM CHAIRS OF MSEC 2024 TECHNICAL PROGRAM AND NAMRC 52 SCIENTIFIC COMMITTEE

Xun Xu
The University of Auckland, New Zealand
NAMRI/SME Scientific Committee Co-Chair

Guha Manogharan
Penn State University, USA
MSEC 2024 Technical Program Co-Chair

CONFERENCE SPONSORS

Travel award sponsor

GE Aerospace

MSC Phillips

CATERPILLAR

Tennessee Orange sponsor level

Tennessee Smokey Gray sponsor level

CONFERENCE SPONSORS

Mastercam

KENNAMETAL

ASU Ira A. Fulton Schools of Engineering
Arizona State University
School of Manufacturing Systems and Networks

iacmi THE COMPOSITES INSTITUTE

NIST

Tennessee White sponsor level

OAK RIDGE National Laboratory | MANUFACTURING DEMONSTRATION FACILITY

Roane State COMMUNITY COLLEGE

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THE UNIVERSITY OF TENNESSEE Oak Ridge Innovation Institute

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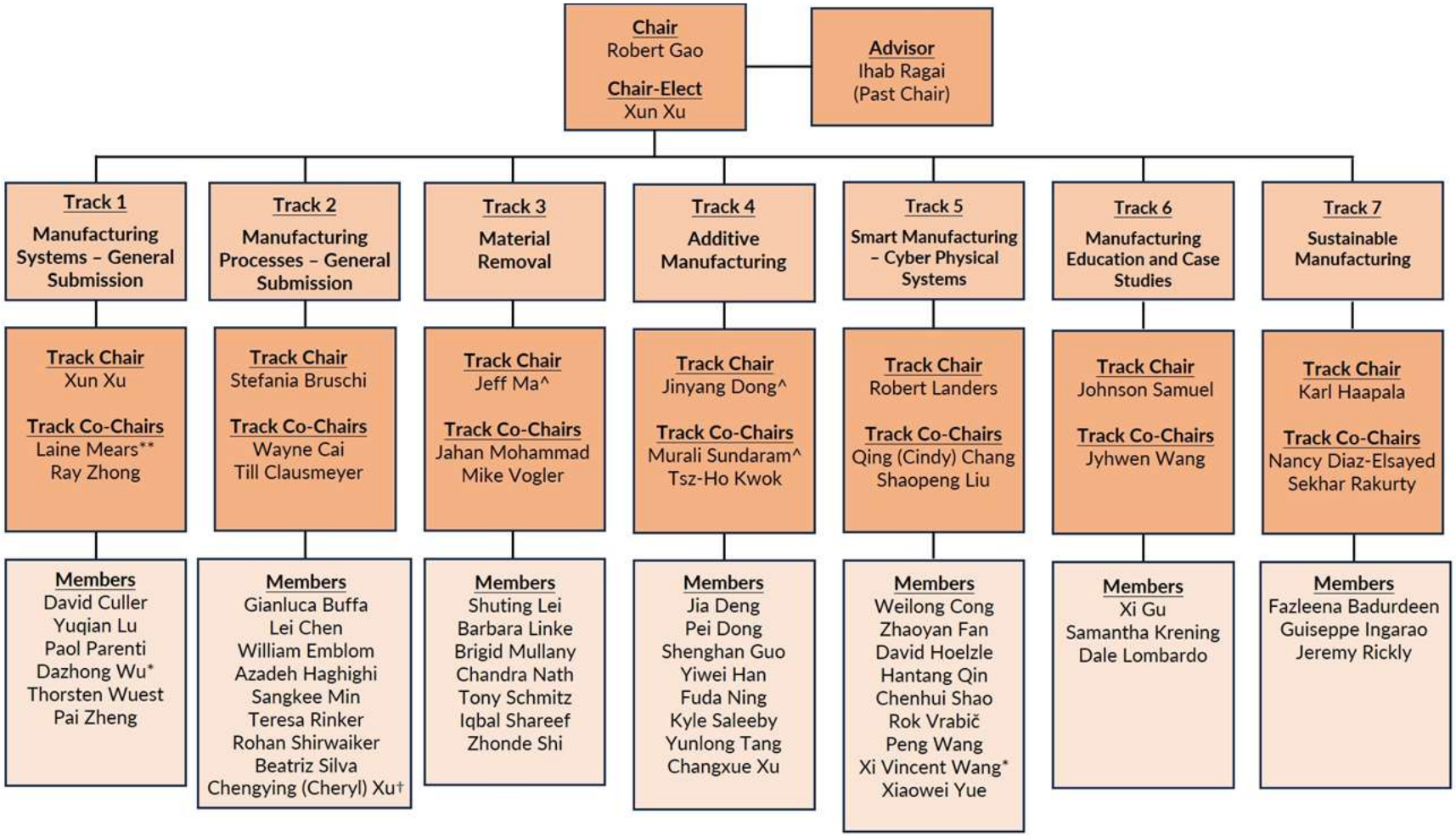
ASME SETTING THE STANDARD

NAMRI/SME SCIENTIFIC COMMITTEE



* Associate Editor, Journal of Manufacturing Systems ** Editor in Chief, Journal of Manufacturing Letters

^ Associate Editor, Journal of Manufacturing Processes † Editor in Chief, npj Advanced Manufacturing

MSEC TRACK & SYMPOSIUM ORGANIZERS

Track 1: Additive Manufacturing (AdM1)

Symposium 1-1: Advances in Metal Additive Manufacturing Processes
Organizers: Ala Qattawi, Dong Lin, Wenchao Zhou, Ho Yeung, and Hector Siller
Symposium 1-2: In Situ Monitoring, Non-Destructive Evaluation, and Qualification for Additive Manufacturing
Organizers: Sarah Wolff, Andy Fan, Samantha Webster, and Andelle Kudzal
Symposium 1-3: Multi-Material Processing in Additive Manufacturing
Organizers: Monique McClain, Weinan Xu, Jay Park, Yanliang Zhang, and Mostafa Yourdkhani
Symposium 1-4: Smart Additive Manufacturing
Organizers: Azadeh Haghighi, Prahalada Rao, Molong Duan, and Uduak Inyang-Udoh

Track 2: Advanced Materials Manufacturing (AMM2)

Symposium 2-1: Advances in Digital Twins of Manufacturing Processes and Systems
Organizers: Weihing "Grace" Guo, Mihaela Banu, Teresa Rinker, Paromita Nath, and Chukwuzubelu Ufodike
Symposium 2-2: Advances in Manufacturing and Processing of Polymers and Composites
Organizers: Erina Joyee, Felicia Stan, Kenan Song, Kun (Kelvin) Fu, and Nestor Vasquez
Symposium 2-3: Convergent Manufacturing of Advanced Materials for Hybrid Manufacturing Systems and Products
Organizers: Thomas Feldhausen, Saeed Farahani, Jason Jones, Christopher Saldana, and Chao Wang

Track 3: Biomanufacturing (BioM3)

Symposium 3-1: Advances in Design, Manufacturing, and Analysis of Biomedical Devices
Organizers: Lei Chen, Yi Wang, and Dian-Ru Annie Li
Symposium 3-2: Advances in Manufacturing of Tissue Constructs/Medical Implants and Bioinspired Materials/Structures for Healthcare Applications
Organizers: Changxue Xu, Cindy (Xiangjia) Li, Ryan B. Wicker, Yang Yang, and Young Huang

Track 4: Life Cycle Engineering (LCE4)

Symposium 4-1: Advances in Sustainable Manufacturing for Improved Component Life Cycle Performance
Organizers: Ritin Matthews, Julius Schoop, Muyue Han, Sheng Yang, and Guoying Dong
Symposium 4-2: Systems Engineering and Digital Technologies for Circular Economy
Organizers: Abheek Chatterjee, Jing (Julia) Zhao, Astrid Layton, Matthew Triebe, and Nehika Mathur

Track 5: Manufacturing Equipment and Automation (MEA5)

Symposium 5-1: Innovations in Equipment Design, Control and Automation
Organizers: Chandra Nath, Lei Zhou, and Huitaek Yun
Symposium 5-2: Semiconductor Manufacturing: Metrology, Inspection, Systems, and Processes
Organizers: ChaBum Lee, Byunggi Kim, Jiyong Park, and Gregory Vogl

MSEC TRACK & SYMPOSIUM ORGANIZERS

Track 6: Manufacturing Processes (MP6)

Symposium 6-1: Advances in Clean Energy and E-Mobility Manufacturing
Organizers: Lei Chen, Alessandro Ascari, Chris Yuan, Erica Liverani, and Wayne Cai
Symposium 6-2: Advances in Machining and Metrology
Organizers: Bruce L. Tai, Xiaoliang Jin, Yi-Tang Kao, Takashi Matsumura, and Norikazu Suzuki
Symposium 6-3: Advances in Surface Engineering: Process, Metrology, and Property/Performance
Organizers: Beiwen Li, Yiliang (Leon) Liao, and Sougata Roy
Symposium 6-4: Deformation Processing of Metals and Alloys
Organizers: Dinakar Sagapuram, Jinjin Ha, and Yang Guo
Symposium 6-5: Innovative Joining Processes for Advanced Materials
Organizers: Xun Liu, Yunwu Ma, and Yongbing Li

Track 7: Manufacturing Systems (MS7)

Symposium 7-1: AI for Smart Manufacturing Systems
Organizers: Chenhui Shao, Shenghan Guo, Ran Jin, and Yujie Chen

Track 8: Nano/ Micro/ Meso Manufacturing (NMM8)

Symposium 8-1: AI for Smart Manufacturing Systems
Organizers: Soham Mujumdar, Ashif Iquebal, Wayne Hung, and Sekhar Rakurty

Track 9: Quality and Reliability (QR9)

Symposium 9-1: Bridging Academic Research and Industrial Practices on Machine Learning for Advanced Manufacturing
Organizers: Peng (Edward) Wang, Hantang Qin, Shaopeng Liu, and Hassan Ghassemi-Arnaki

Posters and Doctoral Symposium (Guha Manogharan)

Student Manufacturing Design Competition (Jaydeep Karandikar)

TRAVEL AWARD RECIPIENTS

The organizers of the NAMRC52/MSEC2024 gratefully acknowledge the generous support of the National Science Foundation (NSF) in providing financial support to the following students and early-career engineers to attend the conference.

Student awardees

Joshua Adesina, *The Ohio State University*
Javid Akhavan, *Stevens Institute of Technology*
Maryam Avateffazeli, *The University of Toledo*
Kaan Bahtiyar, *Oregon State University*
Mahathir Mohammad Bappy, *Mississippi State University*
Alireza Behvar, *University of Toledo*
Purvee Bhatia, *University of South Florida*
Marisa Ravena Bisram, *Northwestern University*
Yan Chen, *Binghamton University*
Yu Jen Chen, *University of Cincinnati*
Yinong Chen, *University of Illinois Chicago*
Patrick Chernjavsky, *Worcester Polytechnic Institute*
Aditya Chivate, *University at Buffalo*
Jeremy Cleeman, *Rutgers University*
Clayton Cooper, *Case Western Reserve University*
Lisa DeWitte, *Georgia Institute of Technology*
Felicia F Fashanu, *University of California Davis*
Jose de Jesus Galarza, *The University of Texas Rio Grande Valley*
Tianyu Gao, *Auburn University*
Jacklyn C. Griffis, *Pennsylvania State University*
Sampa Halder, *Texas Tech University*
Hadear Ibrahim Hassan, *Texas A&M University*
Mahtab Heydari, *Texas A&M University*
Danny Hoang, *University of Connecticut*
Md. Tofazzal Hossain, *University of Delaware*
Seyedmehrab Hosseini, *Auburn University*
Kateland Marie Hutt, *University of Florida*
Krzysztof Kamil Jarosz, *Rochester Institute of Technology*
Jeon Ho Kang, *University of Southern California*
Anna Keim, *Purdue University*
Anasheh Khecho, *University of North Carolina at Charlotte*
Hamed Khosravi, *West Virginia University*
Uday Venkat Kiran Kommineni, *Iowa State University*
Andreas Lianos, *Texas A&M University*
Zahra Lotfizarei, *University of Wisconsin-Madison*
Thomas Maani, *Purdue University*
Kellen Mitchell, *University of Nevada, Reno*
Marielena Molinares, *Texas Tech University*
Dan Tuan Nguyen, *University of North Texas*
Lutfun Nahar Nipa, *University of North Texas*
Oluka S Okia, *University of Michigan*
Ridwan Olalekan Olabiyi, *Arizona State University*
Philip Ayodeji Olubodun, *Missouri University of Science and Technology*
Daniel Penley, *University of Michigan*
Arunachalam Ramanathan, *University of Georgia*
Mei Ruo-Syuan, *University of Michigan, Ann Arbor*
Shawkat Imam Shakil, *University of Toledo*
Jack Shanks, *Worcester Polytechnic Institute*
Tavila Sharmin, *North Carolina State University*
Papia Sultana, *University of Illinois-Urbana Champaign*
HaofanSun, *Arizona State University*
Kamin Tahmasbi, *University of Toledo*
Tengteng Tang, *Arizona State University*
Supreet Sunil Thale, *Virginia Tech*
Jason Thomas, *The University of Texas at Dallas*
Augustine Twumasi, *The University of Texas at El Paso*
Saleh Valizadeh Sotubadi, *Michigan Technological University*
Jingwen Wang, *University of Illinois Chicago*
Yujing Yang, *The University of Texas at Arlington*
Dongyang Yi, *University of Massachusetts Lowell*
Christian Santiago Zuniga-Navarrete, *University of Louisville*

TRAVEL AWARD RECIPIENTS

Early-career awardees

Shiqi Fang, *Rutgers University*
Uroosa Fatima, *Energon Engineering*
Ji Ho Jeon, *Georgia Institute of Technology*
Yahui Zhang, *Northwestern University*
Jiho Lee, *Purdue University*

The Environmental Engineering and Sustainability Program (ENG/CBET) of the National Science Foundation provides financial support through grant CBET-2322400 to engage U.S. early-career researchers (e.g., students, postdocs, and junior faculty members) in presenting, demonstrating, and developing creative and influential solutions for industrial sustainability and networking with international peers and leaders at MSEC 2024 | NAMRC 52. Interested presentation topics include sustainable design, eco-friendly manufacturing processes, end-of-life management, and product life cycle assessment.

NSF ENG awardees

Erasmo Garcia, *University of Texas Dallas*
Mahmudul Hassan, *University of Wisconsin-Madison*
Putong Kang, *Northwestern University*
Abdul Sayeed Khan, *University of Michigan*
Eunseob Kim, *Purdue University*
Chenyang Li, *New Jersey Institute of Technology*
Sina Malakpour, *Northwestern University*
Nitin More, *North Carolina A&T*
Daniel Penley, *University of Michigan*
Mario Riofrio, *Oregon State University*
Wenhao Zhang, *Embry-Riddle Aeronautical University*

SESSION SUMMARY

	Location	HC & CC	DEFG	ORNL & TN-MADE	200 C, D & E	301A	301B	301C	301D	301E	200A	200B	300B	300C	300D
Monday 6/17/24	10:00-20:00	Registration (HC)													
	12:00-18:00			Tutorials ORNL											
	18:30-20:00	Welcome Reception (CC)													
Tuesday 6/18/24	07:00-17:30	Registration (HC)													
	07:00-08:00	Breakfast (CC)													
	09:00-10:15 Tech Session I				Student Mfg. Design Competition 1 (200C)	Tr3: Mat. Removal 1 NAMRC 257 NAMRC 2 NAMRC 20	Tr2: Mfg Processes 1 Track 2 Keynote NAMRC 8	Tr7: Sustainable Mfg 1 NAMRC 58 NAMRC 47 NAMRC 18	ADM1-3: Multi Mat. Proc. In AM 125262 [BP] 122414 [BP]	MS7-1: AI for Smart Mfg. Sys 124764 125279 130310	Tr4: Add. Mfg 1 NAMRC 118 NAMRC 3 NAMRC 10	Tr5: Smart Mfg & CPS 1 NAMRC 70 NAMRC 6 NAMRC 51	LCE4-1: Adv. In Sus. Mfg. for imp comp life cycle perf 125110 [B] 124484 [B] 125115 [B] 125564 [BP] 124121 [B]	MP6-2: Adv. In Mac. & Metrology 124451[B] 128419 [B] 131699 [B] 129976 [BP] 124162 [BP]	NNM8-1: Adv. In Meso, Mic., & Nano Mfg. In Ind. 4.0 124112 [B] 125141 [B] 125364 [B] 124055 [BP]
	10:30-11:45 Tech Session II				Student Mfg. Design Competition 2 (200C)	Tr1: Mfg Systems 2 Track 1 Keynote NAMRC 15	Tr2: Mfg Processes 2 NAMRC 135 NAMRC 140 NAMRC 31	Tr3: Mat. Removal 2 NAMRC 56 NAMRC 72 NAMRC 80	ADM1-1: Adv. In Met. AM Proc. 125361 [BP] 123865 [BP] 122505 [BP] 125316 [B] 124101 [B]	MP6_1: Adv. in Clean Energy & E-Mobility Mfg. Invited Talk 125340 [B] 124312 [B] 124108 [BP]	Tr4: Add. Mfg 2 NAMRC 249 NAMRC 16 NAMRC 33	Tr5: Smart Mfg & CPS 2 NAMRC 254 NAMRC 245 NAMRC 224	BioM3_1: Adv. in Des, Mfg, & Ana of Biomed. Dev. 125051 124396 130799 [BP]	MEA5_1: Inn in Eq Des, Control & Automation 125193 [BP] 124488 [B] 131361 [B] 125414 [B] 125435 [B]	MP6_4: Def Proc of Metals & Alloys Invited Talk 125220 [BP] 129948 [BP]
	12:00-13:30		Lunch												
	13:45-15:00 Tech Session III				Student Mfg. Design Competition 3 (200C)	Tr1: Mfg Systems 3 NAMRC 29 NAMRC 32 NAMRC 55	Tr2: Mfg Processes 3 NAMRC 136 NAMRC 180 NAMRC 113	Tr3: Mat. Removal 3 NAMRC 124 NAMRC 129 NAMRC 256	AdM1_2: In-Situ Mon & Non-Des Testing of AM Proc 131311 [BP] 125563 [BP] 124359 [BP] 125452 [BP]	AdM1_4: Smart AM 125152 125172 125230	Tr4: Add. Mfg 3 NAMRC 19 NAMRC 37 NAMRC 35	Tr5: Smart Mfg & CPS 3 NAMRC 207 NAMRC 74 NAMRC 128	AMM2_1: Adv in Digital Twins of Mfg Proc & Sys 124383 [B] 125175 [B] 124799 [BP] 124303 [BP] 125396 [BP]	BioM3_2: Adv in Mfg of Tis Const 124474 [BP] 125216 [B] 125184 [B] 125171 [B] 124413 [P]	MP6_5: Inn. In Joining Proc for Adv Mat 124606 [BP] 125358 [B] JMSE 23-1065 [J]
	15:15-16:30 Tech Session IV		MSEC Poster Session (ABC)			Tr1: Mfg Systems 4 NAMRC 6 NAMRC 12 NAMRC 65	Tr2: Mfg Processes 4 NAMRC 139 NAMRC 36 NAMRC 131	Tr3: Mat. Removal 4 NAMRC 17 NAMRC 76 NAMRC 100			Tr4: Add. Mfg 4 NAMRC 39 NAMRC 43 NAMRC 54	Tr5: Smart Mfg & CPS 4 NAMRC 209 NAMRC 235 NAMRC 237			
	18:30-21:00			Industry Night TN-MADE											
Wednesday 6/19/24	07:00-17:30	Registration (HC)													
	07:00-08:00	Breakfast (CC)													
	09:00-10:15 Tech Session V					Student Research Presentation 1 NAMRC 93 NAMRC 103 NAMRC 181	Tr3: Mat. Removal 5 NAMRC 157 NAMRC 179 NAMRC 156	Tr7: Sustainable Mfg 2 NAMRC 30 NAMRC 87 NAMRC 177	AdM1_4: Smart AM 121253 121312 122417	MP6_1: Adv. in Clean Energy & E-Mobility Mfg. 125046 [P] 123689 124375	Tr4: Add. Mfg 5 NAMRC 57 NAMRC 59 NAMRC 52	Tr5: Smart Mfg & CPS 5 NAMRC 24 NAMRC 49 NAMRC 41	AMM2_2: Adv in Mfg & Proc of Poly & Comp 121544 125342 124968	MEA5_2: Semi Mfg: Metr, Ins, Sys, & Proc 131691 [B] 125440 [B] 125308 [B] 121840 [B] 124293 [P]	MP6_4: Def Proc of Metals & Alloys 125427 125444 124111
	10:30-11:45 Tech Session VI					Student Research Presentation 2 NAMRC 28 NAMRC 142 NAMRC 145	Tr2: Mfg Processes 5 NAMRC 5 NAMRC 77 NAMRC 14	Tr1: Mfg Systems 4 NAMRC 215 NAMRC 178 NAMRC 196	AdM1_1: Adv in Metal AM Proc 122007 124636 125486	MS7_1: AI for Smart Mfg Sys 124768 125391 125898	Tr4: Add. Mfg 6 NAMRC 75 NAMRC 84 NAMRC 64	Tr5: Smart Mfg & CPS 6 NAMRC 115 NAMRC 110 NAMRC 116	AMM2_3: Conv Mfg of Adv Mat for Hybrid Mfg Sys 124049 124138 129800 [P]	LCE4_2: Sys Engg & Digital Tech for Cir Eco Panel	MP6_2: Adv in Mach & Metrology 125540 123257 124638
	12:00-13:30		ASME MED Award Luncheon												
	13:45-15:00 Tech Session VII				SME Blue Sky Comp I (200C) SME Membership & Student Meeting (200E)	Student Research Presentation 3 NAMRC 171 NAMRC 203 NAMRC 218	Tr2: Mfg Processes 6 NAMRC 27 NAMRC 21 NAMRC 25	Tr1: Mfg Systems 5 NAMRC 225 NAMRC 232 NAMRC 251	AdM1_2: In-Situ Mon & Non-Des Testing of AM Proc 122672 123863 124045	AdM1_4: Smart AM 121979 124113 125241	Tr4: Add. Mfg 7 NAMRC 63 NAMRC 60 NAMRC 61	Tr5: Smart Mfg & CPS 7 NAMRC 46 NAMRC 83 NAMRC 127	BioM3_2: Adv in Mfg of Tis Const 124411 123879 125185	MEA5_1: Inn in Eq Des, Control & Automation 125235 125413 125487	MP6_3: Adv in Surf Engg: Process, Metr, & Prop/Perf 123270 123292 124477
	15:15-16:30 Tech Session VIII				SME Blue Sky Comp II (200C)	Tr1: Mfg Systems 6 NAMRC 85 NAMRC 144 NAMRC 104	Tr2: Mfg Processes 7 NAMRC 40 NAMRC 38 NAMRC 44	Tr7: Sustainable Mfg 3 NAMRC 260 NAMRC 91 NAMRC 166	ADM1-3: Multi Mat. Proc. In AM 124099 125138 125351	AdM1_1: Adv in Metal AM Proc 124367 130041 130182	Tr4: Add. Mfg 8 NAMRC 151 NAMRC 98 NAMRC 120	Tr5: Smart Mfg & CPS 8 NAMRC 22 NAMRC 50 NAMRC 101	LCE4_2: Sys Engg & Digital Tech for Cir Economy 122680 124452 124500	MP6_3: Adv in Surf Engg: Process, Metr, & Prop/Perf 124702 125077	QR9_1: Brid Acad Res & Ind Prac on Mach Learn for Adv Mfg Invited Talk JMSE 23-1313 [J] JMSE 23-1054 [J]
	16:00-18:00				BiAM forum (200 D)										
	16:45-18:00 Tech Session IX					Tr1: Mfg Systems 7 NAMRC 123 NAMRC 107 NAMRC 117	Tr2: Mfg Processes 8 NAMRC 45 NAMRC 53	Tr6: Mfg Edu & Case Studies 1 NAMRC 82 NAMRC 204	AdM1_4: Smart AM 124510 124989	MS7_1: AI for Smart Mfg Sys 125011 125289	Tr4: Add. Mfg 9 NAMRC 132 NAMRC 94 NAMRC 119	Tr5: Smart Mfg & CPS 9 NAMRC 141 NAMRC 143	AMM2_2: Adv in Mfg & Proc of Poly & Comp 124489	LCE4_1: Adv in Sus Mfg for Imp Comp Life Cycle Perf 125157	MP6_2: Adv in Mach & Metrology 125330 125456

SESSION SUMMARY

							NAMRC 73	NAMRC 217	JMSE 22-1551 [J]	JMSE 22-1685 [J]		NAMRC 150	124741	125304 125177 [B]	130712
	18:00-21:00		**Early Career Forum**												
Thursday 6/20/24	07:00-12:00	**Registration (HC)**													
	07:00-08:00	**Breakfast (CC)**													
	09:00-10:15 **Tech Session X**				**Doctoral Symposium 1 (200C)** 141713 [P] 142369 [P] 142904 [P] 142924 [P]	**Tr1: Mfg Systems 8** NAMRC 154 NAMRC 26 NAMRC 152	**Tr2: Mfg Processes 9** NAMRC 125 NAMRC 102 NAMRC 126	**Tr4: Add. Mfg 10** NAMRC 244 NAMRC 240 NAMRC 246	**AdM1_1: Adv in Metal AM Proc** 124321 122135 [B] 123906 [B]	**MP6_1: Adv. in Clean Energy & E-Mobility Mfg.** 124620 125136 [B] 124603 [P]	**Tr4: Add. Mfg 11** NAMRC 105 NAMRC 90 NAMRC 106	**Tr5: Smart Mfg & CPS 10** NAMRC 188 NAMRC 169 NAMRC 184	**AdM1_2: In-Situ Mon & Non-Des Testing of AM Proc** 125343 [B] 130353 [B] 124538 [B] 125343 [B] 125181 [B]	**MEA5_1: Inn in Eq Des, Control & Automation** 121212 124417 JMSE 23-1548 [J]	**AMM2_1: Adv in Digital Twins of Mfg Proc & Sys** 124624 125094 124400 [B]
	10:30-11:45 **Tech Session XI**				**Doctoral Symposium 2 (200C)** 142562 [P] 142762 [P] 142908 [P] 142821 [P]	**HAMMER ERC 1** NAMRC 229 NAMRC 226 NAMRC 221	**Tr2: Mfg Processes 10** NAMRC 96 NAMRC 78 NAMRC 79	**Tr1: Mfg Systems 9** NAMRC 159 NAMRC 168 NAMRC 173	**AdM1_1: Adv in Metal AM Proc** Invited Talk 141899 [P]	**AdM1_2: In-Situ Mon & Non-Des Testing of AM Proc** 124715 124781 124322	**Tr4: Add. Mfg 12** NAMRC 133 NAMRC 158 NAMRC 160	**Tr5: Smart Mfg & CPS 11** NAMRC 155 NAMRC 174 NAMRC 191	**BioM3_2: Adv in Mfg of Tis Const** 120957 125275 125393	**MP6_3: Adv in Surf Engg: Process, Metr, & Prop/Perf** 125163 124815 [B] JMSE 22-1566 [J]	**MP6_4: Def Proc of Metals & Alloys** 124356 124723 130324 [B]
	12:00-13:30		**NAMRI/ SME Award Luncheon**												
	13:45-15:00 **Tech Session XII**				**Doctoral Symposium 3 (200C)** 142717 [P] 142867 [P] 142889 [P]	**HAMMER ERC 2** NAMRC 264 NAMRC 34 NAMRC 216	**Tr2: Mfg Processes 11** NAMRC 134 NAMRC 148 NAMRC 138	**Tr5: Smart Mfg & CPS 12** NAMRC 248 NAMRC 247 NAMRC 252	**AdM1_2: In-Situ Mon & Non-Des Testing of AM Proc** 124117 124650 126798	**MS7-1: AI for Smart Mfg. Systems** 124409 124455 125075	**Tr4: Add. Mfg 13** NAMRC 162 NAMRC 163 NAMRC 165	**Tr5: Smart Mfg & CPS 13** NAMRC 202 NAMRC 200 NAMRC 208	**AMM2_2: Adv in Mfg & Proc of Poly & Comp** 140712 [P] 141837 [P] 131632 [B]	**MP6_2: Adv in Mach & Metrology** 130340 [B] 125067 [B] 123611 [B] 130735 [B] 130793 [B]	**MP6_4: Def Proc of Metals & Alloys** 125277 [B] 125217 [B] 123807 [B] 131757 [B]
	15:00-18:00				**WiAM forum (200 DE)**										
	15:15-16:30 **Tech Session XIII**					**HAMMER ERC 3** NAMRC 109 NAMRC 258 NAMRC 4	**Tr2: Mfg Processes 12** NAMRC 206 NAMRC 167 NAMRC 176	**Tr3: Mat. Removal 6** NAMRC 238 NAMRC 243 NAMRC 259	**AdM1_1: Adv in Metal AM Proc** 125516 [B] 124647 [B] 130242 [B] 121879 [B]	**MP6_1: Inn Join Proc for Adv Mat** 126299 126623 125666	**Tr4: Add. Mfg 14** NAMRC 161 NAMRC 185 NAMRC 189	**Tr5: Smart Mfg & CPS 14** NAMRC 194 NAMRC 201 NAMRC 242	**AMM2_3: Conv Mfg of Adv Mat for Hybrid Mfg Sys & Products** 121937 125490 [B] 124554 [B]	**NNM8-1: Adv. In Meso, Mic., & Nano Mfg. In Ind. 4.0** 122447 141791 [P] JMNM-23-1038 [J]	**QR9_1: Brid Acad Res & Ind Prac on Mach Learn for Adv Mfg** 125432 130229 141659 [P]
	16:45-18:00 **Tech Session XIV**					**HAMMER ERC 4** NAMRC 68 NAMRC 198 NAMRC 230	**Tr2: Mfg Processes 13** NAMRC 250 NAMRC 210 NAMRC 223	**Tr: Cross-Dis Res** NAMRC 239 NAMRC 234	**AdM1_4: Smart AM** 126776 [P] 140578 [P] 141018 [P] 141657 [P] JMSE 23-1400 [J]	**BioM3_2: Adv in Mfg of Tis Const** 123878 125474 JMSE 23-1132 [J]	**Tr4: Add. Mfg 15** NAMRC 187 NAMRC 197 NAMRC 199	**Tr5: Smart Mfg & CPS 15** NAMRC 214 NAMRC 222 NAMRC 228	**LCE4_2: Sys Engg & Digital Tech for Cir Eco** 125056 125254 125107 [B]	**MEA5_2: Semi Mfg: Metr, Ins, Sys, & Proc** 123370 [B] 124600 [B] 125207 [B]	**MP6_2: Adv in Mach & Metrology** 121950 JMSE 23-1725 [J] JMSE 23-1431 [J] JMSE 23-1389 [J]
	19:00-21:00		**Banquet Dinner**												
Friday 6/21/24	07:00-12:00	**Registration (HC)**													
	07:30-08:30	**Breakfast (CC)**													
	09:00-10:15 **Tech Session XV**					**HAMMER ERC 5** NAMRC 186 NAMRC 7 NAMRC 172	**Tr4: Add. Mfg 16** NAMRC 241 NAMRC 233 NAMRC 236	**Tr5: Smart Mfg & CPS 16** NAMRC 261 NAMRC 170 NAMRC 193	**AdM1_4: Smart AM** 125242 [B] 124645 [B] 125118 [B] 125150 [B]	**MP6_1: Adv. in Clean Energy & E-Mobility Mfg.** 124948 125491 JMSE 23-1580 [J]			**MP6_2: Adv in Mach & Metrology** JMSE 23-1060 [J] JMSE 23-1233 [J]		
	10:30-11:45 **Tech Session XVI**					**Tr4: Add. Mfg 17** NAMRC 213 NAMRC 212 NAMRC 219			**AdM1_1: Adv in Metal AM Proc** JMSE 23-1526 [J] JMSE 23-1594 [J] JMSE 23-1243 [J]	**BioM3_1: Adv. in Des, Mfg, & Ana of Bio Dev.** 130739 131651			**AdM1_4: Smart AM** 124641 JMSE 23-1666 [J] JMSE 23-1608 [J]		
	12:00-13:00		**Boxed Lunch**												
	13:00-16:00			**ORNL-DENSO Tours**											

*Tue-Thur – 08:00-08:45: Welcome & Keynote (DEFG)

[B]: Brief paper, [BP]: Brief paper with poster, [J]: Journal paper presentation, [P]: Presentation-only paper

MONDAY JUNE 17, 2024

Time	Location	Event
8:30-15:00	300A	NAMRI SME Board Meeting
10:00-20:00	Henley Concourse	Registration/ Information
12:00-13:00	ORNL MDF	Welcome and Lunch (Pre-registration required)
13:00-15:00	ORNL MDF	Tutorials (Pre-registration required, parallel sessions)
15:00-16:00	ORNL MDF	Tour
16:00-18:00	ORNL MDF	Tutorials (Pre-registration required, parallel sessions)
15:00-17:00	300A	ASME MED Executive Committee Open Meeting
15:00-17:00	Ballroom DEFG	Awards Rehearsal
16:00-18:00	Ballroom ABC	Exhibitor Booths Set-Up
16:00-18:00	Ballroom ABC	Posters Set-Up
18:30-20:00	Cumberland Concourse	Welcome Reception

Tutorials

The tutorials will provide an introduction and overview of topics relevant to MSEC/NAMRC attendees. The target audience is attendees with topic interest, but not deep experience. Tutorials will provide both fundamentals and applications. The tutorial length is two hours and the format is classroom lecture.

Cost per tutorial

- $50 student
- $75 non-student

Continuing education units

Pellissippi State Community College, Knoxville, TN, will partner to offer CEUs for the tutorials. We will provide signups on-site for interested participants.

Location

Oak Ridge National Laboratory (ORNL) Manufacturing Demonstration Facility (MDF)
2350 Cherahala Blvd
Knoxville, TN 37932

MONDAY JUNE 17, 2024

Tutorials

Frank Pfefferkorn, Professor, University of Wisconsin-Madison

Biography

Dr. Frank Pfefferkorn is a Professor and the Associate Chair for Graduate Studies in the Department of Mechanical Engineering and the Director of the Manufacturing Systems Engineering Program at the University of Wisconsin-Madison. His Doctoral Degree is in Mechanical Engineering from Purdue University in West Lafayette, IN (2002). His core expertise is in the experimental and numerical investigation of discrete metal part manufacturing process physics. Dr. Pfefferkorn's research focuses on where the tool meets the workpiece, whether that tool is a mechanical cutting tool, laser beam, or friction stir tool. He has conducted advanced manufacturing process research for 29 years. He has active research projects in solid-state joining, laser polishing, instrumenting cutting tools, solid-state metal additive manufacturing, and multi-material additive-subtractive manufacturing. Dr. Pfefferkorn has authored over 165 peer-reviewed publications in these areas, including journal articles, conference proceedings, and invited book chapters. His research has been funded by the US National Science Foundation, US Department of Energy, US Office of Naval Research, Wisconsin Alumni Research Foundation, Machine Tool Technology Research Foundation, Austrian Marshall Plan Foundation, and industry.

Topic

Solid-state metal additive manufacturing

Description

This tutorial describes the deposition (printing) of metal using processes in which the material does not exceed the melting point. This is achieved by hot working the metal: temperatures are usually between 70% and 95% of the solidus temperature. Metal is deformed and bonded to the substrate by utilizing friction, pressure, velocity, and time. The severe plastic deformation during deposition results in a fine-grained microstructure. The dynamic recrystallization and lower temperatures and temperatures gradients, compared with melting-based processes, results in less formation of intermetallic phases, oxides, and residual stresses. It must also be noted that the hot working nature of the processes results in large forces and torques (at least locally). Significant advantages of these processes are their ability to deposit almost any metal alloy, create deposits/bonds between dissimilar materials, and achieve high deposition rates. The solid-state additive manufacturing processes are still in the early stages of adoption and this tutorial aims at providing a foundation of information that will enable the attendee to begin the process of evaluating these processes for their application(s) and pursue additional sources to increase their knowledge.

The following topics are covered in detail:

- description of process physics
- benefits and limitations

- comparison to melting-based metal additive manufacturing (e.g., economics, properties of build)
- description of various methods (e.g., friction surfacing, friction stir additive, ultrasonic, cold gas spraying).

Applications, future potential, examples of ongoing research, and companies providing commercial solutions are included.

Sudarsanam (Suresh) Babu, UT-ORNL Governor's Chair and Professor, University of Tennessee, Knoxville

Biography

Dr. Suresh Babu obtained his bachelor's degree in metallurgical engineering from PSG College of Technology, Coimbatore, India, and his master's degree in industrial welding metallurgy-materials joining from Indian Institute of Technology, Madras. He obtained his PhD in materials science and metallurgy from University of Cambridge, UK in 1992. He also worked as a research associate in the prestigious Institute for Materials Research, Sendai, Japan before joining ORNL in 1993. From 1993 to 1997, he held joint researcher position with ORNL, University of Tennessee, and Penn State University. From 1997 to 2005, he worked as an R&D staff at ORNL. From 2005 to 2007, Suresh held a senior level technology leader position in engineering and materials at the Edison Welding Institute, Columbus, OH. From 2007 to 2013, Suresh served as Professor of Materials Science and Engineering and Director of NSF I/UCRC Center for Materials Joining Science for Energy Applications, at The Ohio State University. In 2013, Suresh was appointed as UT/ORNL Governor's chair of advanced manufacturing at the University of Tennessee, Knoxville, TN. In this role he acts as a bridge to the ORNL's expertise and infrastructure including manufacturing demonstration facility to develop a collaborative research and education ecosystem locally and deploy engineering solutions to manufacturing industries. In 2019, Suresh was also appointed as Director of Bredesen Center for Interdisciplinary Research and Education for Energy- and Data- Science and Engineering. In 2020, Suresh was selected to be the founding educational director of the UT-Oak Ridge Innovation Institute. In 2020, he was appointed to the National Science Board by the President of the USA for a six-year term. In 2022, he was appointed as inaugural position of senior advisor for research and STEM to the Provost and Vice Chancellor of Research.

Topic

Metallurgy of additive manufacturing: Towards born qualified parts

Description

This tutorial will describe the approaches to map the effect of large number of variables related to additive manufacturing (AM) to fundamental thermo-mechanical-chemical signatures. These signatures, in turn, control the microstructure, properties, and geometrical conformity of

manufactured components. The ability to describe these transient behaviors using combination of modeling and ex-situ/in-situ characterization will be highlighted. Links to open domain computational models will be provided. The sequence of topics to be covered are:

- mechanisms behind complex thermo-mechanical-chemical signatures during both fusion and solid-state additive manufacturing
- integrated approach that combines computational modeling, data science tools and in-situ monitoring
- examples of published qualification pathways to arrive at site-specific properties and rationalization of scatter in mechanical properties
- unresolved gaps and challenges and potential pathways to solve them.

Chinedum Okwudire, Professor, University of Michigan

Biography

Chinedum (Chi) Okwudire is a professor of Mechanical Engineering and Miller Faculty Scholar at the University of Michigan. Prior to joining Michigan, he was the mechatronic systems optimization team leader at DMG Mori USA, Davis, CA. His research is focused on exploiting knowledge at the intersection of machine design, control, and computing to boost the performance of manufacturing automation systems at low cost. Chi has received several awards including the CAREER award from the National Science Foundation; the Young Investigator Award from the International Symposium on Flexible Automation; the Outstanding Young Manufacturing Engineer Award from SME; the Ralph Teetor Educational Award from SAE International; and the Russell Severance Springer Visiting Professorship from UC Berkeley. He was recently selected by SME as one of the 25 leaders transforming manufacturing. He has co-authored several best-paper-award-winning papers in the areas of manufacturing automation, control, and mechatronics. He is also the founder and CTO of Ulendo Technologies, Inc., a start-up company focused on developing automation software for 3D printing and other manufacturing processes.

Topic

Control of manufacturing systems, machines, and processes in the context of Industry 4.0

Description

The control of manufacturing systems, machines, and processes is being transformed by the technologies shaping the smart manufacturing (Industry 4.0) revolution. This tutorial will review key technologies, including the Internet of things (IoT), cloud computing, artificial intelligence/machine learning, and digital twins, that are driving smart manufacturing. Then it will provide industrial case studies and specific examples to show how participants can leverage these technologies to improve the quality, productivity, and/or cost effectiveness of manufacturing

machines and processes through advanced control. The tutorial will be interactive and will not assume any prior background in control theory.

At the end of this tutorial, participants will be able to:

- identify major classes of control used in manufacturing and other industries and understand their importance
- appreciate key technologies shaping smart manufacturing and their relevance to manufacturing control
- identify industry-relevant cases where advanced control, supported by smart manufacturing technologies, is leading to significant performance improvements.

Tony Schmitz, Professor, University of Tennessee, Knoxville, Joint Faculty, Oak Ridge National Laboratory

Biography

Tony Schmitz received his BS in Mechanical Engineering from Temple University in 1993 and his PhD in Mechanical Engineering from the University of Florida (UF) in in 1999. Schmitz completed a post-doctoral appointment at the National Institute of Standards and Technology (NIST) and was then employed as a Mechanical Engineer from 1999-2002. Schmitz accepted an appointment in the UF Department of Mechanical and Aerospace Engineering in 2002 and joined the Mechanical Engineering Department at UNC Charlotte in 2011.

Dr. Schmitz joined the Mechanical, Aerospace, and Biomedical Engineering department at the University of Tennessee, Knoxville (UTK) in 2019 with a Joint Faculty position at the Oak Ridge National Laboratory (ORNL) Manufacturing Demonstration Facility. At UTK, he directs the Machine Tool Research Center (MTRC). His most recent appointment is Director of the Southeastern Advanced Machine Tools Network (SEAMTN), a consortium of companies, colleges and universities, national laboratories, non-profit organizations, and the Tennessee state government that seeks to strengthen the US industrial base by investing in machine tool research and development, education, workforce development, and supply chain support. He continues his manufacturing research in support of the US machine tool industry with an emphasis on machining dynamics, metrology, machine learning, and additive manufacturing.

Topic

Machining dynamics: Theory and application

Description

This tutorial describes the dynamics of machining processes, with a particular focus on milling. The tutorial covers the steps required to improve machining productivity through chatter avoidance and reduced surface location error (forced vibrations resulting in part geometric errors). The following topics are covered in detail:

- modal analysis and experimental methods for frequency response functions
- description of milling dynamics models, including force modeling, time domain simulation, stability map algorithm, and surface location error calculation.

Examples are included. A graphical user interface (GUI) is also provided that enables users to complete virtual milling experiments.

The control of manufacturing systems, machines, and processes is being transformed by the technologies shaping the smart manufacturing

Jaydeep Karandikar, Senior R&D Staff, Oak Ridge National Laboratory

Biography

Dr. Jaydeep Karandikar is a Senior R&D Staff Member in the Intelligent Machine Tools group at Oak Ridge National Laboratory. His broad research interests include machining process modeling, monitoring, & optimization, and smart manufacturing. Prior to joining ORNL, he was a lead research engineer at GE Research, Niskayuna, NY. Dr. Karandikar has published more than 25 peer-reviewed journal papers, two book chapters, and holds two US patents. Dr. Karandikar is a member of the executive committee of the Manufacturing Engineering Division at ASME, and a Research Affiliate at CIRP. Dr. Karandikar has received several awards including the SME S.M. Wu Research Implementation Award, ORNL Innovation Award, and the SME Outstanding Young Manufacturing Engineer Award. Dr. Karandikar earned his PhD in Mechanical Engineering from the University of North Carolina at Charlotte in 2013 where his research focused on the application of decision analysis to manufacturing.

Topic

Bayesian optimization for manufacturing

Description

Bayesian optimization (BO) is a sequential adaptive sampling strategy for the global optimization of black-box functions. This tutorial will describe BO methods for process parameter development and optimization in manufacturing. The tutorial will cover the basics of Gaussian Process (GP) machine learning and different acquisition functions for BO sampling using an example dataset. Acquisition functions for sequential sampling (one sample) and batch sampling (multiple samples) will be described.

Example Python codes for GP regression and BO will be provided. The tutorial aims to enable a practitioner/researcher in manufacturing to understand and apply BO for efficient process parameter development. The tutorial will be interactive and will not assume prior knowledge in machine learning.

Uday Vaidya, UT-ORNL Governor's Chair and Professor, University of Tennessee, Knoxville

Biography

Dr. Uday Vaidya serves as Director of the University of Tennessee, Knoxville (UTK) Fibers and Composites Manufacturing Facility (FCMF), he is the Chief Technology Officer for IACMI-The Composites Institute, and he is the UT-ORNL Governor's Chair in Advanced Composites Manufacturing. The FCMF is funded in collaboration with IACMI, a subsidiary of Collaborative Composite Solutions managed by the University of Tennessee Research Foundation. Through IACMI and UTK's collaboration, more than 10 students have worked as IACMI interns in the laboratory space. IACMI members and partners collaborate on projects, offering both industry and laboratory research experience for UTK engineering students.

Topic

Carbon fiber composites: Key considerations in design, tooling, manufacturing, and machining

Description

Carbon fibers and their composites are making major strides in aerospace, defense, transportation, wind, power, sporting equipment, and infrastructure. The tutorial will cover the various continuous and discontinuous carbon fiber composites, design methodology, material characteristics and property envelopes, tooling for (and with) carbon fiber composites, manufacturing processes (for various sectors), machining of carbon fiber composites, and post-validation and inspection techniques. The course will be tailored to the audience to maximize learning opportunities.

TUESDAY JUNE 18, 2024

Time	Location	Event
7:00-17:30	Henley Concourse	Registration/ Information
7:00-8:00	Cumberland Concourse	Breakfast
8:00-8:15	Ballroom DEFG	Welcome Address: Adele Ratcliff
8:15-8:45	Ballroom DEFG	Keynote: Craig Blue
9:00-10:15	301ABCDE, 300BCD, 200ABC	Paper Session I
10:00-15:00	Ballroom ABC	Exhibitor Booths Open
10:15-10:45	Cumberland Concourse	Morning Break
10:30-11:45	301ABCDE, 300BCD, 200ABC	Paper Session II
12:00-13:30	Ballroom DEFG	Lunch
12:00-13:30	200E	NAMRI Scientific Committee Members Meeting
13:30-14:30	300A	Journal of Manufacturing Science and Engineering (JMSE) Editorial Board Meeting
13:45-15:00	301ABCDE, 300BCD, 200ABC	Paper Session III
15:00-15:30	Cumberland Concourse	Afternoon Break
15:15-16:30	301ABCDE, 300BCD, 200ABC	Paper Session IV
15:15-16:30	Ballroom ABC	MSEC Poster Session
16:45-17:30	200D	State of ASME MED Meeting
17:30-18:15	200D	State of NAMRI Meeting
18:30-21:00	TN MADE	Industry Night (Pre-registration Required)

KEYNOTE

TUESDAY JUNE 18, 2024

Opening remarks

Adele Ratcliff

Director, DoD Innovation Capability and Modernization office

8:00-8:15 | KCC Ballroom DEFG

Biography

Ms. Adele Ratcliff is the Director of the Innovation Capability and Modernization (ICAM) office. In this position, she implements the broad authorities of the Industrial Base Analysis and Sustainment (IBAS) Program to strengthen the competitive posture of the U.S. Defense Industrial Base by fortifying traditional technical capabilities and forging emerging industrial sectors to respond at-will to national security requirements. Ms. Ratcliff's long acquisition career includes serving as Director of the DoD Manufacturing Technology (ManTech) Program, during which time she spearheaded the establishment of DoD's national Manufacturing Innovation Institutes (MIIs), now known as Manufacturing USA Institutes; Program Manager for the congressionally mandated Defense Acquisition Challenge Program, Deputy Program Manager for the Foreign Comparative Test Program, and more than 11 years in Air Force Test and Evaluation at Eglin Air Force Base, Florida. She is a proud alumnus of the Mississippi State University Bulldogs, earning a Bachelor of Science in Mechanical Engineering in 1988. In 2011 she graduated from the U.S. Army War College earning a Master of Science in Strategic Art, and is also a graduate of the Department of Defense's Defense Senior Leadership Development Program. In 2023 she was named an SME Fellow.

KEYNOTE

TUESDAY JUNE 18, 2024

Building a "Future-Ready" Manufacturing Innovation Ecosystem for the US and East Tennessee

Craig Blue

Chief Manufacturing Officer, Oak Ridge National Laboratory

8:15-8:45 | KCC Ballroom DEFG

Abstract

Tennessee has a strong manufacturing history in automotive, chemicals, composites, marine, and medical equipment, with more than $38 billion in exports of manufactured goods annually. There is a critical need to continue driving this innovation forward to develop the manufacturing systems and technologies of tomorrow and ensure global US competitiveness. In East Tennessee, the research strengths of Oak Ridge National Laboratory and the University of Tennessee, Knoxville, are coupled with industry engagement through a public-private partnership model that is catalyzing U.S. manufacturing innovation. The Manufacturing Demonstration Facility at ORNL, which launched in 2012 with support from the Department of Energy's Advanced Manufacturing Office, provides a unique placed-based innovation model where industry, academia, government, and communities work alongside research staff to leverage state-of-the-art facilities. Here, ideas are catalyzed, convened, and accelerated into industry-changing technologies and products. Blue will discuss the key elements and future direction of this thriving regional manufacturing ecosystem that has strategically evolved into national prominence and success.

Biography

Dr. Craig Blue is the Chief Manufacturing Officer at Oak Ridge National Laboratory. ORNL's Advanced Manufacturing Program capitalizes on ORNL's world-class user facilities such as the Spallation Neutron Source, Center for Nanophase Materials Science, Building Technologies Research and Integration Center, Carbon Fiber Technology Facility (CFTF), Manufacturing Demonstration Facility (MDF), and the National Transportation and Research Center. The Advanced Manufacturing Program played key roles in the initiation and support of both the MDF and CFTF

A visionary leader and team builder with a 25-year record of success in creating and building applied research and development teams and programs in materials, manufacturing, energy, and national security at ORNL. Initiated, led, or programmatically enabled 10 major initiatives, hubs, and institutes that leverage ORNL's basic and applied capabilities to address US materials and manufacturing challenges. He was the founding director of the MDF and the founding CEO of the Institute for Advanced Composites Manufacturing Innovation (IACMI).

IACMI was originally a $260M Institute, recently renewed for a second five years, within the White House Manufacturing USA initiative comprising of a public-private partnership to increase domestic production capacity, grow manufacturing, and create jobs across the US composite industry with approximately 130 members.

He has more than 25 years of experience in conducting research in materials and manufacturing technologies, has authored approximately 100 open literature publications, holds 28 U.S. patents, and has received numerous awards including 11 R&D 100 Awards. He has served by invitation on numerous scientific and technical review panels, committees, and convocations convened by the National Science Foundation, the Council on Competitiveness, Manufacturing USA, National Academies of Sciences and Engineering and testified at the U.S. Senate Energy and Natural Resources Committee Hearing on Advanced Manufacturing

He is a Battelle Distinguished Inventor, Fellow of ASM International, Fellow of SME, and has held adjunct faculty appointments at the University of Tennessee, University of North Texas, and the Colorado School of Mines. HE was selected by SME as one of the “25 leaders transforming manufacturing”.

Most recently he enabled three large DOD initiatives: a national machine tool program, America’s Cutting Edge (ACE), to drive the revitalization of the machine tool industry in the US, a National Hypersonics Thermal Protection Systems Program to lower manufacturing costs, and a large Castings and Forgings Replacement Program.

INDUSTRY NIGHT

TUESDAY JUNE 18, 2024

Industry Night

18:30-21:00 | TN MADE, 2030 Valley Vista Rd, Knoxville, TN

Organizers

Tony Schmitz, Rhnea Reagan, Joshua Penney, Jose Nazario, Dave Roberson, and Sweta Baruah

Description

This event will provide an energetic, informal opportunity for industry/government sponsors to meet, engage with, and recruit manufacturing students into their workforce. Sponsors will have a booth to serve as a gathering place for student discussions. Other activities include industry/government presentations to describe capabilities, an oscillating piston air engine assembly competition, an open house for the Machine Tool Research Center to see manufacturing equipment, demonstrations from Knoxville-area FIRST robotics teams, and food/drink throughout the evening. There is no cost to participate for conference attendees, but pre-registration is required.

Agenda

17:00 Booth setup

18:30 Doors open, social networking, food/drink

19:00 Welcome by Adele Ratcliff, Director, DoD Innovation Capability and Modernization office

19:10 Tony Schmitz, America's Cutting Edge (ACE) presentation to introduce training program and oscillating piston air engine assembly competition

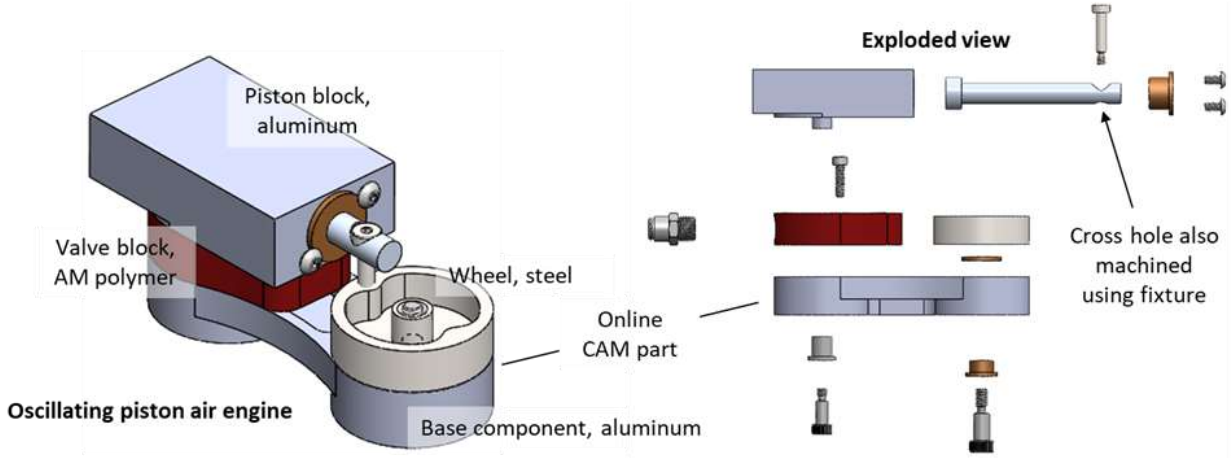
19:20 Industry presentations

INDUSTRY NIGHT

TUESDAY JUNE 18, 2024

Other activities will include prize drawings (shirts, hats, etc.) and social networking at industry booths, high top tables, and laboratory tour.

20:45 ACE oscillating piston air engine assembly competition winner announcement



21:00 Event ends

Transportation to and from the Knoxville Convention Center will be provided. The first buses will depart at 5:30 pm. Second buses will depart shortly after 6:30 pm. Shuttles will wait at the TN-MADE facility and make return trips when the event ends. Free parking and rideshare services are also available.

Sponsorship

Three sponsor levels are available. All sponsors will also have booth space at the conference location (Knoxville Convention Center) throughout the week. Payment may be made by check to the University of Tennessee, Knoxville.

Tennessee Orange $10,000

- Two complimentary conference registrations
- Two complimentary tutorials (Monday)
- Industry Night booth
- Industry Night digital signage
- Industry Night presentation with AV support
- Pre-conference access to student resume database
- Conference attendee list with contact information
- Conference website recognition with company link
- Knoxville Convention Center booth for duration of 2024 MSEC | NAMRC 52

INDUSTRY NIGHT

TUESDAY JUNE 18, 2024

Tennessee Smokey Gray $7,500

- One complimentary conference registration
- One complimentary tutorial (Monday)
- Industry Night booth
- Industry Night presentation with AV support
- Pre-conference access to student resume database
- Conference website recognition with company link
- Knoxville Convention Center booth for duration of 2024 MSEC | NAMRC 52

Tennessee White $5,000

- One complimentary conference registration
- Industry Night booth
- Pre-conference access to student resume database
- Conference website recognition with company link
- Knoxville Convention Center booth for duration of 2024 MSEC | NAMRC 52

POSTER SESSION

TUESDAY JUNE 18, 2024

MSEC Poster Session

15:15-16:30 | KCC Ballroom ABC

Posters will be on display until Thursday.

Poster No.	Authors	Title
142311	Madhur Pandya, Mohit Agarwal, Alok Srivastav, Dhruv Narayan, and Naresh Bhatnagar	A Comparative Study of Helical Polygonal Turning and Helical Peripheral Milling
142911	Nimesh Fernando, R Sarvesha, and James Caudill	A Comparative Study on the Influence of Process Parameters on the Mechanical Properties of Additive Friction Stir Deposited Al-Mg-Si Alloy
141219	Zack Yokun, Yash Mistry, and Dhruv Bhate	A Framework for a Digital Twin for Coral Morphology: Maps, Models and Data
142779	Jonathan Theraroz, and Oguzhan Tuysuz	A General Analytical Approach to Predict Machining Process Damping
142847	Mario Israel Rifrio, Karl Haapala, and Zhaoyan (Andy) Fan	A Methodology for Predicting the Production Cost of Parts Fabricated Using Incremental Forming
142940	Praveen Karebasannanavar Ramachandrappa	A Multifaceted Analytical, Numerical, and Experimental Approach of Quantifying Residual Stress in Fiber Reinforced Polymer Composites
142882	Haofan Sun, Magnas Joseph Albert, Srikar Anudeep Remani, Shenghan Guo, and Qiong Nian	A Physical Comprehensive Model for Studying Temperature Evolution in FDM 3D Printing
142297	Yung-Chun Lin, Chen Qian, Shorya Awtar, and Chinedum Okwudire	A Preliminary Investigation of Input Shaping to Reduce the Residual Vibration of a Wafer-Handling Robot
141767	Rongxuan Wang	Advanced Open-Architecture LPBF Testbed
144256	Mahtab Heydari	An Active Machine Learning Approach for Spatial-Temporal Temperature Prediction of a Moving Heat Source
142918	Valerie Zapata, and Nancy Diaz-Elsayed	An Environmental Life-Cycle Assessment of Alternative 3D Printed Footwear

POSTER SESSION

TUESDAY JUNE 18, 2024

141663	Juan Du	Ano-Sups: Multi-Size Anomaly Detection for Manufactured Products by Identifying Suspected Patches
142871	Kojo Welbeck, Ru Yang, Guangze Li, Yahui Zhang, Hui-Ping Wang, Blair Carlson, and Ping Guo	Application of Graphical Neural Network for Point Cloud Segmentation and Detection of Patterned Welds
141875	Marielena Molinares, Jiachen Liu, and Changxue Xu	Cancer Cell Proliferation and Migration Using a 2D Micropillar Surface and 3D Printed Construct
142870	Dylan Joralmon	Continuous 3D Printing of Metal Structures Using Ultrafast Mask Video Projection Initiated Vat Photopolymerization
141937	Ritin Matthews, Jaydeep Karandikar, Christopher Tyler, Scott Smith, and Tony Schmitz	Coupled Eulerian-Lagrangian Thermomechanical Model to Predict Residual Stress During Additive Friction Stir Deposition of Aluminum 6061
142462	Malachi Landis, and Ping Guo	Dauber: Orbital, Continuous-Feed Additive Friction Stir Deposition
142353	Kaustubh Deshmukh, Alexander Riensche, Ryan Lane, Kale Snyder, Christopher Williams, Reza Mirzaeifar, and Prahalada Rao	Deciphering the Effect of Part Thermal History on Microstructure and Mechanical Properties in Laser Powder Bed Fusion of Stainless Steel 316l
142495	Nichika Masaki, and Norikazu Suzuki	Design of an Acoustic Measurement System for Non-Contact Displacement Estimation and Its Experimental Verification in Turning Operations
142832	Anirban Tudu, Shashi Bhushan Gunjan, and D.S. Srinivasu	Design Strategy for Realizing Optimized Calibration Rod for an End Mill Cutter Based on Receptance Coupling Substructure Analysis
142592	Ipsita Mohanty, Saurav Misra, Sujoy Kar, and Partha Saha	Development of β-Phase Strengthened Ti Alloy with Improved Mechanical and Tribological Properties via Laser-Material Deposition
142588	Yang Li, Wenlei He, Jingyao Tian, Zhe Nie, Wanhua Zhao, and Wenwu Wu	Directional Thermal Conductivity Structure With Multiple Heat Sources
142931	Byunggun Joung, Chandra Nath, and John Sutherland	Edge Device AI with LSTM-RNN Based Anomaly Detection for Manufacturing
142856	Suk Bum Kwon, Dae Nyoung Kim, Aditya Nagaraj, and Sangkee Min	Effect of Coating During 2-Step Ultra-Precision Machining of Single-Crystal Sapphire

POSTER SESSION

TUESDAY JUNE 18, 2024

143218	Justin Boetius, and Jueun Lee	Effect of Parameters on Forces in Deep Hole Bone Drilling
142345	Marwan Haddad, Jianyue Zhang, Alan Luo, and Sarah Wolff	Effect of Recycled Swarf and Spherical Ti-6AL-4V Feedstocks on Laser Directed Energy Deposition Additive Manufacturing
130046	Michael Seger, Ritin Matthews, Deon Marais, Andrew Venter, Jeremiah Halley, Jyhwen Wang, and Arif Malik	Effects of Aluminum Plate Residual Stress on Machined-Part Distortion
142692	Tianlong Chang, Zaiyu Wang, Xiaoqing Tian, Dingyifei Ma, Shahid Hussain, Lian Xia, and Jiang Han	Electrohydrodynamic Jet Printing Mechanisms and Applications to Flexible Electronic Devices
142422	Supreet Thale, and Christopher Williams	Evaluating Effects of Ultraviolet Exposure Strategies on Multi-Material Interfaces in Direct Ink Write Additive Manufacturing
142941	Nisha Raghunath, Kamyar Raoufi, Karl Haapala, and Christopher Sanchez	Evaluating US Industry Needs and Mechatronics Educational Curricula
142530	Medhavi Kamran, and Vinh Nguyen	Exploring Mixed Reality for Improved Human-Robot Interaction in Manufacturing
124473	Yedhartha Sai Chinnasani, and Hector R Siller	Finite Element Analysis of an Anterior Cervical Plate with Topology Optimization and Lattice Structures
131372	Qingqing He, and Yang Yang	Growing Recyclable and Healable Piezoelectric Composites in 3D Printed Bioinspired Structure for Protective Wearable Sensor
141142	Tengteng Tang, Parimal Prabhudesai, and Cindy (Xiangjia) Li	Highly Removable Support via Vat Photopolymerization of Recyclable Polymer
142637	Nazanin Mahjourian, and Vinh Nguyen	Improved Object Detection for Robotics Using Fused Depth and Image Data
142780	Minjae Seo, Jeonghwa Kim, Yongjun Yoon, Younghun Jeong, and Gyuman Kim	Improvement of Mechanical Properties of Nanofibers Through Hot Pressing
142825	Syed Ibn Mohsin	In-Situ Multi-Modal Waveform-Based Defect Detection Using Deep Learning in Wire Arc Additive Manufacturing Process

POSTER SESSION

TUESDAY JUNE 18, 2024

142822	Dingyifei Ma, Xiaoqing Tian, Tianlong Chang, Shahid Hussain, Lian Xia, and Jiang Han	In-Situ Process Monitoring and Optimization for Extrusion-Based Silicone Additive Manufacturing
141935	Shiqi Fang	Inspection on Scratch Performances of a PVD-Coated Cemented Carbide Previously Micromachined by a Nanosecond Laser
142902	Gabriel Dzukey, Anwar Algamal, Md Muhiulislam Muhit, Sara Ranjbareslamloo, and Ala Qattawi	Interfacial Bonding of Multi-Powder Layers of W and in 718 Using LPBF
126792	M Suresh	Investigation of Energy Absorption Characteristics of the Tubular Auxetic Structure Under Quasi-Static Loading
142069	Oluka Okia, Clare Lanaghan, Jack Palmer, Srinivas Yadavalli, David Fenning, and Neil Dasgupta	Lamination of Perovskite Solar Cells
130381	Abhishek Kumar, Cheruvu Siva Kumar, and Ashish Kumar Nath	Laser Additive Polishing of Additive Manufactured Parts: Effect of Process Parameter on Dimensional Accuracy and Surface Finish
142738	Sara Ranjbareslamloo, Anwar Al Gamal, and Ala Qattawi	Laser Power Bed Fusion Additive Manufacturing of FGMS: Compatibility and Effect of Processing Parameters of In718/ss316
142576	Xavier Hebol D Cruze, and Zhengtao Gan	Long-Range Mass Transport Mechanisms in Solid State Sintering for Additive Manufacturing
142800	Shashi Bhushan Gunjan, D.S. Gunjan Srinivasu, and Ramesh Babu N	Machine Tools Thermal Errors Compensation Based on Reliability Concepts
142939	Sarvesha Rajashekara, James Caudill, and I.S. Jawahir	Machining Induced Surface Integrity of Bulk Nano-Crystalline Cu-Ta System
142938	Youngrok Lee, and Mihaela Banu	Macroscopic and Microstructural Analysis of Ultrasonic Vibration on the Compression of Pure Aluminum Al1100-O
144268	Cle Sanchez, Kirk Lemmen, Haluk Karaca, Osman Anderoglu, Xiatong Yang, Paul Rottman, and Damilola Alewi	Magnetic Field Annealing of HT9 Steel and 7075 Aluminum Alloys
142102	Yixuan Ye, Chang Ye, Chao Tang, and Binghan Huang	Magnetic-Assisted Ultrasonic Nanocrystal Surface Modification

		Induced Microstructures of Titanium Alloy
130291	Jong Wan	Materials Extrusion System for Dense Ceramic Additive Manufacturing with Al2O3 Sol-gel Composite
141990	Tsutomu Uenohara, Taiyu Ito, Yasuhiro Mizutani, and Yasuhiro Takaya	Measurement of Tool Edge Geometry Using Saturated Fluorescence from Cutting Fluid
142721	Chuang Qu, Luca Caruso, and Kevin Walsh	Microfabrication of Fish Scale-Inspired Surfaces via Glad with Line Seeds
141661	Gyu Bok Choi, Dong Uk Kim, Seung Han Yang, and Young Hun Jeong	Milling Process Monitoring of Chopped Carbon Fiber Reinforced Thermoplastic Plastic
142903	Akhter Zia	Mof-Laden 3D Printed Monolithic Filter Design and Manufacturing
142952	Felicia Fashanu, Maya Rohrer, Denis Marcellin-Little, and Barbara Linke	Mold Enclosure Finishing for Additively Manufactured Orthopedic Metal Implants with a Focus on Veterinary Medicine
142815	Yan Chen, and Yingge Zhou	Multiscale Channelized Biomimetic Scaffolds for Tissue Vascularization
142915	Kazi Safowan Shahed	Novel Zinc Casting for Biomedical Applications
142575	Shaowei Jiang, Haibo Liu, Yueshuai Zuo, Daomian Sun, Jianming Li, Lingsheng Han, Kuo Liu, and Yongqing Wang	Optimization of Milling Cutter for Superalloy Honeycomb Machining
142937	Melanie Howe, Luis Mantilla, and Abhishek Indupally	Optimization of Surface Roughness in the Electrodeposition Process
140939	Sarower Tareq, Alexandra DeFilippis, Haseung Chung, and Patrick Kwon	Optimization of the Processing Parameters for Laser Powder Bed Fusion and Subsequent Post Processing to Fabricate Functional Nitinol Stents
142956	Daniel Cooper, and Muhammad Umar Farooq	Physics-Based Multi-Fidelity Machine Learning for Gate-to-Gate Life-Cycle Assessment
142529	Augustine Twumasi, Prokash Chandra Roy, Jin Young Choi, Zhengtao Gan	Physics-Guided Scan Paths Optimization for Controlled Microstructure in Laser Powder Bed Fusion
142209	Benjamin Bevans, Alexander Riensche, Yuri Plotnikov, John Sions,	Process Monitoring and Fault Detection in Laser Powder Bed Fusion Using

	Kyle Snyder, Derek Hass, and Prahalada Rao	Acoustic Emission and Heterogeneous Sensor Fusion
142070	Jun Ma, Sigmund A. Tronvoll , Jørgen Blindheim, Geir Ringen, and Torgeir Welo	Reconfigurable Tooling for Customized Stretch Forming of Profiles
142840	Chen Kan, and Yujing Yang	Recurrence Network-Based 3D Geometry Representation Learning for Quality Control in Additive Manufacturing of Metamaterials
142955	Dan Nguyen, Reza Mirshams, Ravi Sankar Haridas, and Hector Siller	Residual Stress Measurement Using Nanoindentation on Parts Additively Manufactured by Laser Powder Bed Fusion (LPBF)
142916	Aishwarya Deshpande, Frank Pfefferkor, Christian Baumann, and Barbara Linke	Reusable Unit Process Life Cycle Inventory for Solid-State Deposition Process: Friction Surfacing
142894	Slesha Tuladhar	Rheological Characterization of Algae Infused Hydrogel Precursors
142607	Jacklyn Griffis, Andrew Masker, Jeremy Schreiber, and Guha Manogharan	Site-Specific Property Informed Interface Design of Multi-Material Laser Powder Bed Fusion
142863	Nismath Valiyakath Vadakkan Habeeb, David Jaggers, and Kevin Chou	Size Effect on Porosity of Thin Struts Fabricated by Laser Powder-Bed Fusion
141427	Chuan He, and Chinedum Okwudire	Smartscan: LPBF Scan Sequences Optimization for Reducing Distortion and Residual Stress
142140	Itzel Chavez Martinez, Ved Mistry, and Dhruv Bhate	Structure-Function Relationships for the Bio-Inspired Design of Scales
142859	Rui Liang, Aditya Nagaraj, Suk Bum Kwon, Dae Nyoung Kim, Dalei Xi, Yiyang Du, Woo Kyun Kim, and Sangkee Min	Study on the Residual Stress Anisotropy in Machined Sapphire Using Raman Spectroscopy
142775	Shenghan Guo, Hasnaa Ouidadi, and Boyang Xu	Support-Structure Decision in 3D Printing with Unsupervised Computer Vision
143186	Kevin Chou, and Beytullah Aydogan	Surface Formation Using 3D Simulation Data
142949	Navaneeth Chandran, and Sam Anand	Topology Optimization for Modifying Part Design to Minimize Stress Concentration

POSTER SESSION

TUESDAY JUNE 18, 2024

142370	Joshua Adesina, J.C. Thomas, Gönül Kaletunç, and Xun Liu	Understanding Temperature Development and Powder Dynamics During Ultrasonic Compression of Different Flour Systems
142852	Anna Keim, Jaylen Young, Cyra Hanson, Megan Collins, and Monique McClain	Understanding the Role of Print Bed Thermal Behavior on Defect Formation in Fused Filament Fabrication
142869	Israt Zarin Era, Imtiaz Ahmed, Srinjoy Das, and Zhichao Liu	Unsupervised Promptable Defect Segmentation in Laser Additive Manufacturing
142936	Shailesh Padalkar, and Sam Anand	Virtual Reality Training for Semiconductor Chip Manufacturing
142826	Swarit Anand Singh, and Kaushal A Desai	Vision-Based In-Line Surface Defect Detection System to Realize Zero Defect Manufacturing During Mass Production of Rollers
142065	Ridwan Olabiyi, Jordan Weaver, and Ashif Iquebal	Characterization of Elastoplastic Properties of Additively Manufactured Specimens from Indentation Data Using Stochastic Inverse Modeling
127916	John Shelton	Investigation of Magnetic Field-Assisted Stereolithography 3d Printed Materials Containing Graphene Nanoplatelets

NAMRC TRACK 2 KEYNOTE

TUESDAY JUNE 18, 2024

Finishing processes of metal additive manufactured alloys

Stefania Bruschi

Deputy Director, Dept. of Industrial Engineering

University of Padova, Italy

09:00-10:15 | KCC Room 301B

Abstract

Additive Manufacturing (AM) of metal alloys offers unique advantages in producing net-shape components of complex geometries with very little material waste. Nevertheless, functional surfaces may need finishing to achieve the required surface finish and geometrical tolerances, and, therefore, the part in-service performance. Among finishing processes dedicated to AM parts, the talk will focus on machining operations carried out with tools of defined geometry. The latter pose particularly challenging issues since the microstructural features characterizing the AM alloys are drastically different from those of the wrought ones of the same chemical composition, which, in turn, may affect the material machinability response to a great extent.

The talk will address metal AM machinability in terms of tool wear and surface integrity, showing how they are affected by the AM-induced microstructural features and build-up orientation. In addition, the correlation between machinability and in-service performance of the AM part will be discussed, with the final aim of designing the AM-based process chain to ensure the required characteristics of the part in its service life.

Biography

Stefania Bruschi, PhD, is professor of professor of Manufacturing Technologies at the Department of Industrial Engineering at the University of Padova, Italy, and former Head of the same department. Her major research areas include sheet and bulk metal forming and machining of metal alloys, with a focus on material behavior, process, and product performances. The research activities are carried out in the framework of EU and Italian-funded projects, and research contracts with Italian and European manufacturing companies. She is a fellow of CIRP (The International Academy for Production Engineering), and currently Vice-Chair of the CIRP Scientific Technical Committee “Forming”. She is a co-author of 300 Scopus-indexed publications.

NAMRC TRACK 1 KEYNOTE

TUESDAY JUNE 18, 2024

Experiential Education Approaches for the Automotive Industry

Laine Mears

Professor and Department Chair

Clemson University

10:30-11:45 | KCC Room 301A

Abstract

The automotive industry is an excellent example of a complex systems-of-systems environment, where decisions and subsequent system behaviors can have significant effect on coupled subsystems. This coupling can manifest in technical domains (e.g., how electrical design decisions can affect mechanical vehicle behaviors), functional domains (e.g., how material selection for lightweighting can affect safety crashworthiness), organizational domains (e.g., how design decisions can drive manufacturing development), and educational domains (e.g., how graduate programs can interface meaningfully with technical programs).

In this talk, Prof. Mears will outline several educational approaches being deployed at the Clemson University – International Center for Automotive Research which embrace the coupled complexity of this industry. Industry-facing experiential learning programs highlighted will include Deep Orange, a program which carries students through the entire vehicle development, realization, and manufacturability analysis processes, and the NSF-sponsored Technology-Human INtegrated Knowledge, Education and Research (THINKER) program which puts graduate, undergraduate, and technical college students together on teams for designing human-integrated vehicle assembly approaches. He will also provide an overview of the nation's first degreed Automotive Engineering bachelor's program which embraces the concepts of multidisciplinarity and systems integration.

Biography

Laine Mears leads the nation's only department of Automotive Engineering at Clemson University. He teaches and conducts research in manufacturing process control, new process development, and manufacturing equipment diagnostics at the Clemson University International Center for Automotive Research in Greenville, SC, USA, and has published over 200 peer-reviewed articles. He is the recipient of the SME International Education Award, the ASME Outstanding Service Award, NSF CAREER award, SAE Ralph Teetor Educational Award, and the George Stephenson Gold Medal and Thatcher Bros. Prize from the UK Institution of Mechanical Engineers. He currently directs a National Science Foundation Traineeship Program which educates graduate students concurrently with technical college students on human-technology issues. Laine is a Fellow of both ASME and SME, and a Senior Member of the American Society for Quality. He is an SME CMfgE, ASQ CQE, and licensed Professional Engineer. He also has 10 years industry experience in precision manufacturing and assembly for the automotive industry.

NAMRC TECHNICAL SESSIONS

TUESDAY JUNE 18, 2024

09:00-10:15 301A	**NAMRC - TRACK 3 MATERIAL REMOVAL - Session 1** *Session Chair: Wilfredo Moscoso-Kingsley | Session Co-Chair: Boqiang Qian*	
Paper 257	Wilfredo Moscoso Kingsley, Aditya Pandey and Viswanathan Madhavan	Photoelastic measurement of tool stress distribution when machining AA-7075-T6 under dynamic conditions produced by shear banding
Paper 2	Boqiang Qian, Papia Sultana, Ricardo Toro, Glennys Mensing and Placid Ferreira	Plasmonic Image Reproduction with Solid-State Superionic Stamping (S4)
Paper 20	Junichi Nakagawa, Yusuke Yoshimi, Katsumasa Chiba and Ryutaro Tanaka	Evaluation and quantification of diffusion wear between cutting chip and workpiece using forging press
09:00-10:15 301B	**NAMRC - TRACK 2 MANUFACTURING PROCESSES - Session 1** *Session Chair: Xiaochun Li | Session Co-Chair: Stefania Bruschi*	
Track 2 keynote	Stefania Bruschi	Finishing processes of metal additive manufactured alloys
Paper 8	Guan-Cheng Chen and Xiaochun Li	Nanotechnology-enhanced castability of wrought aluminum alloys 2024 and 6063
09:00-10:15 301C	**NAMRC - TRACK 7 SUSTAINABLE MANUFACTURING - Session 1** *Session Chair: Shreyas N. Melkote | Session Co-Chair: Nehika Mathur*	
Paper 58	Ji Ho Jeon, Jun Young Choi, Geun Young Kim, Cheonghwa Lee, Jennifer Callanga, Shreyes Melkote and Sung-Hoon Ahn	Assessment of Recycling and Repair Methods for Discontinuous Glass Fiber Reinforced Vitrimer Composites with Reclaimed Parts
Paper 47	Yong Han Kim, Sidi Deng, Thomas Maani, Nehika Mathur, Matthew Triebe and John Sutherland	Developing manufacturing-relevant indicators for assessing long-run circularity of a product's life cycle

Paper 18	Abdullah Al Mamun, Mohammad Abbas Uddin, Md Abu Sayeed Shohag, Mahathir Mohammad Bappy and Amit Talukder	Data-driven life cycle assessment-based energy consumption modeling for measuring carbon footprints: A case study in the apparel industry
09:00-10:15 200A	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 1** *Session Chair: Wei Lu | Session Co-Chair: Dhruv Bhate*	
Paper 118	Kishore Mysore Nagaraja, Dong Qian, Masakazu Soshi and Wei Li	Conforming mesh modeling of multi-physics and residual stress in multi-layer powder bed fusion process
Paper 3	Mandar Shinde, Irving Ramirez-Chavez, Alexander Potts and Dhruv Bhate	A Critical Assessment of the Onset Strain of Densification in the Evaluation of Energy Absorption for Additively Manufactured Cellular Materials
Paper 10	Stephanie B. Lawson, Milad Ghayoor, Xianzhe Fu, Ali Tabei, Andy Fan and Somayeh Pasebani	Thermal profile modeling and microstructural evolution in laser processing of Inconel 625 plates by comparison of analytical and numerical methods
09:00-10:15 200B	**NAMRC - TRACK 5 SMART MANUFACTURING & CPS - Session 1** *Session Chair: Qing (Cindy) Chang | Session Co-Chair: Peng (Edward) Wang*	
Paper 70	Lakmali Nadeesha and Peng Wang	Efficient Stochastic Parametric Estimation for Lithium-Ion Battery Performance Degradation Tracking and Prognosis
Paper 6	Kshitij Bhatta, Muhammad Waseem, Chen Li and Qing Chang	Dynamic Modeling and Real-time Performance Analysis of Multi-product Batch Manufacturing Systems with Perishable Products
Paper 51	Miles Bimrose, Tianxiang Hu, Davis McGregor, Jiongxin Wang, Sameh Tawfick, Chenhui Shao, Zuozhu Liu and William King	Automatic Detection of Hidden Defects and Qualification of Additively Manufactured Parts using X-Ray Computed Tomography and Computer Vision

NAMRC TECHNICAL SESSIONS

TUESDAY JUNE 18, 2024

10:30-11:45 301A	**NAMRC - TRACK 1 MANUFACTURING SYSTEMS - Session 2** *Session Chair: Ahmed Azab | Session Co-Chair: Laine Mears*	
Track 1 Keynote	Laine Mears	Experiential Education Approaches for the Automotive Industry
Paper 15	Abdulnasser El-Gaddar, Ahmed Azab and Mohammed Fazle Baki	Batch-Sizing and Machinability Data Systems for Milling Operations: An Optimal Sustainable Cost of Quality Approach
10:30-11:45 301B	**NAMRC - TRACK 2 MANUFACTURING PROCESSES - Session 2** *Session Chair: Stefania Bruschi | Session Co-Chair: Shreyas N. Melkote*	
Paper 135	Eren Can Sariyarlioglu, Torgeir Welo and Jun Ma	On the mechanisms of charge weld evolution in aluminium extrusion
Paper 140	Enrico Simonetto, Ali Beigzadeh, Andrea Ghiotti and Stefania Bruschi	Evaluation of the effect of forming strategy in newly introduced flexible roll forming process
Paper 31	Ji Ho Jeon, Navjyot Panpalia, Asif Rashid and Shreyes Melkote	Effect of Electropolishing on Ultrasonic Cavitation in Hybrid Post-Processing of Additively Manufactured Metal Surfaces
10:30-11:45 301C	**NAMRC - TRACK 3 MATERIAL REMOVAL - Session 2** *Session Chair: Wonkyun Lee | Session Co-Chair: Binghan Huang*	
Paper 56	Jun-Young Oh, Jae-Eun Kim and Wonkyun Lee	Model-based tool wear detection and fault diagnosis for end mill in various cutting conditions
Paper 72	Chao Tang, Yixuan Ye, Yu Zhang, Binghan Huang, Tao Huang, Dong Zhang, Xiaoming Zhang and Chang Ye	Improving Surface Integrity of GH4169 Alloy through Magnetic-assisted Cutting
Paper 80	Sung-Jin Choi, Jun-Young Oh and Wonkyun Lee	Active compliance control of grinding process for stripping enameled copper wire
10:30-11:45 200A	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 2** *Session Chair: Kandice Suane Barros Ribeiro | Session Co-Chair: Akshar Kota*	

Paper 249	Himanshu Balhara, Cagatay Yelkarasi, Ali Erdemir and Satish Bukkapatnam	Spatial characteristics of ultra hard coating on directed energy deposition (DED)-printed 316L with a novel ultrafast boriding
Paper 16	Kandice Suane Barros Ribeiro, Ana Cecília Reghini and Reginaldo Teixeira Coelho	An analytical model for estimating process parameters input in L-DED based on bead geometry
Paper 33	Asif Rashid, Akshar Kota and Shreyes N. Melkote	Evolution of Microstructure and Mechanical Property Enhancement in Wire-Arc Directed Energy Deposition with Interlayer Machining
10:30-11:45 200B	**NAMRC - TRACK 5 SMART MANUFACTURING & CPS - Session 2** *Session Chair: Abdullah Al Mamun | Session Co-Chair: Douglas Bristow*	
Paper 254	Mitchell Woodside, Tianhao Cui, John Emelko, Soichi Ibaraki, Robert Landers and Douglas Bristow	A Feedforward Kinematic Error Controller with an Angular Positioning Deviations Model for Backlash Compensation of Industrial Robots
Paper 245	Rodrigue Tambeck Nguimfack, Mahathir Mohammad Bappy, Abdullah Al Mamun and Wenmeng Tian	Domain Adaptation between Heterogeneous Time Series Data: A Case Study on Real-time Rotary Machinery Fault Diagnosis
Paper 224	Anthony Sexton, Matthew Doolan and Sam Patane	Prediction of resistance spot welding quality using dynamic time warping
13:45-15:00 301A	**NAMRC - TRACK 1 MANUFACTURING SYSTEMS - Session 3** *Session Chair: Pai Zheng | Session Co-Chair: Wei Li*	
Paper 29	Ke Wan, Chengxi Li, Fo-Sing Lo and Pai Zheng	A virtual reality-based immersive teleoperation system for remote human-robot collaborative manufacturing
Paper 32	Ahmed Azab, Hany Osman and Fazle Baki	CAPP-GPT: A Computer-Aided Process Planning-Generative Pretrained Transformer Framework for Smart Manufacturing
Paper 55	Wei Li and Barrie R. Nault	Trade-offs between optimal and robust scheduling in onestage production

NAMRC TECHNICAL SESSIONS

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13:45-15:00 301B	**NAMRC - TRACK 2 MANUFACTURING PROCESSES - Session 3** *Session Chair: Rhett Jones | Session Co-Chair: Murali Sundaram*	
Paper 136	Keith Ng, Kaveh Rahimzadeh Berenji, Allison Brown and Shreyes N. Melkote	Deflection-Limited Trajectory Planning in Robotic Milling
Paper 180	Rhett Jones, Robert Prins and Jack Zhao	Investigating the use of 3D printed tools for electrochemical machining: lessons learned and future improvements
Paper 113	Prayag Gore, Yu Jen Chen and Murali Sundaram	Unsupervised Detection and Mapping of Sparks in the Electrochemical Discharge Machining Process
13:45-15:00 301C	**NAMRC - TRACK 3 MATERIAL REMOVAL - Session 3** *Session Chair: Justin Hijam | Session Co-Chair: Johanna Steiner-Stark*	
Paper 124	Johanna Steiner-Stark, Maximilian Berndt, Benjamin Kirsch and Jan C. Aurich	Influence of micro- and macroscopic tool features and errors within one batch in end milling
Paper 129	Eyob Messele Sefene, Steve Hsueh-Ming Wang and Chao-Chang Arthur Chen	Analysis of Contact Length and Temperature Effect in Rocking Mode Diamond Wire Sawing of Monocrystalline Silicon Carbide Wafer
Paper 256	Justin Hijam and Madhu Vadali	Beyond Symmetry: Investigating Asymmetric Melt Pool Evolution in Multi-Pulse Laser Surface Melting
13:45-15:00 200A	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 3** *Session Chair: Shreyes N. Melkote | Session Co-Chair: Xiaochun Li*	
Paper 19	Tianqi Zheng, Changyu Ma, Alexander Killips, Bingbing Li and Xiaochun Li	Nanoparticle-Enabled Additive Manufacturing of High Strength 6061 Aluminum Alloy via Laser Powder Bed Fusion
Paper 37	Akshar Kota, Shohom Bose-Bandyopadhyay, Asif Rashid and Shreyes N. Melkote	Influence of Milling Interventions on the Geometry of WallShaped Structures in Hybrid Wire-Arc Direct Energy Deposition

Paper 35	Changyu Ma, Tianqi Zheng, Yu-Keng Lin, Philip Mallory, Xiaochun Li, Morris Wang, Bruce Kang and Bingbing Li	Achieving uniform distribution of nanoparticles in oxide dispersion strengthened (ODS) SS316L through laser powder bed fusion (L-PBF)
13:45-15:00 200B	**NAMRC - TRACK 5 SMART MANUFACTURING & CPS - Session 3** *Session Chair: Gregory Vogl | Session Co-Chair: Yi Wang*	
Paper 207	Yanghu Wang, Zheng Zhou, Laihao Yang, Robert X. Gao and Ruqiang Yan	Wavelet-driven Differentiable Architecture Search for Planetary Gear Fault Diagnosis
Paper 74	Xu Han, Marcella Miller, Gregory Vogl, Guanyu Chen, Chengfu Chou and Xiaodong Jia	Robust feature design for early detection of ball screw preload loss
Paper 128	Patrick McKelvey, Fang Wang, Yao Yao and Yi Wang	A Human-Centered Intelligent Platform for Holographic Control and Management of 3D Printers
15:15-16:30 301A	**NAMRC - TRACK 1 MANUFACTURING SYSTEMS - Session 4** *Session Chair: Ray Y. Zhong | Session Co-Chair: Steven Rice*	
Paper 6	Zhihui Chen, Zeyu Xiao, Yize Sun, Yuhao Dong and Ray Y. Zhong	Production efficiency analysis based on the RFID-collected manufacturing big data
Paper 12	Steven Rice, Ahmed Azab and Sherif Saad	Fusion IK: Solving Inverse Kinematics using a Hybridized Deep Learning and Evolutionary Approach
Paper 65	Yuxin Wang, Yishu Yang and Ray Y Zhong	Data analytics for working performance analysis in production management
15:15-16:30 301B	**NAMRC - TRACK 2 MANUFACTURING PROCESSES - Session 4** *Session Chair: Livan Fratini | Session Co-Chair: NavneetArora*	
Paper 139	Muhammad Adnan, Antonio Barcellona, Gianluca Buffa, Davide Campanella and Livan Fratini	Investigating the influence of deposition techniques and processing conditions on AA2024/SiC FSW joints: Evaluation of microstructural and mechanical properties

Paper 36	David Fieser, Lingyue Zhang Zhang, Matthew Yao, Hugh Shortt, Peter Liaw and Anming Hu	Femtosecond Laser Joining of Stellite and Stainless Steel
Paper 131	Rajdev Singh, Amit Choudhary and Navneet Arora	Employing the electrode of different diameters to join dissimilar Al-Cu thin sheets using resistance spot welding
15:15-16:30 301C	**NAMRC - TRACK 3 MATERIAL REMOVAL - Session 4** *Session Chair: Mark Rubeo | Session Co-Chair: Dave Kim*	
Paper 17	Hyeong Gu Kim, Tae Hwa Hong, Dave Kim and Seong Hyeon Kim	Machinability of a woven carbon fiber preform on the ultrasonic-knife cutting process conducted by an industrial robot
Paper 76	Mark Rubeo	Experimental Validation of the Amplitude Ratio as a Metric for Milling Stability Identification
Paper 100	Nishant Ojal, Ryan Copenhaver, Harish P Cherukuri, Kyle T Devlugt, Adam W. Jaycox and Kyle Beith	Modeling Modulated Tool Path Turning using Coupled Smoothed Particle Hydrodynamics and Finite Element method
15:15-16:30 200A	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 4** *Session Chair: Rohan Shirwaiker | Session Co-Chair: Yan Lu*	
Paper 39	Andrew Couch and Yan Lu	Expanding MAM Readiness: Towards A Holistic Model for Metal Additive Manufacturing in the Fourth Industrial Revolution
Paper 43	Tavila Sharmin and Rohan Shirwaiker	Assessing Design-induced Elasticity of 3D Printed Auxetic Scaffolds for Tissue Engineering Applications
Paper 54	Shafahat Ali, Vijayant Mehra, Abdelkrem Eltaggaz, Ibrahim Deiab and Salman Pervaiz	Optimization and Prediction of Additive Manufacturing of PLA-PHA Biodegradable Polymer Blend Using TOPSIS and GA-ANN
15:15-16:30 200B	**NAMRC - TRACK 5 SMART MANUFACTURING & CPS - Session 4** *Session Chair: Martin Jun | Session Co-Chair: WenmengTian*	

Paper 209	Durant Fullington, Emmanuel Yangue, Mahathir Bappy, Chenang Liu and Wenmeng Tian	Leveraging Small-scale Datasets for Additive Manufacturing: Current Practice and Remaining Gaps
Paper 235	Michail Katsigiannis, Madison Evans, John Osho, Minas Pantelidakis, Julia Bitencourt and Konstantinos Mykoniatis	Empowering Decentralized Production: A Distributed Manufacturing System for Additive Manufacturing Processes
Paper 237	Jiho Lee, Semih Akin, Yuseop Sim, Hojun Lee, Eunseob Kim, Jungsoo Nam, Kyeongeun Song and Martin Jun	A stethoscope-guided interpretable deep learning framework for powder flow diagnosis in cold spray additive manufacturing

MSEC SPECIAL SESSIONS

TUESDAY JUNE 18, 2024

09:00-10:15 **200C**	**ASME Student Manufacturing Design Competition - 1** *Session Chair: Jaydeep Karandikar*
Mitchell Mello, Erasmo Garcia, Alex Vega Arcay, Benjamin Sanguinetti, Logan Bolling, and Ryan Shenefelt *(Robert Hart: University of Texas Dallas)*	Long Wire Assembly Process Improvement
Cameron Cash, Tristan Linn, Dane Chronister, Jason Thomas, Hayden Ellis, and Genesis Di Mattia (*Robert Hart: University of Texas Dallas*)	Connector Stake Insert Machine
Alireza Behvar (*Meysam Haghshenas: University of Toledo*)	Impact of Corrosion on Rotating Bending Fatigue of Additive Manufactured 316L Stainless Steel: New Model Development

10:30-11:45 **200C**	**ASME Student Manufacturing Design Competition - 2** *Session Chair: Jaydeep Karandikar*
Daniel Penley, Tae H. Cho, Andre Brooks, Lauren Ransohoff, Hyunwoo Park, Ellis Herman, Enpei Zhao, and Orlando Trejo *(Kira Barton, Neil P. Dasgupta: University of Michigan)*	Process Control for Spatial Atomic Layer Deposition
Jack Shanks, Caitlyn Harrington, Maeve Sousa, Gachau Kabuga, and Patrick Chernjavsky (*Yihao Zhenga: Worcester Polytechnic Institute*)	Flow the Polishing Power to the Unreachable - HydroFlex System for Polishing Complex Internal Channels
Jacklyn Griffis, and Amber Wang (*Guha Manogharan: Penn State*)	Multi-Material Topology Optimization Enabled by Multi-Material Laser Powder Bed Fusion

13:45-15:00 **200C**	**ASME Student Manufacturing Design Competition - 3** *Session Chair: Jaydeep Karandikar*
Kamin Tahmasbi *(Meysam Haghshenas, University of Toledo)*	Integrated framework for predicting very high cycle fatigue Characteristics of additively manufactured AlSi10Mg based on pore defect structures and surface roughness
Tianyu Gao, and Thiraj Santhush Wegala *(Rongxuan Raphael Wang: Auburn University)*	The development of an open-architecture multi-physics controllable LPBF testbed

MSEC TECHNICAL SESSIONS

TUESDAY JUNE 18, 2024

09:00-10:15 301D	**AdM1-3 (1): Multi-Material Processing in Additive Manufacturing** *Session Chairs: Monique McClain and Mostafa Yourdkhani*	
125262 [BP]	Supreet S. Thale, and Christopher B. Williams	Evaluating Effects of Ultraviolet Exposure Strategies on Multi-Material Interfaces in Direct Ink Write Additive Manufacturing
122414 [BP]	Nolan Aberdeen, Kimia, Forghani, and Ryan Sochol	Geometric Determinants of Material Jetting-Enabled Bi-Material Interface Integrity Using Polyjet 3D Printing
09:00-10:15 301E	**MS7-1 (5): AI for Smart Manufacturing Systems** *Session Chairs: Chenhui Shao and Ran Jin*	
124764	Jeon Ho Kang, Neel Dhanaraj, Omey Manyar, Siddhant Wadaskar, and Satyandra Gupta	A Task Allocation and Scheduling Framework to Facilitate Efficient Human-Robot Collaboration in High-Mix Assembly Applications
125279	Sourabh Deshpande, Manish Raj Aryal, and Sam Anand	Deep Learning-Based Recognition of Manufacturing Components Using Augmented Reality for Worker Training of Assembly Tasks
130310	Azzam Radmam, Faisal Aqlan, Pratik Parikh, and Md Noor E Alam	A Deep Reinforcement Learning Approach for Production Scheduling in Computer Server Industry
09:00-10:15 300B	**LCE4_1 (1): Advances in Sustainable Manufacturing for Improved Component Life Cycle Performance** *Session Chairs: Ritin Mathews, Julius Schoop and Muyue Han*	
125110 [B]	Jingwen Wang, Lingxiang Yun, and Lin Li	Sizing of Grid-Connected PV-Battery System in Manufacturing Facility Considering Life Cycle Assessment
124484 [B]	Lingxiang Yun, Muyue Han, and Di Wang	Enhancing Low-Carbon Routing Through Additive Manufacturing of Reconfigurable Products: An Exploratory Study
125115 [B]	Lucia Valenzuela, Muyue Han, and Lin Li	Dimensional Integrity of 4d Printed Parts: A Multi-Cycle Analysis for Quality Assurance
125564 [BP]	Mario Israel RiFrio, Karl Haapala, and Zhaoyan (Andy) Fan	A Methodology for Predicting the Production Cost of Parts Fabricated Using Incremental Forming

124121 [B]	Garrett Price, Zhuangru Wen, Yunlong Tan, and Guoying Dong	Energy Prediction Model for the Sustainability of Continuous Fiber Reinforced Polymers Made by Fused Deposition Modeling
09:00-10:15 300C	**MP6_2 (1): Advances in Machining and Metrology** *Session Chairs: Norikazu Suzuki and Burak Sencer*	
124451[B]	Daming Shi, Senlin Ma, Tao Huang, and Xiaoming Zhang	A Theoretical Cutting Force Model Coupled with Surface Topography and Vibrations in Milling of Laser Cladding Layers
128419 [B]	Shun Liu, Yang Xiang, Qunfi Gu, Sun Jin, Changqi Yang, and Yongqiao Jin	Modeling of Geometric Variation Propagation in Multi-Axis Robotic Assistant Milling System
131699 [B]	Mert Ozdemir, and Burak Sencer	Brief Paper: A Preliminary Study on the Dynamics of Modulated Turning (MT) with Spindle Speed Variation (SSV)
129976 [BP]	Madhur Pandya, Mohit Agarwal, Alok Srivastava, Dhruv Narayan, and Naresh Bhatnagar	A Comparative Study of Helical Polygonal Turning and Helical Peripheral Milling in a Turn-Mill
124162 [BP]	Nichika Masaki, and Norikazu Suzuki	Design of an Acoustic Measurement System for Non-Contact Displacement Estimation and Its Experimental Verification in Turning Operations
09:00-10:15 300D	**NMM8_1 (1): Advances in Meso, Micro and Nano Manufacturing in Industry 4.0** *Session Chairs: Sekhar Rakurty and Soham Mujumdar*	
124112 [B]	Daniel Penley, and Neil P. Dasgupta	Spatial Atomic Layer Deposition: Experimentally Validated Modeling for Improved Process Control
125141 [B]	Andriy Sherehiy, Michael Sassa, Douglas Jackson, Daniel Sills, Dilan Ratnayake, Ruoshi Zhang, Zhong Yang, Kevin Walsh, John Naber, and Dan O. Popa	Aerosol Jet and Inkjet Printing of Electrical Interconnects for Die Level Packaging of Custom MEMS Devices
125364 [B]	Rituparna Mohanty, Yogin Patel, Bryan Llumiquinga, and Jonathan Singer	Dynamic Mechanical Properties of Carbon Fiber Reinforced with

		Macropore-Infused Nanoparticle Emulsion Thermoset (Minets)
124055 [BP]	Shiqi Fang, Nuria Salan, Yuebin Guo, Carles Colominas, and Luis Llanes	Inspection on Scratch Performances of a PVD-Coated Cemented Carbide Previously Micromachined by a Nanosecond Laser
10:30-11:45 301D	**AdM1_1 (1): Advances in Metal Additive Manufacturing Processes** *Session Chairs: Dong Lin and Emily Wall*	
125361 [BP]	Augustine Twumasi, Prokash Chandra Roy, Jin Young Choi, and Zhengtao Gan	Physics-Guided Scan Paths Optimization for Controlled Microstructure in Laser Powder Bed Fusion
123865 [BP]	Kaustubh Deshmukh, Alexander Riensche, Ryan Lane, Kyle Snyder, Christopher Williams, Reza Mirzaeifar, and Prahalada Rao	Deciphering the Effect of Part Thermal History on Microstructure and Mechanical Properties in Laser Powder Bed Fusion of Stainless Steel 316L
122505 [BP]	Ipsita Mohanty, Saurav Misra, Sujoy Kumar Kar, and Partha Saha	Development of β-Phase Strengthened Ti Alloys with Improved Mechanical and Tribological Properties via Laser-Material Deposition
125316 [B]	Bemnet Molla, Tadek Kosmal, and Christopher Williams	Adaptive Layer Height Control for WAAM Oscillatory Toolpaths Enabled by In-Situ 3D Scanning
124101 [B]	Emily S. Wall, Gehendra Sharma, Elton Freeman, Walker Jarell, and Joel Austin	Evaluation of Single Wall Builds Using Wire Arc Additive Manufacturing
10:30-11:45 301E	**MP6_1 (1): Advances in Clean Energy and E-Mobility Manufacturing** *Session Chairs: Lei Chen and Wayne Cai*	
Invited Talk 10:30-11:00	Speaker - Jianlin Li	Manufacturing Cathodes via Dry-Processing for Lithium-Ion Batteries
125340 [B]	Runming Tao, Bryan Steinhoff, Yang-Tse Cheng, and Jianlin Li	Manufacturing Cathodes via Dry-Processing for Lithium-Ion Batteries
124312 [B]	Yifan Zhang, M Shahriar, and Shan Hu	Building High Performance Battery Electrodes with Tailored Structures via

		Fast and Efficient Multi-Scale Texturing
124108 [BP]	Oluka Okia, Clare Lanaghan, Jack Palmer, Srinivas Yadavalli, David Fenning, and Neil Dasgupta	Lamination of Perovskite Solar Cells
10:30-11:45 300B	**BioM3_1 (1): Advances in Design, Manufacturing, and Analysis of Biomedical Devices** *Session Chairs: Lei Chen and Yi Wang*	
125051	Dongyang Yi, Nathan Landry, Samuel Blake, John Baron, and Lei Chen	An Experimental Study of Incremental Buckling-Resistant Inchworm-Type Insertion of Microwire Neural Electrodes
124396	Karson Wardell, Yao Han, Qingrui Jiang, Shinghua Ding, Yi Wang, and Yiwei Han	Direct Printing of High-Resolution Metallic 3D Microneedle Arrays (Mas) via Electrohydrodynamic Jet Printing
130799 [BP]	Tianlong Chang, Zaiyu Wang, Xiaoqing Tian, Dingyifei Ma, Shahid Hassain, Lian Xia, and Jiang Han	Electrohydrodynamic Jet Printing Mechanisms and Applications to Flexible Electronic Devices
10:30-11:45 300C	**MEA5_1 (1): Innovations in Equipment Design, Control and Automation** *Session Chairs: Chandra Nath and Lei Zhou*	
125193 [BP]	Yung-Chun Lin, Chen Qian, Shorya Awtar, and Chinedum Okwudire	A Preliminary Investigation of Input Shaping to Reduce the Residual Vibration of a Wafer-Handling Robot
124488 [B]	Anirban Tudu, Shashi Bhushan Gunjan, and Sivasrinivasu Devadula	A Design Strategy of Equivalent Calibration Rod for an End Mill Cutter to Replicate Its Dynamic Response Based on Receptance Coupling Substructure Analysis
131361 [B]	Kaan Bahtiyar, and Burak Sencer	Brief Paper: Model-Less Adaptive Spindle Speed Regulation for Mitigation of Machining Vibrations
125414 [B]	Kazi MD Masum Billah, Neel Ashwinbhai Gleasman, Marrio Barron Gonzalez,	Development of Wire Delivery Tool with Desktop 3D Printer for Multifunctional Additive Manufacturing

	Jeffrey David Gleasman, Ruben Alan Lopez, and Kristian Torres	
125435 [B]	Danny Hoang, Hanning Chen, Mohsen Imani, Ruimin Chen, and Farhad Imani	Multi-Task Brain-Inspired Learning for Interlinking Machining Dynamics With Parts Geometrical Deviations
10:30-11:45 300D	**MP6_4 (1): Deformation Processing of Metals and Alloys** *Session Chairs: Yang Guo and Jinjin Yang*	
Invited Talk 10:30-11:15	Speaker - Christopher J. Saldaña	Manufacturing Innovation for America's Clean Energy Future
125220 [BP]	Youngrok Lee, and Mihaela Banu	Macroscopic and Microstructural Analysis of Ultrasonic Vibration on the Compression of Commercially Pure Aluminum Al1100-O
129948 [BP]	Binghan Huang, Longjie Xu, Kai Wang, Yu Zhang, Chao Tang, Yixuan Ye, and Chang Ye	Enhancing Laser Shock Peening Effect on AA7075 Using a Magnetic Field
13:45-15:00 301D	**AdM1_2 (1): In Situ Monitoring and Non-Destructive Testing of Additive Manufacturing Processes** *Session Chairs: Samantha Webster and Jihoon Jeong*	
131311 [BP]	Ritin Mathews, Jaydeep Karandikar, Christopher Tyler, Scott Smith, and Tony Schmitz	Coupled Eulerian-Lagrangian Thermomechanical Model to Predict Residual Stress During Additive Friction Stir Deposition of Aluminum 6061
125563 [BP]	Haofan Sun, Magnas Joseph Albert, Srikar Anudeep Remani, Shenghan Guo, and Qiong Nian	A Physical Comprehensive Model for Studying Temperature Evolution in FDM 3D Printing
124359 [BP]	Anna Keim, Jaylen Young, Cyra Hanson, Megan Collins, and Monique McClain	Understanding the Role of Print Bed Thermal Behavior on Defect Formation in Fused Filament Fabrication
125452 [BP]	Ridwan Olabiyi, Jordan Weaver, and Ashif Iquebal	Characterization of Elastoplastic Properties of Additively Manufactured Specimens from Indentation Data Using Stochastic Inverse Modeling
13:45-15:00 301E	**AdM1_4 (1): Smart Additive Manufacturing** *Session Chairs: Azadeh Haghighi and Uduak Inyang -Udoh*	

125152	Meysam Faegh, and Azadeh Haghighi	Generative Adversarial Networks with Domain Knowledge Fusion for Metal Additive Manufacturing
125172	Saleh Valizadeh Sotubadi, Nicholas Hendrickson, and Vinh Nguyen	Integrated Data Processing and Model Selection in Machine Learning Framework Development to Predict Dimensional Errors in Wire Arc Additive Manufacturing (WAAM)
125230	Alexander Riensche, Benjamin Bevans, Grant King, Ajay Krishnan, Kevin Cole, and Prahalada Rao	Predicting Microstructure Evolution in Laser Powder Bed Fusion Additive Manufacturing Using Physics-Based Machine Learning
13:45-15:00 300B	**AMM2_1 (1): Advances in Digital Twins of Manufacturing Processes and Systems** *Session Chairs: Weihong "Grace" Guo and Mihaela Banu*	
124383 [B]	Changheon Han, Hojun Lee, Jiho Lee, Martin Jun, and Huitaek Yun	Digital Twins for Autonomous CNC Equipment Operation
125175 [B]	Suleiman Obeidat, Chris Smith, Iftekhar Basith, Ulaan Dakeev, and Junkun Ma	The Impact of the Size of the Printed Parts on the Shrinkage and Density in Binder Jetting Additive Manufacturing of Ceramics Powder
124799 [BP]	Xavier Hebol D Cruze, and Zhengtao Gan	Long-Range Mass Transport Mechanisms in Solid State Sintering for Additive Manufacturing
124303 [BP]	Zack Okun, Yash Mistry, and Dhruv Bhate	A Framework for a Digital Twin for Coral Morphology: Maps, Models and Data
125396 [BP]	Akhter Zia, and Bashir Khoda	MOF-Laden 3D Printed Monolithic Filter Design and Manufacturing
13:45-15:00 300C	**BioM3_2 (1): Advances in Manufacturing of Tissue Constructs/ Medical Implants and Bioinspired Materials/Structures for Healthcare Applications** *Session Chairs: Yifei Jin and Kaidong Song*	
124474 [BP]	Chuang Qu, Luca Caruso, and Kevin Walsh	Microfabrication of Fish Scale-Inspired Surfaces via Glad with Line Seeds

125216 [B]	Carter Smith, Perrin Woods, Scott Clark, and Md Ahasan Habib	Design and Fabrication of a Nozzle Holding System for a Custom-Made 3D
125184 [B]	Marielena Molinares Ponce, Nicholas Wolpert, Lauren Gollahon, and Changxue Xu	Investigation of the Morphological and Migration Behavior of Breast Cancer Cells on a Micropillar-Based Topography
125171 [B]	Itzel Chavez Martinez, Ved Mistry, and Dhruv Bhate	Structure-Function Relationships for the Bio-Inspired Design of Scales
124413 [P]	Yifei Jin	3D Bioprinting of Multi-Scale Engineered Human Tissue and Organ Analogs
13:45-15:00 300D	**MP6_5 (1): Innovative Joining Processes for Advanced Materials** *Session Chairs: Xun Liu, Yunwu Ma and Yongbing Li*	
124606 [BP]	Joshua Adesina, Xun Liu, Gonul Kaletunc, and J.C. thomas	Understanding Temperature Development and Powder Dynamics During Ultrasonic Compression of Different Flour Systems
125358 [B]	Guanjin Yan, Masoud M. Pour, Teresa J. Rinker, Blair E. Carlson, and Wenda Tan	Spiral Laser Keyhole Welding of Aluminum and Copper: Composition, Microstructure and Properties
JMSE 23-1065 [J]	Andrew Wylie, and Amborish Bannerjee	Finite element modeling and microstructure evolution of the rotary friction welding process of MLX19 maraging steel

WEDNESDAY JUNE 19, 2024

Time	Location	Event
7:00-17:30	Henley Concourse	Registration/ Information
7:00-8:00	Cumberland Concourse	Breakfast
7:30-9:00	300A	SME Journals Meeting
8:00-8:15	Ballroom DEFG	Welcome address: Chad Duty
8:15-8:45	Ballroom DEFG	Keynote: Merlin Theodore
9:00-10:15	301ABCDE, 300BCD, 200AB	Paper Session V
10:00-17:00	Ballroom ABC	Exhibitor Booths Open
10:15-10:45	Cumberland Concourse	Morning Break
10:30-11:45	200D	NSF Roundtable
10:30-11:45	301ABCDE, 300BCD, 200AB	Paper Session VI
12:00-13:30	Ballroom DEFG	ASME MED Award Luncheon
13:45-15:00	301ABCDE, 300BCD, 200AB	Paper Session VII
13:45-15:00	200C	SME Blue Sky Competition I
13:45-15:00	200E	SME Membership/Student Meeting
15:00-15:30	Cumberland Concourse	Afternoon Break
15:00-17:00	Ballroom DEFG	NAMRC Awards Rehearsal
15:00-17:00	Park Concourse	NSF Program Director One-on-one Meetings (Pre-registration required)
15:15-16:30	301ABCDE, 300BCD, 200AB	Paper Session VIII
15:15-16:30	200C	SME Blue Sky Competition II
16:00-18:00	200D	Blacks in Advanced-Additive Manufacturing (BiAM)
16:45-18:00	301ABCDE, 300BCD, 200AB	Paper Session IX
18:00-19:30	200E	SME Journals and Scientific Committee reception
18:00-21:00	Ballroom DEFG	Early Career Forum

KEYNOTE

WEDNESDAY JUNE 19, 2024

Opening remarks

Chad Duty

Professor, UTK MABE and CEO, IACMI

8:00-8:15 | KCC Ballroom DEFG

Biography

Chad Duty is currently the CEO of IACMI – The Composites Institute and a Professor in the Mechanical, Aerospace, & Biomedical Engineering (MABE) Department at the University of Tennessee. Chad also holds a joint faculty appointment with the Manufacturing Demonstration Facility (MDF) at the Oak Ridge National Laboratory (ORNL), where he previously was a Senior Research Scientist and Group Leader of the Deposition Science & Technology Group. Dr. Duty's research has primarily focused on advanced materials and process developments for additive manufacturing, or 3D printing of composite materials. He was part of a team that developed and helped to commercialize one of the world's largest 3D printers called BAAM (Big Area Additive Manufacturing) and created the world's first 3D printed car (the *Strati*). Chad's work has led to over 150 publications, more than a dozen patents, and several R&D100 Awards in this field as well as previous research on roll-to-roll manufacturing and solar energy technologies.

Following his undergraduate degree in mechanical engineering from Virginia Tech in 1997, Chad received his Ph.D. in mechanical engineering from Georgia Tech in 2001. His dissertation focused on the development of a new type of rapid prototyping using Gas-Jet Laser Chemical Vapor Deposition. After spending a few years with Lockheed Martin on the redesign of the C-5 Galaxy, he joined ORNL as a Wigner Fellow in 2004. Dr. Duty's early research involved high temperature material development for small scale nuclear reactors and the use of high intensity plasma arc lamps for the Pulse Thermal Processing (PTP) of various thin films, semiconductors, and photovoltaic materials. Chad also led an initiative on the bacterial-production of complex nanoparticles, called NanoFermentation, and served as ORNL's Solar Program Manager and the Director of Technology for the Tennessee Solar Institute.

More recently, Dr. Duty helped to establish ORNL's Manufacturing Demonstration Facility where he worked to improve the mechanical performance of polymer-based additive manufactured components and contributed to the development of a large-scale 3D printer, called Big Area Additive Manufacturing (BAAM), capable of depositing parts 10x larger and 200x faster than current technology. As Group Leader for Deposition Science & Technology, Chad was involved in a variety of projects including site-specific microstructural control of metal additive manufacturing, neutron imaging and residual stress characterization, magnetic field processing, and direct write electronics. Dr. Duty has also recently served as the Associate Director of UT's Center for Material Processing and Associate Editor of the *Additive Manufacturing* journal. He joined the University of Tennessee in August 2015 and started working with IACMI in November 2022.

KEYNOTE

WEDNESDAY JUNE 19, 2024

Pioneering the Future for Clean Energy Applications with Advanced Fiber Manufacturing in an “Innovation Ecosystem"

Merlin Theodore

Group Leader, Advanced Fibers Manufacturing Group in the Manufacturing Science Division, Oak Ridge National Laboratory

8:15-8:45 | KCC Ballroom DEFG

Abstract

Oak Ridge National Laboratory (ORNL) Manufacturing Science Division houses two user facilities (Carbon Fiber Technology Facility & Manufacturing Demonstration Facility) that are key elements of the US & Tennessee Manufacturing Innovation Ecosystem. The Carbon Fiber Technology Facility and research team has strategically evolved with a proven track record that is evidenced in serving as a key role in the development of scaled fiber manufacturing technologies for clean energy applications. ORNL’s Composites Science and Technology Section within the Manufacturing Science Division focuses on creating an innovation bridge between an idea and implementation for industrial applications and serves as the point of contact for composites research and development by providing comprehensive capabilities ranging from precursor formulation to additive manufacturing and spanning bench scale to industry relevant scale. Merlin will discuss the key elements and future direction of the Carbon Fiber Technology Facility and its success.

Biography

Dr. Merlin Theodore is the Group Leader for the Advanced Fibers Manufacturing Group in the Manufacturing Science Division at Oak Ridge National Laboratory. She guides material research efforts at two Department of Energy national user facilities – the Carbon Fiber Technology Facility and the Manufacturing Demonstration Facility - where she helps industry overcome the barriers associated with advanced fibers such as cost, technology scaling, and product and market development. Her efforts allow technologies to advance from the research and development stage to validation and deployment.

Theodore has more than 13 years of experience in carbon-based composites from the lab scale to commercialization. She has served in numerous leadership positions in government agencies, industry, and academia. Theodore is Head of Excellence at SGL Automotive Carbon Fiber LLC in Moses Lake, Washington, a research scientist and technical advisor for the Minority Leaders Program at Universal Technology Corporation co-located at Wright-Patterson Airforce Base in Dayton, Ohio, and a research faculty at Georgia Tech University.

Theodore has contributed to over 30 publications. She led the filter media initiative for a supply chain of N95 masks needed in the fight against COVID-19 to support the production of filter media for one million masks, three million surgical masks, and half a million N95 face masks per day, in addition to creating more than 1,500 jobs in the state of Florida. She is a member of the National Science Board's class of 2022-2028.

BLUE SKY COMPETITION

WEDNESDAY JUNE 19, 2024

SME Manufacturing Blue Sky Competition

Session 1: 13:45-15:00 | Session 2: 15:15-16:30 | KCC Room 200C

Organizers

Moneer Helu, Michael Sealy, and Brigid Mullany

Description

This is the eighth annual Manufacturing Blue Sky Competition and David Dornfeld Manufacturing Vision Award. The goal of this annual competition is to influence the future of manufacturing research and education in the United States through new visionary ideas of the future. Such visionary ideas are often described as “radical”, “outrageous”, “transformational”, “unconventional”, “convergent”, and “breakthrough”. Presentations should pose grand challenges to be addressed by pursuing the manufacturing research vision, describing the intersections between disparate disciplines necessary to advance that vision. Topical areas should extend beyond the scope of single investigator and show potential for transformative impact in areas of interest to federal agencies.

Six finalists will present on the following topics.

- *Printing Beyond Barriers: A Pathway to Non-Invasive Deep Inside Body Printing*
    - Authors: Mohsen Habibi (UC Davis), Aijun Wang (UC Davis), James Marcin (UC Davis)
    - Presenter: Mohsen Habibi
- *Language of Everything in Manufacturing (LEM)*
    - Authors: Martin Jun (Purdue), Jiho Lee (Purdue), Changheon Han (Purdue), Jurim Jeon (Purdue), Yuseop Sim (Purdue)
    - Presenter: Martin Jun
- *Metrology-, Manufacturing-, and Reverse Design-Guided Repair Engineering*
    - Authors: Chabum Lee (Texas A&M), Jaejong Park (Prairie View A&M), Farid Ahmed (UT Rio Grande Valley)
    - Presenter: Chabum Lee
- *Resilient Cyber Manufacturing Mesh Networks*
    - Authors: Shreyes Melkote (Georgia Tech), Xiaoliang N. Yan (Georgia Tech)
    - Presenter: Shreyes Melkote
- *Beyond Additive with Robotic Assisted Induction Casting in-a-Box for Fast, Distributed and Automated Manufacturing*
    - Authors: Andrew Neils (Northeastern), Jack Lesko (Northeastern)
    - Presenter: Andrew Neils
- *Leveraging Smart Manufacturing to Create Employment Opportunities for People with Disabilities in Manufacturing Industry*
    - Authors: Satyandra Gupta (USC), Berok Khoshnevis (USC), Quan Nguyen (USC), Stefanos Nikolaidis (USC), Gisele Ragusa (USC)
    - Presenter: Satyandra Gupta

The selection committee members are:

- **Adele Ratcliff**, Director, Industrial Base Analysis & Sustainment (IBAS) Program, Department of Defense (DoD)
- **Dale Lombardo**, Special Process Technologies Leader, General Electric Aviation
- **Jaydeep Karandikar**, Senior R&D Staff Member, Advanced Machining and Machine Tool Research group, Oak Ridge National Laboratory
- **John Vickers**, Principal Technologist, Space Technology Mission Directorate, National Aeronautics and Space Administration (NASA)
- **Noel Greis**, Research Professor, University of North Carolina at Charlotte
- **Rich Seugling**, Manufacturing Engineering Section Leader, Lawrence Livermore National Laboratory
- **Brian Rohm**, Principal Engineer CTH, General Electric Aviation

SME MEMBERSHIP MEETING

WEDNESDAY JUNE 19, 2024

SME Membership and Student Meeting

13:45-15:00 | KCC Room 200E

SME Membership - Ice Cream Open House

Join us for an icy-cool adventure at the "Chill with SME - Ice Cream Open House"!

Indulge your sweet tooth while exploring the world of SME! Whether you're a student eager to learn about our vibrant Student Chapters or a professional looking to explore our Membership options, there's a scoop of knowledge waiting for you.

Discover the benefits of SME Membership, where innovation meets opportunity. Dive into the chill vibes of our emerging professionals' scene, or learn how institutions can engage with SME for mutual growth. Plus, get a taste of the exciting SME Engagement programs that make us more than just your average association.

BIAM FORUM

WEDNESDAY JUNE 19, 2024

Blacks in Advanced-Additive Manufacturing (BiAM) Forum

Wednesday, June 19th | 16:00-18:00 | Location: KCC Room 200D

Join us for an enlightening and impactful networking forum titled "Mobilizing Excellence: Advancing Faculty Success in Manufacturing Engineering." This event, hosted by Blacks in Advanced-Additive Manufacturing (BiAM), is designed to inspire and support current and aspiring faculty members in the field of manufacturing engineering. Registration is free! Everyone is welcome.

This Networking Forum promises to be a valuable and transformative experience for all attendees, providing tools, connections, and inspiration to advance faculty success in manufacturing engineering. Don't miss this opportunity to mobilize excellence and take your academic career to new heights!

Networking Forum Title: "Mobilizing Excellence: Advancing Faculty Success in Manufacturing Engineering"

Agenda

16:00-16:05: BiAM Welcome & Introduction

- Dr. Chukwuzubelu Ufodike, Founder of BiAM, and Dr. Chinedum Okwudire, BiAM Co-founder
- Introduction to the forum's goals and significance in enhancing faculty success.

16:05-16:20: Keynote Speaker

- Introduction by the moderator.
- Keynote speaker: A leading figure in manufacturing engineering or academia.
- Delivering an inspiring keynote on the importance of excellence and innovation in faculty roles.
- Sharing personal experiences and insights on professional growth.

16:20-16:40: Panel Discussion on Faculty Development

- Moderated by Dr. Chukwuzubelu Ufodike.
- Distinguished panelists: Faculty members from various institutions.

- Discussing strategies for professional development, career advancement, and excellence in academia.
- Sharing best practices and opportunities for growth in the field of manufacturing engineering.

16:40-16:50: Audience Q&A Session

- Audience engages with panelists.
- Participants can ask questions, share perspectives, and seek advice.
- Interactive and informative segment fostering dialogue and collaboration.

16:50-16:55: Launch of Mentorship Program

- Introduction of BiAM's mentorship program.
- Invitation for mentors and mentees to join the initiative.
- Overview of the program's objectives and benefits for aspiring professionals in manufacturing engineering.

16:55-17:00: Collaborative Initiatives with ASME and SME

- Representatives from ASME and SME share their organizations' commitment to professional development and excellence.
- Discussing collaborative efforts and resources available through ASME and SME.
- Encouraging attendees to explore opportunities for involvement and collaboration.

17:00-17:15: Networking Session

- Participants join breakout rooms for small group discussions.
- Opportunity to connect, share experiences, and build relationships.
- Facilitated networking to encourage meaningful interactions and collaborations.

17:15-17:30: Closing Remarks

- Dr. Chukwuzubelu Ufodike and Dr. Chinedum Okwudire
- Summarizing key insights and takeaways from the forum.
- Emphasizing the importance of faculty excellence and continued collaboration.
- Encouraging attendees to join BiAM, ASME, and SME's initiatives for ongoing professional development.

BIAM FORUM

WEDNESDAY JUNE 19, 2024

About the FOUNDERS

Dr. Chukwuzubelu Ufodike, Assistant Professor and Charlotte and Walter Buchanan Faculty Fellow, Texas A&M University, **Founder Blacks in Additive Manufacturing (BiAM)**

Dr. Chukwuzubelu Ufodike is an Assistant Professor and Charlotte and Walter Buchanan Faculty Fellow in the Department of Engineering Technology & Industrial Distribution at Texas A&M University. He holds joint (courtesy) appointments in the Department of Mechanical Engineering, Multidisciplinary Engineering, and the School of Engineering Medicine – EnMed, at Texas A&M University. With a diverse academic background spanning industrial and manufacturing engineering, materials engineering, and business administration, Dr. Ufodike stands at the forefront of innovation. He is the Director of the Digital Manufacturing and Distribution Lab (DMD-Lab) at the Texas A&M Engineering Experiment Station (TEES). His research group (Professor Ufodike Research Group – PURG) focuses on AI-Enhanced Adaptive Additive Manufacturing for Precision Engineering. His commitment extends beyond research; he is the visionary founder of "Blacks in Additive Manufacturing (BiAM)" and PrintLearn, exemplifying dedication to diversity and education. Dr. Ufodike's influence extends far beyond the academic realm, making him a distinguished figure shaping the future of additive manufacturing.

Dr. Chinedum Okwudire, Professor and Miller Faculty Scholar, University of Michigan, **Co-Founder Blacks in Additive Manufacturing (BiAM)**

Dr. Chinedum (Chi) Okwudire is a Professor of Mechanical Engineering and Miller Faculty Scholar at the University of Michigan. Before joining Michigan, he was the mechatronic systems optimization team leader at DMG Mori USA, Davis, CA. His research is focused on exploiting knowledge at the intersection of machine design, control, and computing to boost the performance of manufacturing automation systems at low cost. His research has found applications in 3D printing, machining, and nanomanufacturing. Chi has received several awards including the ***CAREER Award*** from the National Science Foundation; the Young Investigator Award from the International Symposium on Flexible Automation; the Outstanding Young Manufacturing Engineer Award from the Society of Manufacturing Engineers; the Ralph Teetor Educational Award from SAE International; and the Russell Severance Springer Visiting Professorship from UC Berkeley. He was recently selected by SME as one of the 25 leaders transforming manufacturing. He has co-authored several best-paper-award-winning papers in the areas of manufacturing automation, control, and mechatronics. He is also the Founder and CTO of Ulendo Technologies, Inc., a start-up company focused on developing automation software for 3D printing and other manufacturing processes. He was recently appointed as a member of the SME Additive Manufacturing Technical Community Leadership Committee.

NSF ROUNDTABLE

WEDNESDAY JUNE 19, 2024

NSF Program Directors Roundtable

10:30-11:45 | KCC Room 200CD

In this roundtable session, four NSF program directors from the NSF Advanced Manufacturing Cluster will update attendees on NSF advanced manufacturing programs and plans. They will also answer questions from the audience.

The panelists at this special session are:

- **Linkan Bian,** Program Director - Responsible for Advanced Manufacturing
- **Janis Terpenny,** Program Director - Responsible for Manufacturing Systems Integration (MSI)
- **Andy Wells**, Program Director - Responsible for Advanced Manufacturing (AM) and Future Manufacturing (FM)
- **Satish Bukkapatnam,** Professor, Industrial & Systems Engineering, Regents Professor, Rockwell International Professor, College of Engineering, Director, TEES Institute for Manufacturing Systems, Texas A&M University

LINKAN BIAN is a program director in the Advanced Manufacturing (AM) cluster of Civil, Mechanical and Manufacturing Innovation division of National Science Foundation (NSF). At his home institute Mississippi State University, Dr. Bian is the Thomas B. & Terri L. Nusz Endowed Professor in Industrial and Systems Engineering Department. Dr. Bian received his Ph.D. in Industrial and Systems Engineering from Georgia Institute of Technology, and B.S. in Applied Mathematics from Beijing University. The major themes of Dr. Bian's research focus on understanding the process-structure-property relationships of additive manufacturing, as well as the investigation of how AI/ML can transform the modeling and experimental approaches. His research has received federal funding from NSF, NIH, DoD, DoE, and industrial companies. Dr. Bian received the Outstanding Young Investigator Award from Institute of Industrial and Systems Engineering (IISE) and serves as Associate Editor for multiple ASME and IISE journals.

JANIS TERPENNY is Program Director for the Manufacturing Systems Integration (MSI) program at NSF. She is also Professor of Systems Engineering & Operations Research and Mechanical Engineering at George Mason University. Her research focuses on smart integrated systems for design and manufacturing and on design education. She is area editor for two journals, Chair of the ASME Intelligent Manufacturing Technology Group (IMTG), and Senior Vice President for Academics on the IISE Board of Trustees. Previously, she served as Professor of Industrial & Systems Engineering (ISE) and Dean of Engineering at the University of Tennessee, Department Head of Industrial & Manufacturing Engineering at Penn State, Department Chair of Industrial & Manufacturing Systems Engineering at Iowa State,

Technology Thrust Lead for the Digital Manufacturing and Design Innovation Institute (DMDII, now MxD), Director of the NSF Center for e-Design, Program Director at NSF in the Division of Undergraduate Education, and Professor at Virginia Tech and the University of Massachusetts. She completed her BS in Applied Mathematics from VCU and MS and PhD in ISE from Virginia Tech. She worked in industry for General Electric, including a 2-year rotational management program in information systems. She is fellow of ASME and IISE, and member of AAAS, Alpha Pi Mu, ASEE, INORMS, SME, and Tau Beta Pi.

ANDY WELLS is a Program Director in the National Science Foundation's Advanced Manufacturing program, and also co-leads the Future Manufacturing solicitation. He is an NSF representative to the National Science and Technology Council's (NSTC) Subcommittee on Advanced Manufacturing, and to the Manufacturing USA Interagency Working Group. He has over 25 years of experience developing and building precision equipment that enables manufacturers and researchers to visualize and transform materials at the micro- and nano-scale. Previously, he was a technical program manager at Thermo Fisher Scientific and FEI Company, where he led development of scanning electron microscopes and ion-beam machining tools for semiconductor, materials science, and life science customers. Prior to that, he developed equipment for laser and mechanical micromachining at Electro Scientific Industries and was an adjunct professor at Portland State University. He received his PhD and MS degrees in mechanical engineering from Caltech, and his bachelor's degree from Dartmouth.

SATISH BUKKAPATNAM is a Professor of Industrial & Systems Engineering, Regents Professor, Rockwell International Professor, College of Engineering, Director of TEES Institute for Manufacturing Systems, and Affiliated Faculty, Multidisciplinary Engineering and Biomedical Engineering. Dr. Satish T. S. Bukkapatnam's research in smart manufacturing addresses the harnessing of high-resolution nonlinear dynamic information, especially from wireless micro-electromechanical systems sensors, to improve the monitoring and prognostics, mainly of ultraprecision and nanomanufacturing processes and machines, and wearable sensors for cardiorespiratory process prognostics. His research has led to over 160 peer-reviewed publications (101 published/accepted in journals and 68 in conference proceedings); five pending patents; $6.5 million in grants as PI/Co-PI from the National Science Foundation, the U.S. Department of Defense and the private sector; and 17 best-paper/poster recognitions.

EARLY CAREER FORUM

WEDNESDAY JUNE 19, 2024

Technology, Research & Development Professions in Academia, Industry & National Laboratories: An Early Career Forum

Wednesday, June 19th | 18:00-21:00 | Location: KCC Ballroom DEFG

Organized by: ASME/MED and NAMRI/SME

Sponsored by: The U.S. National Science Foundation (providing travel support to students)

Hosted by: The University of Tennessee, Knoxville, Tennessee

Purpose: The goal of this forum is to provide current students at all levels of graduate and undergraduate programs as well as recent graduates with information about various research and technical positions in academia, industry, and national laboratories. Panelists will present an overview of their careers and discuss how to be successful professionally in various settings in a roundtable format.

The forum will be held during the co-located manufacturing conferences at University of Tennessee, Knoxville: the ASME 2024 International Manufacturing Science and Engineering Conference (MSEC2024) and the NAMRI/SME 52nd North American Manufacturing Research Conference (NAMRC52).

Agenda

18:00-18:15 Opening remarks and welcome
18:15-19:00 Up to 3-minute spoken introductions by each panelist with Q&A session.

Break and switch-over of panelists.

19:15-20:00 Up to 3-minute spoken introductions by each panelist with Q&A session.
20:00-21:00 Roundtable discussions, networking and wrap-up

Forum Format

1. Panelists will introduce themselves and discuss their career paths. Panelists have experience in conducting/leading research and engineering projects in academia, government labs, and industry.
2. During each panel session, 20min will be set aside for audience members to a live Q&A poll moderated by Prof. Binil Starly using Polleverywhere.
3. During the roundtable discussions, forum participants can discuss careers in academia, government, and industry. Panelists will discuss how to search for a job, career management, and funding, among other topics that is relevant to the panelist speaker. Participants will be able to visit with several panelists during the 1hr roundtable session.

4. During and after the forum, participants are encouraged to engage in conversations/discussions related to their professional and personal interests.

All registered conference participants are welcome to attend the forum with no additional fee.

Attendance of the Early Career Forum is mandatory for NSF Travel Grant student applicants.

2024 Early Career Forum Chair

Dr. Binil Starly, Professor & Department Head, School of Manufacturing Systems and Networks, Arizona State University, email: bstarly@asu.edu

The 16 panelists have experience working in academia, government/national labs, and industry. Several of the panelists have experience in more than one of these sectors, as indicated below.

Panelist	Academia	Government/ National Labs	Industry
Nina Arcot (Northrop Grumman)			X
Dr. Mark Du (Argonne National Labs)		X	
Dr. Ardeshir Raihanian (Amazon Lab126)			X
Dr. Richard Seugling (LLNL)		X	
Dr. J. Patrick Spicer (General Motors R&D)			X
Dr. Mickey Clemon (UIUC)	X	X	
Dr. Jeffrey Abell (General Motors R&D)			X
Dr. Nehika Mathur (NIST)		X	
Dr. Samantha Webster (NIST)	X	X	
Nestor Vasquez (DuPont)			X
Dr. Agajan Torayev			X

(Robominder.ai)			
Prof. Mohammed Shafae (University of Arizona)	X		
Prof. Dhruv Bhate (Arizona State University)	X		X
Prof. Jingjing Li (Pennsylvania State University)	X		
Prof. Martin Byung-Guk (Purdue University)	X		X
Prof. Cindy Chang (University of Virginia)	X		X

Panelist Biographies

Nina Arcot, Northrop Grumman

Nina is a Manufacturing Engineer in Northrop Grumman's Future Technical Leaders (FTL) program. In her current role, she leads internal R&D efforts related to additive manufacturing, collaborative automation, and manufacturing simulations. Prior to FTL, Nina was a Mission Assurance lead for NG's innovative ESPASat-L product line of small satellites. Nina completed her bachelor's and master's degrees in the Mechanical & Aerospace Engineering (MAE) department at Princeton, with a focus on materials science coursework and research. She aims to combine her interests in spacecraft engineering, manufacturing, and materials science to develop technologies that increase access to space and improve life on Earth. She is passionate about STEM outreach and volunteers with the Society of Women Engineers (SWE) and the Brooke Owens Fellowship (BOF).

Dr. Mark Du, Argonne National Labs

Dr. Wenchao (Mark) Du is a Materials Engineer at Argonne National Laboratory. He received his doctoral degree in 2021 from Texas A&M University, master's degree in 2015 from Tianjin University, and bachelor's degree in 2012 from Hunan University, all in Industrial Engineering. His expertise is additive manufacturing of advanced ceramic materials, focusing on material development, process optimization, and post-processing. He has more than thirty journal and conference publications and various technical and poster presentations. Recently his research has focused on advanced manufacturing technologies and applications in the area of solar energy.

EARLY CAREER FORUM

WEDNESDAY JUNE 19, 2024

Dr. Ardeshir Raihanian, Amazon Lab126

Dr Raihanian is a proponent of building sustainability at scale with a focus on transitioning toward Circular Economy. He has been involved in several exciting projects related to residential energy consumption, sustainable design and manufacturing and consumer behavior. His expertise lies within applying machine learning, simulation and optimization techniques to provide business/sustainability insights. Dr Raihanian graduated from Sharif University of Technology, became an instructor for a high School on topics related to Physics. He then moved to the US and completed his M.S. and PhD in Mechanical Engineering from the University of Buffalo.

Dr. Richard Seugling, Lawrence Livermore National Lab (LLNL)

Dr. Richard M. Seugling is the Manufacturing Engineering Section (MES) Leader within the Materials Engineering Division (MED) at Lawrence Livermore National Laboratory (LLNL). He has been at LLNL since 2004 and has been supporting experimental programs at LLNL for over 19 years. He began his career in the Precision Systems and Manufacturing group in the Materials Engineering Division supporting the National Ignition Campaign (NIC) before transitioning to the Defense Technologies Engineering Division focusing on High Energy Density Science (HEDS). Prior to joining LLNL, Dr. Seugling was serving a post doctorate appointment from the National Research Council (NRC) at the National Institute for Standards and Technology (NIST). Dr. Seugling holds a Doctorate in Mechanical Engineering from the University of North Carolina at Charlotte.

Dr. J Patrick Spicer, General Motors

Dr. Spicer is a Chief Technologist, Reconfigurable Assembly Research (General Motors R&D, Manufacturing Systems Research Lab). He led a research team focused on the development of advanced reconfigurable assembly systems for low-volume scalable vehicle manufacturing. He has been at GM R&D for 12 years and has worked for over 20 years in automotive manufacturing. He has made research contributions in the areas of technical cost modeling, battery manufacturing, machine learning, process monitoring, additive manufacturing, scalable manufacturing systems, reconfigurable manufacturing, and machine vision. He is a recipient of the General Motors "Boss" Kettering Award - highest technical honor given to General Motors employees. He is the Inventor / Co-Inventor on over 20 granted patents.

EARLY CAREER FORUM

WEDNESDAY JUNE 19, 2024

Dr. Lee Clemon, University of Illinois, Urbana Champaign

Dr. Lee Clemon, P.E. is a Teaching Assistant Professor at the University of Illinois, Urbana Champaign. His research interests are in advanced manufacturing and high consequence design and licensed professional engineer. He focuses on the interplay of materials, design, and manufacturing for a more reliable and environmentally conscious industrial world. His current research interests are in process improvement and material property manipulation in advanced manufacturing processes, with an emphasis on additive and hybrid additive-subtractive manufacturing through particulate, wire, layer, and ensemble fabrication methods. He earned his BS from the University of Kansas, MS and Ph.D from the University of California, Berkeley. Prior to his current position, he spent 6 years at Sandia National Labs.

Dr. Jeff Abell, General Motors

Dr Abell is the director & Chief Scientist for Global Manufacturing (appointed 2018) - experienced research & development leader with product development background. Recognized as having strong strategy development and team development & management skills, innovation management track record, and successful turnaround experience. Responsible for GM's global manufacturing research strategies and activities including vehicle electrification, lightweight materials processing, automation, systems and controls. Developed several first-in-industry battery manufacturing technologies, including ultrasonic weld process monitoring and reconfigurable battery assembly systems resulting in tens of millions in benefit. Current research efforts include advanced propulsion, lightweight systems manufacturing, scalable and low-volume reconfigurable systems, and machine learning. Two-time recipient of General Motors "Boss" Kettering Award.

Dr. Samantha Webster, National Institute of Standards & Technology (NIST)

Dr Webster is an NRC Postdoc at NIST Gaithersburg in the Material Measurement Laboratory. She recently graduated with a Ph.D. in Theoretical and Applied Mechanics from Northwestern University. Her research is in metal additive manufacturing technologies with a focus on fundamental interactions and formation of defects in Directed Energy Deposition (DED). With knowledge of defect formation, she has recently begun research in hybrid metal AM techniques to address defects and challenges in metal AM processes as well as alloy development through DED and hybrid-AM techniques. She has received the National Science Foundation Graduate Research Fellowship for her work, and she was recently named one of the Society of Manufacturing Engineers' 30 under 30. With the intent to help people through science, her plan is to continue developing fundamental knowledge in metal additive manufacturing to support fabrication of unique functional designs.

EARLY CAREER FORUM

WEDNESDAY JUNE 19, 2024

Dr. Nehika Mathur, National Institute of Standards & Technology (NIST)

Dr. Nehika Mathur is a researcher and Project Lead in the Systems Integration Division (SID) at NIST. Here, she leverages her expertise in sustainable manufacturing systems to advance measurement science research that supports the development of technical standards for a Circular Economy (CE). At NIST SID, Nehika leads the CE Closed Loop Recovery research thrust and currently serves as a technical expert with the ISO TC 323 on CE standards. Nehika's research is rooted in Industrial Ecology, Complex systems and Operations research. Her work explores strategies for creating closed-loop systems (including via Life Cycle Symbiosis and Industrial Symbiosis) and developing quantitative decision-making tools to enhance the sustainability of clean energy technologies, critical materials, and plastics.

Nestor Vasquez, DuPont

Néstor Vásquez is the Technical Manager for Process Development in Chemical Mechanical Planarization Technologies (CMPT) at DuPont. He leads the development of new processes to produce polishing pads for chip manufacturing. Previously, Nestor worked for Dow Chemical in Core R&D and Automotive R&D. He authored 8 patents on diverse areas, such as ceramic extrusion, carbon fiber composites, solids processing and CMPT. His outstanding contributions earned him the Excellence in Engineering Award for E&I in 2021. Nestor holds a MS in Mechanical Engineering from University of Pittsburgh and a BS from Universidad Santa Maria in Chile. He enjoys traveling and photography.

Dr. Agajan Torayev, Robominder.ai

Agajan Torayev earned his diploma in applied mathematics and informatics from Magtymguly Turkmen State University in 2015 and an MSc in computer science, focusing on deep learning from the University of Bonn in 2019. He worked as a Marie Skłodowska-Curie Researcher at the University of Nottingham from 2020 to 2023, contributing to the Horizon 2020 project. His research involved intelligent decision-making and optimization for Industry 4.0, using techniques like Bayesian optimization and machine learning for the optimization of industrial robots. Currently, he is the CEO of Robominder AI, a UK-based startup creating AI visual inspection systems for manufacturing.

Dr. Mohammed Shafae, University of Arizona

Dr Shafae is an Assistant Professor in the Systems & Industrial Engineering at the University of Arizona. His research interests are in Cyber-Physical Systems Security; Smart Manufacturing Systems; Statistical Process Monitoring; Manufacturing Process Data Analytics (Modeling, Monitoring, and Diagnosis); Advanced Metrology Systems Data Driven Quality Control. He has won the Virginia Tech Teaching Excellence Award, first place in the ASCEND Propel Pitch Competition, multiple graduate fellowship awards, and best track paper awards. Dr. Shafae earned his B Sc. & M Sc. in Production Engineering from Egypt, then went on to complete his M.S and PhD in Industrial & Systems Engineering from Virginia Tech.

EARLY CAREER FORUM

WEDNESDAY JUNE 19, 2024

Dr. Dhruv Bhate, Arizona State University

Dhruv Bhate is an Associate Professor in the School of Manufacturing Systems and Networks at Arizona State University, where his group (3DX Research) seeks answers to questions in bio-inspired design, architected materials and additive manufacturing. He has co-authored over 50 peer-reviewed publications and 3 book chapters, edited two books, and is co-inventor on 3 patents. Prior to joining ASU, Dhruv spent two years at PADT, Inc, a small business in Tempe, AZ, where he led the company's R&D efforts in metal Additive Manufacturing. Prior to joining PADT, he spent seven years at Intel Corporation developing several laser-based manufacturing processes. Dhruv has a PhD from Purdue University and a master's degree from the University of Colorado at Boulder, both in mechanical engineering.

Dr. Jingjing Li, Pennsylvania State University

Jingjing Li is a Professor of Industrial and Manufacturing Engineering at the Pennsylvania State University, University Park. She holds a PhD and MA from the University of Michigan, Ann Arbor, an MS from Tsinghua University and a BS from Beihang University, Beijing, China. She worked in General Motors R&D Center as an intern for one year and has continued to collaborate with industry for over 15 years. Her primary research interest focuses on materials processing and characterization. She is an Associate Editor of Journal of Manufacturing Science and Engineering, Manufacturing Letters, and Journal of Materials Processing Technology. She received several prestigious awards, such as the ASME Chao and Trigger Young Manufacturing Engineer Award, the US National Science Foundation CAREER award, and recognition as an ASME fellow.

Dr. Martin Jun, Purdue University

Dr. Martin Jun is a Professor of the School of Mechanical Engineering at Purdue University, West Lafayette, IN, USA. His main research focus is on advanced multi-scale and smart manufacturing processes and technologies for various applications. His sound-based smart machine monitoring technology led to a start-up company on smart sensing. He is an ASME fellow and Area Editor of Journal of Manufacturing Processes. He is also the recipient of the 2011 SME Outstanding Young Manufacturing Engineer Award, 2012 Canadian Society of Mechanical Engineers I.W. Smith Award for Outstanding Achievements, and 2015 Korean Society of Manufacturing Technology Engineers Damwoo Award. He has also been recognized as 25 leaders transforming manufacturing in the Smart Manufacturing magazine. He received his BSc and MASc degrees in Mechanical Engineering from the University of British Columbia, Vancouver, Canada in 1998 and 2000, respectively. He then received his PhD degree in 2005 from the University of Illinois at Urbana-Champaign in the Department of Mechanical Science and Engineering.

Dr Cindy Chang, University of Virginia

Qing Chang's current research interests include math-based and data-enabled modeling and analysis of dynamic manufacturing systems, improving manufacturing efficiency and sustainability through adaptive control and machine learning-based methods, and driving innovation in human-robot collaborations within the manufacturing domain. Prior to her academic career, Chang accumulated a decade of experience at General Motors Global Research & Development Center, where she received the highest corporate award for innovation, the Boss Kettering Awards, three times in recognition of her research on improving production efficiency and quality. She is an elected fellow of ASME and SME and has assumed leadership and editorial positions for numerous societies, journals, and conferences affiliated with ASME, IEEE, SME, and others. She received the NSF CAREER Award and has been recognized as one of the "20 most influential professors in smart manufacturing" by SME.

NAMRC TECHNICAL SESSIONS

WEDNESDAY JUNE 19, 2024

09:00-10:15 301A	**NAMRC – STUDENT RESEARCH PRESENTATION - Session 1** *Session Chair: Ihab Ragai and Peng Wang*	
Paper 93	Bin Dong, Yan Wang and Yanglong Lu	A slicing and path generation method for 3D printing of periodic surface structure
Paper 103	Songlin Duan, Dominik Kozjek, Edward Mehr, Mark Anders and Jian Cao	Forming Force Prediction in Double-Sided Incremental Forming via GNN-Based Transfer Learning
Paper 181	Marthe Vanhulst, Stijn Waumans, Hans Vanhove and Joost R. Duflou	Investigating Intermediate Shapes for Multi-Stage Forming of Cranial Implants
09:00-10:15 301B	**NAMRC - TRACK 3 MATERIAL REMOVAL - Session 5** *Session Chair: Anil Srivastava | Session Co-Chair: Hitomi Yamaguchi*	
Paper 157	Anil Srivastava and Md. Mofakkirul Islam	Prediction of Tool Wear and Surface Finish using ANFIS Modelling during Turning of Carbon Fiber Reinforced Plastic (CFRP) Composites
Paper 179	Kateland Hutt, Justin Rietberg, Paul Gradl and Hitomi Yamaguchi	Characterization of oscillatory magnetic field-assisted finishing of directed energy deposition NASA HR-1 integral channels
Paper 156	Muhammad Ali Khan and Sachhal Mufti	Tool chip contact length analysis of dry and cryogenic turning of aerospace alloy Ti-6Al-4V
09:00-10:15 301C	**NAMRC - TRACK 7 SUSTAINABLE MANUFACTURING - Session 2** *Session Chair: Stefania Bruschi | Session Co-Chair: Barbara Linke*	
Paper 30	Katia Cristiane Gandolpho Candioto, Luiz Fernando Moretao and Barbara Sabine Linke	Mass finishing of additively manufactured AISI 316L using nutshells as sustainable abrasive media
Paper 87	Stefania Bruschi, Rachele Bertolini, Andrea Ghiotti, Haroon Mahmood and Caterina Zanella	Machinability of recycled aluminum alloys
Paper 177	Ufoma Anamu, Olusoji Ayodele,	Response Surface Methodology and Process Optimization of Spark Plasma Sintered

	Emmanuel Olorundaisi, Bukola Babalola, Kingsley Ukoba, Ngeleshi Kibambe, Mutombo Umba, TienChien Jen and Peter Olubambi	Parameters of Ti20Al20Cr5Nb5Ni19Cu12Co19 High Entropy Alloy
09:00-10:15 200A	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 5** *Session Chair: Jianjing Zhang | Session Co-Chair: Didier Talamona*	
Paper 57	Daniyar Syrlybayev, Andrei Yankin, Asma Perveen and Didier Talamona	SLM-Printed Lattice Structures with Tapered Vertical Struts: Design, Simulation and Experimentation
Paper 59	Mutha Nandipati, Michael Ogunsanya and Salil Desai	Predictive Models for 3D inkjet Material Printer using Automated Image Analysis and Machine Learning Algorithms
Paper 52	Riccardo C. Clemente and Seyed A. Niknam	Applying Design Complexity Metrics for Post-processing cost modeling in Metal Additive Manufacturing
09:00-10:15 200B	**NAMRC - TRACK 5 SMART MANUFACTURING & CPS - Session 5** *Session Chair: Rohan Shirwaiker | Session Co-Chair: Thorsten Wuest*	
Paper 24	Mojtaba Farahani, Fadi El Kalach, Ramy Harik and Thorsten Wuest	High-resolution time-series classification in smart manufacturing systems
Paper 49	Khalifa Alremeithi and Winston Sealy	The Use of Digital Twin for Mobile Robot Swarm Task Allocation
Paper 41	Nafi Ahmed, Lokesh Narayanan and Rohan Shirwaiker	A Framework for Digital Twin Integration in Biofabrication and a Scaffold 3D Bioplotting Case Study
10:30-11:45 301A	**NAMRC – STUDENT RESEARCH PRESENTATION - Session 2** *Session Chair: Ihab Ragai | Session Co-Chair: Thorsten Wuest*	
Paper 28	Tian Wang, Junming Fan and Pai Zheng	An LLM-based Vision and Language Cobot Navigation Approach for Human-centric Smart Manufacturing

Paper 142	Ahmed Shoyeb Raihan, Hamed Khosravi, Srinjoy Das and Imtiaz Ahmed	Accelerating material discovery with a threshold-driven hybrid acquisition policy-based Bayesian optimization
Paper 145	Muhammad Saad Amjad and Nancy Diaz-Elsayed	Evaluating the environmental impacts of brick production from waste plastic
10:30-11:45 301B	**NAMRC - TRACK 2 MANUFACTURING PROCESSES - Session 5** *Session Chair: Wayne Cai | Session Co-Chair: Dave Kim*	
Paper 5	Wayne Cai, Matthew Bondy, Blair Carlson and Mark Baylis	Prediction of Automotive Body-in-White Distortion in Paint Baking Process
Paper 77	Pardeep Pankaj, Pankaj Biswas and Dave Kim	Metallurgical characteristics and mechanical properties of dissimilar friction stir welded DH36 steel and UNS G10080 steel joints
Paper 14	Guangyan Ge, Yukun Xiao, Jun Lv and Zhengchun Du	A non-iterative compensation method for machining errors of thin-walled parts considering coupling effect of tool-workpiece deformation
10:30-11:45 301C	**NAMRC - TRACK 1 MANUFACTURING SYSTEMS - Session 4** *Session Chair: Yuebin Guo | Session Co-Chair: Sebastian Lang*	
Paper 215	Dawei Xue, Xi Gu and Hae Chang Gea	Production Overrun Optimization Considering Supply Chain Network Reliability
Paper 178	Liwen Hu, Baihui Chen, Elhussein Shata, Shashank Shekhar, Charif Mahmoudi, Ivan Seskar, Qingze Zou and Y.B. Guo	Feasibility of 5G-Enabled Process Monitoring in Milling Operations
Paper 196	Sebastian Lang, Sofia Talleri, Josef Mayr, Konrad Wegener and Markus Bambach	Kalman Filter-Driven State Observer for Thermal Error Compensation in Machine Tool Digital Twins
10:30-11:45 200A	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 6** *Session Chair: Xinnian Wang | Session Co-Chair: Xiangfan Chen*	

Paper 75	Wenbo Wang, Siying Liu, Mingqi Yu and Xiangfan Chen	Rapid 3D printing of electro-active hydrogels
Paper 84	Weijun Zhang, Muqing Yang, Wenqi Mao, Shogo Takesue and Masakazu Soshi	The effect of productive and quality deposition strategies on residual stress for Directed Energy Deposition (DED) process
Paper 64	Xinnian Wang, Yong Ii Kim, Alexander Yarin and Yayue Pan	Electric field-assisted micro-scale direct ink writing for electronic textiles
10:30-11:45 200B	**NAMRC - TRACK 5 SMART MANUFACTURING & CPS - Session 6** *Session Chair: Xun Xu | Session Co-Chair: Sheng Yang*	
Paper 115	Md Tahmid Bin Touhid, Enshen Zhu, Mohammad Vahid Ehteshamfar and Sheng Yang	Synchronization Evaluation of Digital Twin for A Robotic Assembly System Using Computer Vision
Paper 110	Wanqing Xia, Yuqian Lu, Weiliang Xu and Xun Xu	Deep reinforcement learning based proactive dynamic obstacle avoidance for safe human-robot collaboration
Paper 116	Michail Katsigiannis and Konstantinos Mykoniatis	Enhancing Industrial IoT with Edge Computing and Computer Vision: An Analog Gauge Visual Digitization Approach
13:45-15:00 301A	**NAMRC – STUDENT RESEARCH PRESENTATION - Session 3** *Session Chair: Livan Fratini | Session Co-Chair: KC Morris*	
Paper 171	Chen Zhou, Saurabh Basu and Soundar Kumara	A MIL-based approach for welding defect classification
Paper 203	Shashank Galla, Akash Tiwari, Saikiran Chary Nalband, Sean Michael Hayes, Suhas Bhandarkar and Satish Bukkapatanam	Detecting anomalous motions in ultraprecision shell-polishing process combining unsupervised spectralband identification and Explainable-AI

Paper 218	Vispi Karkaria, Anthony Goeckner, Rujing Zha, Jie Chen, Jianjing Zhang, Qi Zhu, Jian Cao, Robert Gao and Wei Chen	Towards a Digital Twin Framework in Additive Manufacturing: Machine Learning and Bayesian Optimization for Time Series Process Optimization
13:45-15:00 301B	**NAMRC - TRACK 2 MANUFACTURING PROCESSES - Session 6** *Session Chair: Sougata Roy | Session Co-Chair: Uday Venkat Kiran Kommineni*	
Paper 27	Huangyi Qu and Yi Cai	Improved Semantic Segmentation Method for Weld Penetration Prediction of TIG Welding with Dual Ellipsoid Heat Source
Paper 21	Kommineni Uday Venkat Kiran, Alexandar Azenkeng and Sougata Roy	Exploring the Potential of Coal Derived Graphite as Next Generation Lubricant Additive for Multifunctional Applications
Paper 25	Xiaowei Yu, Mengyuan Chen, Ming Wang, Jennifer Bracey, Bradley Frieberg, Roland Koestner, Wai Ping Gloria Tam, David Titmuss and Nicholas Ware	Effect of Drying Temperature on Binder/Current Collector Interfacial Adhesion in Electrode Manufacturing of Li-ion Batteries
13:45-15:00 301C	**NAMRC - TRACK 1 MANUFACTURING SYSTEMS - Session 5** *Session Chair: Douglas Bristow | Session Co-Chair: Sangkee Min*	
Paper 225	Vignesh Selvaraj, Aditya Nagaraj, Benjamin Whiffen and Sangkee Min	Development of a Wireless Smart Sensor System and Case Study on Lifting Risk Assessment
Paper 232	Xuepeng Jiang, Pengyu Zhang and Hantang Qin	A qualitative validation of an in-situ monitoring system for EHD inkjet printing via laser diffraction
Paper 251	Philip Olubodun, Joseph Fischer and Douglas Bristow	Iterative Correction of Robotic Grinding using Spatial Feedback for Precision Applications
13:45-15:00 200A	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 7** *Session Chair: Xun Xu | Session Co-Chair: Simon Chang*	

Paper 63	Simon Chan, Xun Xu and Olaf Diegel	Developing a hybrid-built pre-hardened alloy steel for injection moulding tools using the laser powder bed fusion process
Paper 60	Yash Gopal Mittal, Gopal Gote, Yogesh Patil, Avinash Kumar Mehta, Pushkar Kamble and K. P. Karunakaran	Investigations on Ironing Parameters in Screw Extrusion Additive Manufacturing (SEAM)
Paper 61	Yash Gopal Mittal, Yogesh Patil, Pushkar Kamble, Gopal Gote, Avinash Kumar Mehta and K. P. Karunakaran	Warpage Control in Material Extruded (MEX) Thermoplastic ABS
13:45-15:00 200B	**NAMRC - TRACK 5 SMART MANUFACTURING & CPS - Session 7** *Session Chair: ChristianOien | Session Co-Chair: Fadi El Kalach*	
Paper 46	Fadi El Kalach, Jitendra Solanki and Anand Todkar	A Federated Information System Framework for Vertical Integration
Paper 83	Darren Wei Wen Low, Geok Soon Hong and A. Senthil Kumar	Micro-milling digital twin for real-time tool condition monitoring
Paper 127	Christian Dalheim Øien and Geir Ringen	Data-driven through-process modelling of aluminum extrusion mechanical properties
15:15-16:30 301A	**NAMRC – TRACK 1 MANUFACTURING SYSTEMS - Session 6** *Session Chair: Sean Wagner | Session Co-Chair: Michael Schiller*	
Paper 85	Michael Schiller, Peter Frohn-Sörensen, Florian Schreiber, Daniel Morez, Martin Manns and Bernd Engel	Smart design and additive manufacturing of bending tools to improve production flexibility
Paper 144	J. Patrick Spicer, Debejyo Chakraborty, Jeffrey Abell and Michael Wincek	Implementation Strategy for Launch and Performance Improvement of High Throughput Manufacturing Inspection Systems

Paper 104	Sean Wagner and John Agapiou	Optical Inspection of Stator Slots for Electric Motors
15:15-16:30 301B	**NAMRC - TRACK 2 MANUFACTURING PROCESSES - Session 7** *Session Chair: Xiaochun Li | Session Co-Chair: Murali Sundaram*	
Paper 40	Prasanna S Abbigeri, Pavan Pandit, Niketh S, Shalini Singh and Samuel Gl	Flow Analysis and Fabrication of Micro Scale Controlled Surfaces by Ultrashort Pulse Laser for Microfluidic Applications
Paper 38	Yitian Chi and Xiaochun Li	Nanotechnology-enabled Rapid Investment Casting of High-Performance Wrought Aluminum Alloys
Paper 44	Yu-Jen Chen and Murali Sundaram	A study on the gas film formation in electrochemical discharging processes by molecular dynamics simulation
15:15-16:30 301C	**NAMRC - TRACK 7 SUSTAINABLE MANUFACTURING - Session 3** *Session Chair: Pai Zheng | Session Co-Chair: Gregory Purdy*	
Paper 260	Liqiao Xia, Jiazhen Pang, Chengxi Li, Ruoxin Wang and Pai Zheng	Large Language Models Empower the Reliability of Disassembly in Remanufacturing
Paper 91	Ankit Agarwal, Karan Bhuta, Tyler Grimm and Laine Mears	Investigating the Effect of Nanobubble-based Cutting Fluid on Tool Wear and Cutting Forces in Milling of Inconel 718
Paper 166	Md Monir Hossain and Gregory Purdy	Role of Industry 4.0 in zero-defect manufacturing: A systematic literature review and a conceptual framework for future research directions
15:15-16:30 200A	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 8** *Session Chair: Erika García López | Session Co-Chair: Soham Mujumdar*	
Paper 151	Rajendra Hodgir, Ramesh K. Singh and Soham Mujumdar	Improved Wear and Corrosion Resistance of Additively Manufactured SS316L by Laser Remelting Process
Paper 98	Rakesh Kumar, Varinder Kumar and Anupam Agrawal	A New Approach to Finish Metal Additive Manufactured Parts using Micro Wire Electric Discharge Polishing (μ-WEDP)
Paper 120	Luis Enrique Almanza Vazquez, Raquel Tejeda-Alejandre, Ciro	A study for geometrical error in micro-geometries using VAT photopolymerization

	A. Rodríguez, Erick Ramírez-Cedillo, Elisa Vazquez-Lepe and Erika GarcíaLópez	
15:15-16:30 200B	**NAMRC - TRACK 5 SMART MANUFACTURING & CPS - Session 8** *Session Chair: Xun Xu | Session Co-Chair: Rami Harik*	
Paper 22	Huiyue Huang, Tang Ji and Xun Xu	An adaptable Digital Twin model for manufacturing
Paper 50	Anjana Venugopal Raghunathan and Winston Sealy	An Initial Approach to Industry 5.0
Paper 101	Nitol Saha, Philip Paul, Kun Ji and Ramy Harik	Performance Evaluation Framework of MQTT Client Libraries for IoT Applications in Manufacturing
16:45-18:00 301A	**NAMRC – TRACK 1 MANUFACTURING SYSTEMS - Session 7** *Session Chair: Ahmed Azab | Session Co-Chair: Azadeh Haghighi*	
Paper 123	Suyog Ghungrad and Azadeh Haghighi	Kinematics-guided Data-driven Energy Surrogate Model for Robotic Additive Manufacturing
Paper 107	Albert J. Patrick, Salil Bapat and Ajay P. Malshe	3D Soft Material Printer as a Mesoscale Additive Biomanufacturing Platform for In-Space Manufacturing
Paper 117	Hany Osman, Ahmed Azab, Rifat Bin Hasan and Fazle Baki	Mass Customization using hybrid manufacturing and smart assembly: An Optimal Configuration and Platform Design Approach
16:45-18:00 301B	**NAMRC - TRACK 2 MANUFACTURING PROCESSES - Session 8** *Session Chair: Imtiaz Qavi | Session Co-Chair: Chi Wang*	
Paper 45	Advay Pawar, Bruce Anderson, Behnam Pourdeyhimi, Amy McNulty, Matthew Fisher and Rohan Shirwaiker	3D Melt Blowing of Elastollan Thermoplastic Polyurethane for Tissue Engineering Applications: A Pilot Study
Paper 53	Imtiaz Qavi and George Tan	Harnessing Interpretable and Ensemble Machine Learning Techniques for Precision Fabrication of Aligned Micro-Fibers

Paper 73	Chi Wang and Yingge Zhou	Stereolithography-Assisted Sodium Alginate-Collagen Hydrogel Scaffold with Molded Channels
16:45-18:00 301C	**NAMRC - TRACK 6 MANUFACTURING EDUCATION AND CASE STUDIES – Session 1** *Session Chair: Barbara Linke | Session Co-Chair: Krzysztof Jarosz*	
Paper 82	Barbara S. Linke, Chantelle M. Corsiga, Blade Baxter, Justin MartinezGarcia, Joseph S. Koury and Andrew Jung-Sub Moon	Design and Prototyping of Smart Mobile Grinding Bots as an Educational Experience
Paper 204	Krzysztof Jarosz, Thomas Matijas and Rui Liu	Investigating the Human Capabilities for Intuitive Evaluation of Component Manufacturability
Paper 217	Swarit Anand Singh, Sujay B J and K A Desai	Exploring Feasibility of Vision-Based Automated Evaluation during Laboratory Courses in Manufacturing
16:45-18:00 200A	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 9** *Session Chair: Shantanu G. Gaurkhede | Session Co-Chair: Beytullah Aydogan*	
Paper 132	Nismath V H, Beytullah Aydogan, David Jaggers and Kevin Chou	An Investigation into Contouring Strategy Effects on Morphology and Roughness of Upskin Surfaces in Laser Powder-Bed Fusion
Paper 94	Shantanu G. Gaurkhede, Chi Wang, Anthony J. Di Pasqua, Yingge Zhou and Jia Deng	3D Printing Novel Enteric Capsule Shells for Personalized Drug Delivery
Paper 119	Qingrui Jiang, Ruofan Cao, Yi Wang and Yiwei Han	Ultrasonic Vibration-assisted High-Resolution Electrohydrodynamic (EHD) Printing
16:45-18:00 200B	**NAMRC - TRACK 5 SMART MANUFACTURING & CPS - Session 9** *Session Chair: Imtiaz Ahmed | Session Co-Chair: Chenhui Shao*	
Paper 141	Yaoxuan Zhu, Amir Rashid, Tomas Österlind and Andreas Archenti	Surface quality prediction in-situ monitoring system: a deep transfer learning-based regression approach with audible signal

Paper 143	Hamed Khosravi, Sarah Farhadpour, Manikanta Grandhi, Ahmed Shoyeb Raihan, Srinjoy Das and Imtiaz Ahmed	Strategic Data Augmentation with CTGAN for Smart Manufacturing: Enhancing Machine Learning Predictions of Paper Breaks in Pulp-and-Paper Production
Paper 150	Ruo-Syuan Mei, Christopher Conway, Miles Bimrose, William King and Chenhui Shao	Deep Learning of 3D Point Clouds for Detecting Geometric Defects in Gears

MSEC TECHNICAL SESSIONS

WEDNESDAY JUNE 19, 2024

09:00-10:15 301D	**AdM1_4 (2): Smart Additive Manufacturing** *Session Chair: Uduak Inyang-Udoh and Prahalada Rao*	
121253	Manish Raj Aryal, Sourabh Deshpande, Jilian Aurisano, and Sam Anand	Imvr: Enabling Immersive Design Exploration and Process Integration for Additive Manufacturing of Complex Organic Geometries
121312	Elizabeth M. Mamros, Saketh Kantipudi, Matthew Eaton, Jinjin Ha, and Brad L. Kinsey	Investigation of Distributed Additive Manufacturing for 3D Printed Headband Component During Global Supply Chain Disruptions
122417	Botao Zhang, Vysakh Venugopal, Mitansh Tripathi, Navaneeth Chandran, Niloofar Sanaei, Logan Ware, Prashant Khade, and Sam Anand	Design for Additive Manufacturing Constrained Topology Optimization of Liquid-to-Air Heat Exchangers With Machine Learning-Based Turbulent Flow Considerations
09:00-10:15 301E	**MP6_1 (2): Advances in Clean Energy and E-Mobility Manufacturing** *Session Chair: Wayne Cai and Alessandro Ascari*	
125046 [P]	Neil Dasgupta	Laser Patterning of Graphite Anodes for Fast-Charging Li-Ion Batteries
123689	Erica Liverani, Alessandro Ascari, Caterina Angeloni, Michele Franciosco, Lorenzo Cestone, Dexiang Zha, and Alesandro Fortunato	Remote Laser Cutting of Foils for Battery Electrodes Fabrication: Modelling of the Process and Experimental Validation.
124375	Jagannath Suresh, Gagan K. Goyal, Haozheng Wang, and Lei Zuo	Numerical Analysis of the Melt Pool Kinetics in Selective Laser Melting Based Additive Manufacturing of Thermoelectric Powders
09:00-10:15 300B	**AMM2_2 (1): Advances in Manufacturing and Processing of Polymers and Composites** *Session Chair: Erina B Joyee and Kenan Song*	
121544	Adarsh Shah, and Atul Jain	Physical, Mechanical, and Thermal Characterization of Unfilled and Carbon Fiber Filled Polyamide (Pa) Filaments and Corresponding Fused Deposition Modeling Fabricated Samples

125342	Tengteng Tang, Kashish Patel, Ivan Pesqueira, and Xiangjia(cindy) Li	A Novel 3D Printing Method for Continuous Fiber Reinforced Composites with Functional Embedded Framework
124968	Felicia Stan, Ionut-Laurentiu Sandu, and Catalin Fetecau	Study on the Interfacial Properties of Dissimilar Structures Fabricated by Hybrid Injection Molding
09:00-10:15 300C	**MEA5_2 (1): Semiconductor Manufacturing: Metrology, Inspection, Systems, and Processes** *Session Chair: ChaBum Lee and Gregory Vogl*	
131691 [B]	Md Mahmudul Hasan, and Faiz Rahman	Aqueous Wet Etching of Silicon With Alkali Metal Hydroxides
125440 [B]	Kuan Lu, and Chabum Lee	Brightfield and Grayfield via Metrology and Inspection by Edge Diffractometry
125308 [B]	Amanat Ur Rahman, Xu Han, and Xiaodong Jia	Enhanced Data-Driven Virtual Metrology on Chemical Mechanical Planarization Process Using Dual Linear Kalman Filter
121840 [B]	Olukayode Fatoki, and Zhichao Li	Model Development of Manufacturing Information System for Silicon Carbide Wafer Production
124293 [P]	Jiyong Park	Optical metrology with femtosecond laser for advancing chip inspection and measurement
9:00-10:15 300D	**MP6_4 (2): Deformation Processing of Metals and Alloys** *Session Chair: Wilfredo Moscoso and Dinakar Sagapuram*	
125427	Amit Anand, and Rakesh Lingam	The Effect of Electric Pulse and Strain Rate on the Formability of Aluminium 6061: An Experimental Investigation
125444	Shayan Darzi, Enrico Tulung, Brad L. Kinsey, and Jinjin Ha	Localized Manipulation of Martensite Transformation in Double-Sided Incremental Forming Through Deformation Path Control
124111	Md. Saddam Hossen, Jeremiah Westrum, Matthew Shultz, Hua Tan, and Dave Kim	Variable Friction Model Development and Implementation to the Pulling Force Prediction of the Split-Sleeve Cold Expansion Process for Aluminum 2024-T3

10:30-11:45 301D	**AdM1_1 (2): Advances in Metal Additive Manufacturing Processes** *Session Chair: Ala Qattawi and Elham Mirkoohi*	
122007	Zaky Hussein, Jesse Goodwin, Matthew McCoy, Shohom Bose-Bandyopadhyay, Kyle Saleeby, and Chirstopher Saldaña	Impact of Heat Input and Step Over Distance on Part Geometry for Multi-Bead WAAM Components
124636	Seyedmehrab Hosseini, and Elham Mirkoohi	Understanding Fatigue Life Behavior in Directed Energy Deposition by Utilizing Novel Volumetric Defect Features
125486	Wenze Zhang, Siqi Chen, Boge Dong, Yuanzhi Chen, Xiaoke Deng, Molong Duan, and Kai Tang	A Dynamic Model for Deposition Geometry Prediction in Directed Energy Deposition Process
10:30-11:45 301E	**MS7_1 (2): AI for Smart Manufacturing Systems** *Session Chair: Chenhui Shao and Weihong (Grace) Guo*	
124768	Rong Lei, Yuebin Guo, and Weihong "Grace" Guo	Bridging Data Gaps: A Federated Learning Approach to Heat Emission Prediction in Laser Powder Bed Fusion
125391	Javid Akhavan, Ke Xu, Chaitanya Krishna Vallabh, and Souran Manoochehri	Real-Time Print Tracking in Metal Additive Manufacturing Using Acoustic Emission Sensors and Vision Transformer Algorithms
125898	Ethan Regal, Vidita Gawade, and Weihong Guo	Physics-Informed Loss Functions With Explainable Ai to Predict Emission in Powder Bed Fusion
10:30-11:45 300B	**AMM2_3 (1): Convergent Manufacturing of Advanced Materials for Hybrid Manufacturing Systems and Products** *Session Chair: Thomas Feldhausen and Saeed Farahani*	
124049	Stephan Rosenthal, Hamed Dardaei Joghan, Marlon Hahn, and A Arman Tekkaya	Characterization of Resistance Welded Hybrid Sandwich Sheets with Additive Manufactured Core Structure
124138	Saeed Farahani, Marlon Hahn, Hamed Dardaei Joghan, and A Arman Tekkaya	A Novel Concept to Manufacture Nano/microcellular Foam Structures
129800 [P]	Sarah Jordan	Indirect Additive Manufacturing Hybrid Systems

MSEC TECHNICAL SESSIONS

WEDNESDAY JUNE 19, 2024

10:30-11:45 300C	**LCE4_2 (1): Systems Engineering and Digital Technologies for Circular Economy** *Session Chair: Abheek Chatterjee and Ritin Mathews*	
Panel 10:30-11:30	Panelists: Fazleena Badurdeen, Sudarsanam Suresh Babu, Tapjyoti Ghosh, and Arif Malik	
10:30-11:45 300D	**MP6_2 (2): Advances in Machining and Metrology** *Session Chair: Xiaoliang Jin and Keivan Ahmadi*	
125540	Shenliang Yang, Xiaoliang Jin, Serafettin Engin, Raja Koutanya, and Tahani El-Wardany	Coupling Effect of Shear Localization on Surface Residual Stress in Machining of Waspaloy
123257	Hui Liu, Tobias Kelliger, Marcus Meurer, and Thomas Bergs	Investigating Nozzle Design for Cutting Fluid Supply During Turning of Inconel 718 With CBN Tools
124638	Ayberk Zorlu, and Keivan Ahmadi	Operational Modal Analysis for Predicting Chatter in Milling

13:45-15:00 301D	**AdM1_2 (2): In Situ Monitoring and Non-Destructive Testing of Additive Manufacturing Processes** *Session Chair: Samantha Webster and Jihoon Jeong*	
122672	Lisa DeWitte, and Katherine Fu	A Simulated Evaluation of Powder Flowability Through a Partially Obstructed Consumable in Blown Powder Directed Energy Deposition Systems
123863	Benjamin Bevans, Anis Assad, Jakob Hamilton, Prahalada Rao, and Iris Rivero	In-Process Monitoring of Process Stability in Laser Wire Directed Energy Decomposition Using Physics-Based Machine Learning
124045	Saurav Misra, Ipsita Mohanty, Cheruvu Siva Kumar, and Partha Saha	Online Monitoring of Infrared Pyrometer Captured Thermal Signature for Prediction of Fe Dilution and Its Effect on Corrosion Properties of Laser Deposited Inconel 625 Coating on Ss 304l
13:45-15:00 301E	**AdM1_4 (3): Smart Additive Manufacturing** *Session Chair: Prahalada Rao and Molong Duan*	
121979	Frederic Cousin, Vishnuu Prakash, Julian Ulrich Weber, and Ingomar Kelbassa	Digitalization of a Robot-Based Directed Energy Deposition Process for In-Situ Monitoring and Post-Process Data Analytics

124113	Austen Thien, Nicole Van Handel, Helen Hu, Kyle Saleeby, and Christopher Saldana	Data Efficient Modeling for Prediction and Forecasting of Waam Process Conditions
125241	Alexander Riensche, Benjamin Bevans, John Sions, Kyle Snyder, Yuri Plotnikov, Derek Haas, and Prahalada Rao	Toward Rapid Qualification of Laser Powder Bed Fusion Additive Manufacturing: Model Predictive Control of Part Thermal History
13:45-15:00 300B	**BioM3_2 (2): Advances in Manufacturing of Tissue Constructs/Medical Implants and Bioinspired Materials/Structures for Healthcare Applications** *Session Chair: Ross Salary and Changxue Xu*	
124411	Kellen Mitchell, Aidan Shackleford, Erick Bandala, Guangrui Chai, and Yifei Jin	Embedded Fused Deposition Modeling of Pcl Orbital Implants with Enhanced Performance
123879	Hamzeh Al-Qawasmi, Sebastian Risch, and Roozbeh (Ross) Salary	Polypropylene and Glass Fiber Composite Extrusion for Additive Biofabrication of Bone Tissue Scaffolds with Complex Microstructures
125185	Md Ahasan Habib, Bashir Khoda, Slesha Tuladhar, and Rokeya Sarah	Fine-Tuning Rheological Properties of 3D Bioprintable Hybride Hydrogel by Controlling Component Solid Content
13:45-15:00 300C	**MEA5_1 (2): Innovations in Equipment Design, Control and Automation** *Session Chair: Lei Zhou and Chandra Nath*	
125235	Daniel Sills, Ruoshi Zhang, Andriy Sherehiy, Douglas Jackson, Henry Reynolds, Dilan Ratnayake, Cassidy Caid, and Dan. O Popa	Automated Manufacturing Process for Multilayer Flexible Printed Circuit Board with Smd Components
125413	Yifei Li, Jeongwon Park, Guha Manogharan, Feng Ju, and Ilya Kolavenko	A Mobile Additive Manufacturing Robot Framework for Smart Manufacturing Systems
125487	Alireza Tofangchi, Cassidy Caid, Danming Wei, Keng Hsu, and Dan O. Popa	Robotic Ultrasonic Micro-Wire Bonding for Structural Electronics

13:45-15:00 300D	**MP6_3 (1): Advances in Surface Engineering: Process, Metrology, and Property/Performance** *Session Chair: Beiwen L and Sougata Roy*	
123270	A Gnanavelbabu, M Prahadeeswaran, and E Vinothkumar	Synergistic Effect of Tin/hbn Concentration and Various Ageing Temperatures Improving Salt Spray Corrosion Characteristics of Az91d Mg Composites
123292	A Gnanavelbabu, M Prahadeeswaran, and E Vinothkumar	Effect of Ageing Temperature on Mechanical and Tribological Behaviour of Az91d/zrb2 Composites
124477	Yan Dou, and Qiong Nian	Electrochemical Sensor Fabrication via Fdm 3D Printing and Rgo Surface Modification
15:15-16:30 301D	**AdM1_3 (2): Multi-Material Processing in Additive Manufacturing** *Session Chair: Monique McClain and Jay Park*	
124099	Ladpha Teawdeswan, Jake Dong, Dana Carpenter, and Guoying Dong	Numerical Simulation of Multi-Material Gyroid Structures Made by Fused Deposition Modeling
125138	Jacklyn Griffis, Andrew Masker, Jeremy Schreiber, and Guha Manogharan	Nanoindentation-Informed Interface Design for Multi-Material Laser Powder Bed Fusion (Mm-Lpbf)
125351	Yinong Chen, and Yayue Pan	Periodic Line-Patterned Particle-Polymer Composite Surface Structures Fabricated by Acoustic Assembly Photopolymerization (Aap)
15:15-16:30 301E	**AdM1_1 (3): Advances in Metal Additive Manufacturing Processes** *Session Chair: Wenchao Zhou and Ala Qattawi*	
124367	Vysakh Venugopal, Parisa Farahmand, Gen Satoh, and Sam Anand	Entrapped Powder Removal Using a Graph-Based Orientation Sequence Optimization for Powder Bed Fusion Additive Manufacturing Processes
130041	Md Saidur Rahman Roney, Amm Nazmul Ahsan, Hayri Sezer, and Sudhir Kaul	An Island Type Novel Scan Pattern with Non-Linear Island Intersections for Laser Powder Bed Fusion Additive Manufacturing Processes

130182	Abhik Deb, Priti Ranjan Panda, Koushik Viswanathan, and Pradip Dutta	Study of Transport Phenomena in Laser Melting Based Metal Additive Manufacturing
15:15-16:30 300B	**LCE4_2 (2): Systems Engineering and Digital Technologies for Circular Economy** *Session Chair: Nehika Mathur and Abheek Chatterjee*	
122680	Hadear Hassan, Amira Bushagour, and Astrid Layton	Resilient Sustainability in Manufacturing: Synergies Between Circular Economy and Reconfigurability
124452	Jing Zhao, Zayda Riggle, Gamini Mendis, and Yiran Yang	Sustainability Evaluation of Traditional and Additive Manufacturing for Injection Mold Insert Application
124500	Sidi Deng, Yongxian Zhu, Daniel Cooper, and John Sutherland	A Dynamic Material Flow Model for Risk-Informed Decision Making in Decarbonizing Global Aluminum Manufacturing
15:15-16:30 300C	**MP6_3 (2): Advances in Surface Engineering: Process, Metrology, and Property/Performance** *Session Chair: Yiliang Liao and Qiong Nian*	
124702	Jiayu Liu, Tommy Bird, Aadit Nagori, Johnson Samuel, and Yinan Wang	Unsupervised Anomaly Detection Using 3D Point Cloud Data for Model-Free Products
125077	Aryan Bhardwaj, Shayan Bayki, and Soham Mujumdar	Application of Dielectric Barrier Discharge Plasma Jet for Enhanced Wettability of Titanium Grade 23 Alloy
15:15-16:30 300D	**QR9_1 (1): Bridging Academic Research and Industrial Practices on Machine Learning for Advanced Manufacturing** *Session Chair: Peng Wang and Hantang Qin*	
Invited Talk	Speaker - Hassan Ghassemi-Armaki	Artificial Intelligence in Automotive Welding: From Body-In-White (BIW) to Battery Cell Welding
JMSE 23-1313 [J]	Ferdous Alam, and David Hoelzle	A testbed to evaluate machine learning based autonomous manufacturing
JMSE 23-1054 [J]	Cindy Chang	Real-time Control of Mobile Robots in Multiproduct Flexible Production Systems using Reinforcement Learning
16:45-18:00 301D	**AdM1_4 (4): Smart Additive Manufacturing** *Session Chair: Molong Duan and Azadeh Haghighi*	

124510	Lu Liu, Eonyeon Jo, Uday Vaidya, Soydan Ozcan, Seokpum Kim, and Feng Ju	Robust Layer Time Optimization for Large Scale Additive Manufacturing
124989	Md Shahriar Aziz, and Gregory Purdy	Simulating Current Profile in Fused Deposition Modeling
JMSE 22-1551 [J]	Azadeh Haghighi	Architecture-driven Physics-informed Deep Learning for Temperature Prediction in Laser Powder Bed Fusion Additive Manufacturing with Limited Data
16:45-18:00 301E	**MS7_1 (3): AI for Smart Manufacturing Systems** *Session Chair: Shenghan Guo and Ran Jin*	
125011	Christian Zuniga-Navarrete, Stalin Jamil Segura, Sabur Baidya, Christian Narváez-Muñoz, Juan Diego Toscano, and Luis Javier Segura	Electrospinning Process Modeling: A Multistage View
125289	Mahtab Heydari, and Bruce Tai	A Tandem-Machine Learning Approach for Spatial-Temporal Temperature Prediction of a Moving Heat Source
JMSE 22-1685 [J]	Huitaek Yun	Autonomous robotic bin picking platform learning from human demonstration and YOLOv5
16:45-18:00 300B	**AMM2_2 (2): Advances in Manufacturing and Processing of Polymers and Composites** *Session Chair: Erina B Joyee and Kenan Song*	
124489	Anasheh Khecho, Rodward Hewlin Jr., and Erina Baynojir Joyee	Direct Ink Writing of SIC-Fe3O4-Polymer Nanocomposites for Magnetic Humidity Sensors: Rheology Characterization
124741	Yang Zhang, and Hao Zhang	Synergistic Enhancements in Wcob Cemented Carbide: A Study of Microstructural and Performance Benefits Achieved Through Cu and Ni Addition via Vacuum Sintering
16:45-18:00 300C	**LCE4_1 (2): Advances in Sustainable Manufacturing for Improved Component Life Cycle Performance** *Session Chair: Shange Yang and Guoying Dong*	
125157	Mohammad Ahnaf Shahriar, and Yiran Yang	Cost Modeling and Evaluation of Hybrid Manufacturing Process with

		Laser Metal Deposition and CNC Machining
125304	Md Tarique Hasan Khan, and Saki Rezwana	Assessing the Sustainability Impacts of Additive Manufacturing: A Comprehensive Literature Review
125177 [B]	Hariteja Nandimandalam, and Gamini Mendis	Multi-Facility Location Optimization to Analyze the Economics of Plastic Recycling Systems: A Study Integrating K-Means and Monte Carlo Methods
16:45-18:00 **300E**	**MP6_2 (3): Advances in Machining and Metrology** *Session Chair: Bruce Tai and Oguzhan Tuysuz*	
125330	Otto Randolph, Chin Sheng Chih, and Bruce Tai	Dynamic Force Measurement Using an Accelerometer – a Proof-of-Concept Study
125456	Jonathan Theraroz, and Oguzhan Tuysuz	A General Analytical Approach to Predict Machining Process Damping
130712	Tsutomu Uenohara, Taiyu Ito, Yasuhiro Mizutani, and Yasuhiro Takaya	Measurement of Tool Edge Geometry Using Saturated Fluorescence from Cutting Fluid

THURSDAY JUNE 20, 2024

Time	Location	Event
7:00-17:30	Henley Concourse	Registration/ Information
7:00-8:00	Cumberland Concourse	Breakfast
8:00-8:15	Ballroom DEFG	Welcome address: Michael Gomez
8:15-8:45	Ballroom DEFG	Keynote: Martina McIsaac
9:00-10:15	301ABCDE, 300BCD, 200ABC	Paper Session X
10:00-17:00	Ballroom ABC	Exhibitor Booths Open
10:15-10:45	Cumberland Concourse	Morning Break
10:30-11:45	301ABCDE, 300BCD, 200ABC	Paper Session XI
12:00-13:30	Ballroom DEFG	NAMRI/SME Award Luncheon and Founder's Lecture
13:45-15:00	301ABCDE, 300BCD, 200ABC	Paper Session XII
14:00-15:00	300A	Life Cycle Engineering Technical Committee Meeting
15:00-18:00	200DE	Women in Advanced Manufacturing (WIAM) Forum
15:00-15:30	Cumberland Concourse	Afternoon Break
15:15-16:30	301ABCDE, 300BCD, 200ABC	Paper Session XIII
16:45-18:00	301ABCDE, 300BCD, 200ABC	Paper Session XIV
19:00-21:00	Ballroom DEFG	Banquet and Keynote: Mike Molnar

KEYNOTE

THURSDAY JUNE 20, 2024

Opening remarks

Michael Gomez

Principal R&D Engineer, MSC Industrial Supply Co.

8:00-8:15 | KCC Ballroom DEFG

Biography

Dr. Michael Gomez is a Principal R&D Engineer at MSC Industrial Supply Co., where he focuses on metalworking innovation and advanced manufacturing research. In his role, Dr. Gomez lead's MSC's Manufacturing Research and Technology team focused on early stage and technical development of manufacturing solutions and services to the U.S. manufacturing marketplace aimed at improving workforce development, manufacturing productivity, and operational efficiency.

Prior to joining MSC, Michael held research positions at the University of Tennessee Knoxville and Oak Ridge National Laboratory. He has made several distinguished contributions to the intersection of machining dynamics, milling process modeling, and metrology. He chairs MSC's generational inclusion circle and is a mentor for MSC's launch internship program.

Dr. Gomez holds bachelor's degrees in mechanical engineering and physics from the University of North Carolina at Charlotte and a Ph.D. in mechanical engineering from the University of Tennessee at Knoxville. He serves as a member of SME's Technical Community Committee and is an associate editor for the Journal of Manufacturing Processes. He is a recipient of the 2022 Sandra L. Bouckley Outstanding Young Manufacturing Engineer award and is a 2023 SME Media '30 Under 30' honoree.

NAMRI/SME AWARD LUNCHEON

THURSDAY JUNE 20, 2024

Customer Needs and Technological Innovation: An MSC Perspective

Martina McIsaac

Executive Vice President and Chief Operating Officer, MSC Industrial Supply Co.

8:15-8:45 | KCC Ballroom DEFG

Abstract

The metalworking industry is at a critical moment, facing unique challenges and opportunities that require innovative solutions to remain competitive. Martina McIsaac, COO of MSC Industrial Supply Co., will explore how MSC is meeting the critical needs of metalworking customers by leveraging advanced technologies. Martina will discuss how MSC works closely with customers to understand their needs and act as their voice in the industry. With a focus on practical applications, she will highlight how MSC is enhancing operational efficiency and driving business success for both large organizations and small enterprises. Through real-world examples and case studies, attendees will gain insights into MSC's collaborative approach with industry partners and customers. This session will emphasize the importance of a customer-centric, technology-driven strategy in fostering sustainable growth and maintaining a competitive edge in the market.

Biography

Martina McIsaac joined MSC Industrial Supply Co. as Executive Vice President and Chief Operation Officer in October 2022. In her role, she oversees the day-to-day operations of MSC's United States and Canada businesses, includes Sales, Field Service/Solutions, Category Management, Procurement, Pricing, and Supply Chain.

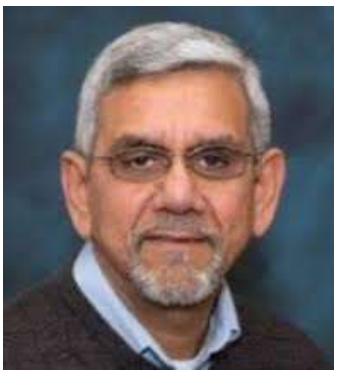
Before joining MSC, McIsaac had a distinguished nine-year tenure at Hilti Corporation, a multinational company that develops, manufactures, and markets hardware, software and services for the construction, building maintenance, energy and manufacturing industries. Most recently, she served as Region Head and Chief Executive Officer of Hilti, Inc., leading the North America organization to significantly outperform the market with strong top-line and profit growth.

McIsaac holds a bachelor's degree in economics from Western University and a master's degree in international business from the University of South Carolina. She serves on the board of the Folks Center for International Business at the University of South Carolina. Known for her advocacy in diversity, equity, and inclusion, she is a signatory to the Catalyst CEO Champion for Change pledge. McIsaac is a member of the Texas Women's Foundation's Economic Leadership Council and is the former chair of the Dallas Habitat for Humanity Women Build and former board member of the United Way of Metropolitan Dallas.

NAMRI/SME AWARD LUNCHEON

THURSDAY JUNE 20, 2024

NAMRI/SME Founder's Lecture 2024



Numerical Modeling of Manufacturing Processes: A Historical Perspective

Rajiv Shivpuri

Professor Emeritus, Integrated Systems Engineering

Ohio State University

12:00-13:30 | KCC Ballroom DEFG

Abstract

While the mathematical modeling of manufacturing processes started much earlier, their numerical modeling began in the 1970s with the developments in finite difference and finite element methods. Open architecture source codes were initially developed at the Universities and the National Labs to tackle hard problems of material behavior during processing. In the 1990s, these source codes gave rise to commercial general-purpose codes, as well as special purpose codes dedicated to the individual processes. More recently, the focus of modeling has shifted to the study of material behavior during processing at the micro, nano and atomic levels, using advances in sensing, characterization and computational tools. This presentation provides a perspective to these developments, as witnessed by the presenter, and relates them to the important contributions from the NAMRI community. Many of the examples cited come from the 40+ years research of the presenter in the modeling of metal forming, machining, casting and additive processes.

Biography

Dr. Rajiv Shivpuri is an Emeritus Professor in the Integrated Systems Engineering at the Ohio State University (1986- 2018), and an Associate Director of the NSF-ERC for Net Share Manufacturing (1986-97). Prior to OSU, he was a Senior Scientist with the Defense R&D Organization in India (1972-80). Dr. Shivpuri has graduate degrees from IIT Kanpur (1972) and Drexel University (1980, 1986). He has advised over 120 graduate student theses and published around 400 research articles. He has participated in and presented his research findings in many NAMRC/MSEC Conferences. His 40+ years of research spans design, modeling and control of manufacturing processes (forming, machining, casting, deposition and joining) with an emphasis on industrial relevance and collaboration. He is a Fellow of ASM Int., ASME, CIRP and SME. He was recognized with several education and research awards by the OSU, and professional and trade organizations. Three of his research collaborators were recognized with the Taylor Award by the CIRP (Vikram Bedekar, 2014; Domenico Umbrello 2011 and Livan Fratini 2007). Dr. Shivpuri has been a member of NAMRI/SME since 1987 and was its President in 2001.

WIAM FORUM

THURSDAY JUNE 20, 2024

5th Women in Advanced Manufacturing (WIAM) Forum

15:00-18:00 | KCC Room 200 DE

The WIAM Forum 2024 will continue to showcase successful career paths, discuss next generation technologies, and promote diversity, equity, and inclusion in the field of advanced manufacturing. This forum is organized by the ASME Manufacturing Engineering Division (MED). Funding for this event is being provided by MED and the ASME Technical and Engineering Communities (TEC) Sector and it is co-sponsored by SME.

Registration fee of $5 is required. All genders are welcome!

Program Details

Session I (15:00-15:30): WIAM Welcome

Moderator: Dr. Ala Qattawi and Dr. Azadeh Haghighi
Agenda: The welcome session will include WIAM 2024 Forum introduction and agenda as well as a brief presentation of the WIAM 2024 sponsors: NSF, SME and ASME

Session II (15:30-17:00): Technical Panel of Advanced Manufacturing Leaders

Panel Topic: Advances in Smart Manufacturing, Materials & Systems
Moderator: Dr. Ala Qattawi and Dr. Megan McGovern
Panelists: Dr. Katie Copenhaver, Dr. Hoda Eiliat, Dr. Yan Lu, Aneesa Muthana, Dr. Sneha Prabha Narra, and Dr. Teresa Rinker
Agenda: WIAM 2024 will feature a diverse panel of women in advanced manufacturing materials and systems from academia, industry, and national labs. Each panelist will discuss her work in advanced manufacturing, as well as her career path. The presentations will be followed by a Q&A session moderated by Dr. Ala Qattawi.

Session III (17:00-18:00): WIAM Networking

Agenda: The WIAM 2024 Forum will host a networking event following the technical panel, offering attendees the opportunity to engage in open discussions with the panelists and fellow participants. This event aims to foster connections, establish mentoring relationships, and build collegial bridges within the advanced manufacturing community.

WIAM FORUM

THURSDAY JUNE 20, 2024

ASME MED WIAM 2024 Panel of Smart Manufacturing, Materials, and Systems Leaders

Katie Copenhaver, ORNL – R&D Associate Staff

Dr. Katie Copenhaver is an R&D Associate Staff member in the Sustainable Manufacturing Technologies Group at the Oak Ridge National Laboratory. She joined ORNL in 2020, and her research interests lie in the use of natural fibers and bio-based polymers in novel applications. She received a B.S. in Polymer and Fiber Engineering in 2014 and a Ph.D. in Materials Science and Engineering in 2019, both from the Georgia Institute of Technology. Her doctoral research focused on polymer surface patterning for structured adhesives.

Hoda Eiliat, General Motors – Structure Lead Integration Engineer

Dr. Hoda Eiliat is a Senior Structure Lead Integration Engineer at General Motors. She has 15 years of Automotive Industry experience. She has worked in different capacities such as Vehicle System Engineering, Advanced Technical Work Engineering, Robustness and Quality Engineering and R&D. Hoda holds a PhD in Material Science and Engineering and a Master of Applied Science in Mechanical Engineering from the University of Windsor in Canada. Hoda is a metallurgist and tribologist at heart. She is running a reverse mentorship program and is passionate about inspiring new engineers and advocating for Women in Engineering.

Yan Lu, NIST – Information Modeling and Testing Group Leader

Dr. Yan Lu is a member of the System Integration Division at the Engineering Lab. Her research interests at NIST include additive manufacturing data registration, data integration and fusion, and smart manufacturing system information modeling and integration architecture. Before joining NIST, Dr. Lu was the head of the Grid Automation and Production Operation and Optimization Research Group at Siemens Corporation, Corporate Technology. With Siemens, she has led and successfully delivered tens of millions of dollars of corporate funded, and government funded research projects in the areas of survivable control systems, energy automation, and building energy management systems. She has published more than 100 peer-reviewed journal and conference papers and was granted more than 15 patents in industry and building automation technology. Dr. Lu also worked for Seagate Research Center for two years on developing hard disk drive servo control.

Aneesa Muthana, Pioneer Service Inc. & M&M Quality Grinding, Inc- CEO and Co-Owner

Aneesa Muthana got her first taste of manufacturing as a youngster in her parents' bar grinding shop, M&M Quality Grinding. In her early 20s, Aneesa left M&M to become CEO and co-owner of Pioneer Service. Her passion and experience drove her to implement the changes necessary to substantially grow the business into a successful Swiss CNC operation. Thirty-one years later, the company serves a variety of industries including aerospace, medical, and electric vehicles. In 2021, Aneesa returned to M&M as co-owner and CEO, coming full circle while retaining her role at Pioneer Service. Outside of the shop, Aneesa advocates for DEI through outreach at various public speaking events. Her core message stakes its claim on hard work, not playing the victim, and disavowing the "us vs. them" mindset behind most harmful stereotypes. In her personal life, she always finds time for faith, family, and her four grandchildren, who remain the light of her world.

Sneha Prabha Narra, Carnegie Mellon University, Department of Materials Science & Engineering – Assistant Professor

Dr. Narra's research focuses on advancing fundamental knowledge in metal additive manufacturing to enable lightweight, high-performance printed parts. This includes studying process-structure interactions, material behavior, and physics-driven process design paradigms aimed at accelerating industrial adoption. Her group works at the intersection of mechanical engineering and materials science to advance additive manufacturing technologies. Sneha P. Narra received her B.E. in civil engineering from Osmania University in India (2012). She pursued graduate education at Carnegie Mellon University, where she obtained her M.S. in computational mechanics (2013), M.S. in mechanical engineering (2015), and Ph.D. in mechanical engineering (2017). She then completed postdoctoral training at the NextManufacturing Center before joining the mechanical engineering department at Worcester Polytechnic Institute as an assistant professor in 2018. After three years in WPI's materials and manufacturing engineering program, she joined the CMU mechanical engineering department in 2021. She is currently serving as the Associate Editor of the Additive Manufacturing Journal and plays an active role in organizing symposia through the TMS Additive Manufacturing Bridge Committee and other educational and outreach activities.

Teresa Rinker, General Motors- Senior Researcher

Dr. Teresa Rinker is a Senior Researcher at GM R&D in the Materials & Manufacturing Systems Research Lab. She studied joining and fatigue failure of dissimilar ultrasonic welds in magnesium and steel where she was an NSF Graduate Research Fellow at the University of Michigan. While there, she received a master's degree in both Mechanical Engineering and Material Science and Engineering in 2010 and 2013, along with her Ph.D. in Mechanical Engineering in 2013. Currently, Rinker is working on battery joining for electric vehicles. Her research interests include destructive testing as well as welding of dissimilar metals and thin foils.

WIAM FORUM

THURSDAY JUNE 20, 2024

ASME MED WIAM 2024 Organizing Committee

Chair: Ala Qattawi, University of Toledo
Vice Chair: Nancy Diaz-Elsayed, University of South Florida
Co-Lead: Sarah Wolff, Ohio State University
Treasurer: Megan McGovern, General Motors Global R&D Center
Secretary: Maya Reslan, NIST & Azadeh Haghighi, University of Illinois Chicago
Liaison Coordinator: Dian-Ru Annie Li, National Taiwan University
ASME Coordinator: Barbara Zlatnik, ASME

Ala Qattawi, University of Toledo- Assistant Professor, WIAM 2024 Lead Organizer

Dr. Ala Qattawi is an assistant professor at the Department of Mechanical, Industrial, and Manufacturing Engineering at the University of Toledo. She is the director and the principal investigator at the Integrated Design and Manufacturing (IDM) Laboratory at the University of Toledo, where her research group interests include advanced manufacturing: additive manufacturing and sheet metal forming, design for manufacturing, sustainable manufacturing, and Origami-inspired metal structures as well as applications to vehicles body-in-white design. She earned her Ph.D. in Automotive Engineering from Clemson University, specializing in metal fabrication, and served as a post-doctorate fellow at the International Center for Automotive Research in South Carolina. Ala has earned several awards, including the Hellman Faculty Award in 2016, the Young Manufacturing Engineer Award from SME in 2018, the Ralph Teetor Education Award from SAE in 2021, the Toyota Programmable System Innovation Fellowship Award in 2022, the ORR Best Paper Award from ASME in 2022, the Distinguished Alumni Award from Clemson University-Automotive Engineering Department in 2023, the 2023 Excellence in Supervision of Undergraduate Research Award from the University of Toledo, and the Engineering Research Initiation (ERI) Award from National Science Foundation in 2023.

Nancy Diaz-Elsayed, University of South Florida – Assistant Professor

Dr. Nancy Diaz-Elsayed joined the Department of Mechanical Engineering at USF as an Assistant Professor in 2020 where she leads the Smart and Sustainable Systems Laboratory. Under her leadership, the S3 Lab evaluates the sustainability of engineered systems to inform strategies that can lower environmental and economic impacts, while improving technological performance using data-driven methodologies. Her research interests include system and process modeling, technology development for smart and sustainable systems, and the role of industrial symbiosis in the design and growth of urban environments. She holds an M.S. and Ph.D. in Mechanical Engineering from UC Berkeley and a B.S. in Mechanical Engineering from MIT. For her professional achievements to date and support of the future generation of engineers, she has received several accolades including the 2022 SME Sandra L. Bouckley

Outstanding Young Manufacturing Engineer Award from the Society of Manufacturing Engineers, a 2022 Luminary Award from Great Minds in STEM, and a 2021 William R. Jones Outstanding Mentor Award from the Florida Education Fund.

She has collaborated with partners across Tampa Bay, Florida, and the U.S. in support of offering local manufacturing workforce training and accelerating technology development for advanced manufacturing solutions. In addition to her technical and professional achievements, Dr. Diaz-Elsayed has supported USF's Sloan University Center of Exemplary Mentoring (UCEM) by leading the documentation of best practices for the recruitment and mentoring of Hispanic and African American students in STEM doctoral programs. She led the inaugural Girls Rise Up program at USF in 2022 in collaboration with STEM from Dance out of New York City, which invited middle school and high school students to our USF campus from across Hillsborough County to learn engineering skills through a dance-infused curriculum.

Sarah Wolff, Ohio State University – Assistant Professor

Dr. Sarah Wolff is an assistant professor in the mechanical and aerospace department at The Ohio State University. She was awarded the 2022 SME Outstanding Young Manufacturing Engineer Award. Her previous roles include an assistant professorship in the industrial and systems engineering department at Texas A&M University and an Enrico Fermi Fellow at Argonne National Laboratory. She graduated from Northwestern University in 2018 with a PhD in mechanical engineering. Dr. Wolff's expertise is in metal additive manufacturing and laser processing, particularly in the areas of situ monitoring, high-speed X-ray imaging, image processing, and microstructural characterization.

Maya Reslan, NIST – Associate Researcher

Maya Reslan is an Associate Researcher at the National Institute of Standards and Technology in Gaithersburg, Maryland. Her research focuses on Lean manufacturing, maintenance workflows, advanced manufacturing, industry 4.0, and change management. She graduated from the Lebanese American University with a Bachelor in Mechanical Engineering in December of 2015 and then moved to Germany to pursue her Masters in Management and Engineering in production systems at RWTH Aachen.

Maya is a certified Six Sigma Green belt and has experience in many manufacturing environments, which include automotive, metal, furniture, pumps, aerospace, and others. Most of her work in industry varied between lean six sigma, continuous process improvements, supply chain management, risk mitigation, project management, inventory management, and others. She has held positions ranging from Business Development to Production Engineer to Research. She is also passionate about psychology and anthropology and has been integrating her engineering research in topics like work motivation, job attitudes, teams, enhancing performance and efficiency, and organizational development; mainly how employees can adapt to digitization and technology and transition into smart factories.

Maya is also an active member of ASME since 2012 and is currently serving the Career Engagement Center (CEC) and Student Leadership Training Conference (SLTC). She joined ASME during her second year of undergrad and has remained involved since. She is also an active volunteer in different societies and NGOs targeting humanitarian issues like the refugee crisis, poverty, and emergency relief. Furthermore, Maya's hobbies vary between Martial Arts, swimming, painting, volunteering, traveling, and experiencing new cultures.

Megan McGovern, General Motors Global R&D – Senior Researcher

Dr. Megan McGovern is a Senior Researcher in the Manufacturing Systems Research Lab at General Motors Global Research and Development. She joined General Motors in 2016, where she leads research projects to develop inline and post manufacturing inspection systems crucial for first-time quality, especially in low-volume applications where launches are quick and highly customized. In 2019, she was the lead inventor in developing a technique to enable inline inspection of welded joints during pre-production battery pack assembly. Dr. McGovern received her Bachelor's, Master's, and Doctorate degrees in Systems and Entrepreneurial Engineering from the University of Illinois Urbana-Champaign. Her research interests include inline and post manufacturing inspection solutions, nondestructive evaluation of materials, components, and structures, digital signal and image processing, process monitoring, and prognosis of materials and components. She is proficient in several nondestructive techniques, including ultrasound, thermography, X-Ray CT, and laser ultrasound.

Dr. McGovern is the chair of the Detroit Section of the American Society for Nondestructive Testing (ASNT). She is active in various professional societies and is a licensed Professional Engineer (Michigan). She has 6 patents and 27 peer-reviewed journal articles, one of which received the Outstanding Paper Published in Materials Evaluation. She recently received the 2022 ASNT Research Innovation Award and the 2022 SME Outstanding Young Manufacturing Engineer Award.

Dian-Ru Annie Li, National Taiwan University – Assistant Professor

Dr. Dian-Ru (Annie) Li is currently an Assistant Professor in the Department of Mechanical Engineering at National Taiwan University. Dr. Li received her Bachelor's and Master's degrees from the Department of Mechanical Engineering at National Taiwan University. She then obtained her Doctorate degree from the Department of Mechanical Engineering at the University of Michigan – Ann Arbor in 2019 and continued as a Postdoctoral Researcher for a year. Dr. Li was also a senior R&D mechanical engineer at Zap Surgical Systems, Inc. during 2020-2022.

Dr. Li's research interests lie in the field of design and manufacturing with the focused areas on biomedical engineering and advanced & smart manufacturing. She has a deep understanding of tool-workpiece interaction mechanics and mechanical structural analysis. She is also experienced

with the processes of medical product design and development including initial concept prototyping, manufacturability evaluation, performance testing and patentability/commercialization assessment. Beyond this, Dr. Li's recent research themes extend to advanced and smart manufacturing, focusing on integrating advanced computer science technologies into manufacturing processes to improve product quality and achieve process sustainability. Dr. Li was selected as one of thirty of the top junior academic women in Mechanical Engineering and invited to a Rising Star in Mechanical Engineering workshop hosted by the Massachusetts Institute of Technology in 2018. She also led a project team developing an innovative nasal airway device and won the First Prize at the Michigan Business Challenge in 2020. Dr. Li has 11 peer-reviewed journal articles, 11 conference proceedings (one of them received Paper Presentation Award at the World Congress on Micro and Nano Manufacturing 2017 International Conference), and 4 patent applications (with 1 USA patent awarded).

Azadeh Haghighi, University of Illinois Chicago – Assistant Professor

Dr. Azadeh Haghighi is an Assistant Professor at the Mechanical and Industrial Engineering Department, University of Illinois Chicago, and the director of the Smart Manufacturing of the Future Lab. She leads pioneering research initiatives focused on advancing novel manufacturing capabilities and intelligent decision-support systems, particularly within additive, hybrid, and robotic manufacturing processes. She serves as an associate editor for the Robotics and Computer-Integrated Manufacturing Journal and has received several notable recognitions, including the 2024 Susan Smyth SME Outstanding Young Manufacturing Engineer Award, UIC Chancellor's Translational Research Initiative Award, IMEC Future of Illinois Manufacturing Faculty Award, UIC Provost's Award for Graduate Research, and the Society of Manufacturing Engineers' Outstanding Paper Award.

Barbara Zlatnik, CAE, ASME – Senior Manager, Technical & Engineering Communities (TEC) Operations

Barbara Zlatnik is a Senior Manager at ASME supporting a number of the Society's technical divisions and technology groups. Barbara supports the division and technology group members and their leadership. Barbara has worked for several professional membership associations in various membership, volunteer management and customer service positions. She earned her Certified Association Executive credential in 2010.

BANQUET KEYNOTE

THURSDAY JUNE 20, 2024

Growing Manufacturing Ecosystems

Mike Molnar

Director, Advanced Manufacturing National Program Office and NIST Office of Advanced Manufacturing

19:00-21:00 | KCC Ballroom DEFG

Abstract

Manufacturing USA exists to secure U.S. global leadership in advanced manufacturing through large-scale public-private collaboration on technology, supply chain, and workforce development. The institutes in the Manufacturing USA network convene business competitors, academic institutions, and other stakeholders to test applications of new technology, create new products, reduce cost, and risk, and enable the manufacturing workforce with the skills of the future. This session will highlight the status and growth of the Manufacturing USA network of advanced manufacturing innovation institutes, and cover the launch of two new institutes on Digital Twins for Semiconductor Manufacturing, and on Artificial Intelligence for Resilient Manufacturing.

The Manufacturing USA network is operated by the interagency Advanced Manufacturing National Program Office, which is headquartered in the National Institute of Standards and Technology (NIST), in the Department of Commerce. The office operates in partnership with the Department of Defense, the Department of Energy, NASA, the National Science Foundation, and the Departments of Education, Agriculture, Health and Human Services (HHS), and Labor.

Biography

Mike Molnar is the founding director of the Advanced Manufacturing National Program Office, the interagency team responsible for the Manufacturing USA program. Mike also leads the NIST Office of Advanced Manufacturing and serves as co-chair of the National Science and Technology Council, Subcommittee on Advanced Manufacturing – the team responsible for the National Strategic Plan for Advanced Manufacturing.

Prior to joining federal service in 2011 Mike had a successful industry career, including 25 years leading manufacturing and technology development at Cummins, a U.S. based global company that designs, manufactures, and distributes engines and power generation products. Midcareer he served as the first Manufacturing Policy Fellow in the White House Office of Science and Technology Policy. He earned a Bachelor's in Mechanical Engineering and Master's in Manufacturing Systems Engineering from the University of Wisconsin, and an Executive MBA from the University of Notre Dame. He is a licensed Professional Engineer, Certified Manufacturing Engineer, and was elected a Fellow of SME and a Fellow and Honorary Member of ASME.

NAMRC TECHNICAL SESSIONS

THURSDAY JUNE 20, 2024

09:10-10:15 301A	**NAMRC – TRACK 1 MANUFACTURING SYSTEMS - Session 8** *Session Chair: Zhengchun Du | Session Co-Chair: Peter Olubambi*	
Paper 154	Emmanuel Olorundaisi, Bukola J Babalola, Ufoma S. Anamu, Moipone L. Teffo, Ngeleshi Michel Kibambe, Anthony O. Ogunmefun, Peter Odetola and Peter A. Olubambi	Thermo-mechanical and phase prediction of Ni25Al25Co14Fe14Ti9Mn8Cr5 high entropy alloys system using THERMO-CALC
Paper 26	Yukun Xiao, Guangyan Ge, Ming Deng, Jun Lv and Zhengchun Du	An unconstrained and non-redundant identification method of geometric errors and compensation of machine tools by X-AX Laserbar
Paper 152	Emmanuel Olorundaisi, Bukola J Babalola, Ufoma S. Anamu, Moipone L. Teffo, Ngeleshi Michel Kibambe, Anthony O. Ogunmefun, Peter Odetola and Peter A. Olubambi	Phase formation and mechanical analysis of sintered Ni25Al25Co15Fe15Mn8Ti7Cr5 high entropy alloy
09:10-10:15 301B	**NAMRC - TRACK 2 MANUFACTURING PROCESSES - Session 9** *Session Chair: Lukas Kluy | Session Co-Chair: Sathyan Subbiah*	
Paper 125	Yashdeep Yashdeep and Sathyan Subbiah	Use of Magnetic fields to impact Glass-Transition and Crystallization during Manufacturing of ZBLAN Optical Fibers
Paper 102	Lukas Kluy, Lina Klinge, Christopher Spiegel, Carsten Siemers and Peter Groche	Design of thermomechanical processes for tailored microstructures
Paper 126	Aravind Shriram, Nithya Srimurugan and Sathyan Subbiah	Mid-Spatial Frequency Reduction via Zero-Depth of Cut Rapid-Feed passes in FaceTurning
09:10-10:15 301C	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 10** *Session Chair: Sangkee Min | Session Co-Chair: Howon Noh*	
Paper 244	Al Mazedur Rahman, Abhinav Bhardwaj,	Characterization of 3D Printed Samples from Biomass-Fungi Composite Materials

	Peiran Wei, Yeasir Mohammad Akib, Taieba Tuba Rahman, Zhijian Pei, Brian D. Shaw and Chukwuzubelu Ufodike	
Paper 240	Manikanta Grandhi, Aditya Nagaraj, Hamed Khosravi, Zhichao Liu and Sangkee Min	Mechanical and microstructural profiling of additively manufactured Cobalt-Nickel functional gradient structure
Paper 246	Howon Noh and Pranav Shrotriya	Direct writing of calcium phosphate/graphite nanocomposite film using laser induced graphitization of polyimides
09:10-10:15 200A	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 11** *Session Chair: Iason Sideris | Session Co-Chair: Tao Sun*	
Paper 105	Guanxiong Miao, Wenchao Du, Ming Li, Zhijian Pei and Chao Ma	Powder-bed additive manufacturing: the effect of layer thickness on powder bed density
Paper 90	Iason Sideris, Jan Petrik and Markus Bambach	Too hot to print, too slow to handle; finding optimal path characteristics for WAAM
Paper 106	Quinton Porter, Wenchao Du and Chao Ma	Selective laser melting of 316L stainless steel: porosity dependence on geometric feature size
09:10-10:15 200B	**NAMRC - TRACK 5 SMART MANUFACTURING & CPS - Session 10** *Session Chair: Martin Jun | Session Co-Chair: Ramy Harik*	
Paper 188	Eunseob Kim, Thu Bui, Junyi Yuan, Chandra Sekar, Bruno Ribeiro, Raymond Yeh, Michael Fassnacht and Martin Jun	Online real-time machining chatter sound detection using convolutional neural network by adopting expert knowledge
Paper 169	Ibrahim Yousif, Jad Samaha, Juhyeong Ryu and Ramy Harik	Safety 4.0: Harnessing Computer Vision for Advanced Industrial Protection
Paper 184	Dileep Parvathaneni, Syed Ahmed and Iqbal Shareef	Scanning problems in production parts transfer within the smart factory

NAMRC TECHNICAL SESSIONS

THURSDAY JUNE 20, 2024

10:30-11:45 301A	**NAMRC – HAMMER ERC - Session 1** *Session Chair: Jian Cao | Session Co-Chair: Ping Guo*	
Paper 229	Derick Suarez, Fan Chen, Putong Kang, Ben Forbes, Margaret Gao, Orlyse Ineza, Kevin Benton, Nicholas Dewberry, Balakrishna Gokaraju, Kornel Ehmann and Jian Cao	On the feasibility of an integrated English wheel system
Paper 226	Yahui Zhang, Derick Suarez, Kornel Ehmann, Jian Cao and Ping Guo	In-process Part Tracking and Shape Measurement using Vision-based Motion Capture for Automated English Wheeling
Paper 221	Kevin Benton Jr, Nicholas Dewberry, Chandra Jaiswal, Shuva Chowdhury, Issa Alhmoud, Derick Suarez, Kornel Ehmann, Jian Cao and Balakrishna Gokaraju	Initial Framework Design of a Digital Twin Mixed-Reality-Application on HumanRobot Bi-Directional Collaboration for Forming Double Curvature Plate
10:30-11:45 301B	**NAMRC - TRACK 2 MANUFACTURING PROCESSES - Session 10** *Session Chair: Anne Brant | Session Co-Chair: Weizhao Zhang*	
Paper 96	Deyong Sun, Wanrui Zhang, Jianchao Zou, Yifeng Xiong, Chongrui Tang and Weizhao Zhang	Coupled 3D non-orthogonal constitutive model for woven composites in preforming and compaction processes
Paper 78	Mehrdad Sadeghieh, Sayyed Mohammadreza Mofidi, Ali Hosseini and Behnam Moetakef-Imani	Jerk Limited Continuous Tool Path Generation for Flexible Systems in Non-Cartesian Coordinate Systems
Paper 79	Anne Brant, Spencer Keane and Murali Sundaram	Electrochemical additive manufacturing of interdigitated structures using a multianode system with independently-controlled anodes
10:30-11:45 301C	**NAMRC - TRACK 1 MANUFACTURING SYSTEMS - Session 9** *Session Chair: Sathyan Subbiah | Session Co-Chair: Karl Haapala*	

Paper 159	Asmaa Harfoush, Zhaoyan Fan, Lisbeth Goddik and Karl Haapala	A Review of Ice Cream Manufacturing Process and System Improvement Strategies
Paper 168	Ronit Shetty, Ahmad Al Majali and Lee Wells	Surface insight: leveraging high-density dataset fusion for enhanced roughness classification
Paper 173	Salil Bapat, Nithya Srimurugan, Albert J. Patrick, Sathyan Subbiah and Ajay P. Malshe	Maintenance Factory Platform for In-space Manufacturing: Conceptualizing Design Architecture
10:30-11:45 200A	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 12** *Session Chair: Tao Sun | Session Co-Chair: Suryank Dwivedi*	
Paper 133	Shantanu G. Gaurkhede, Yiwei Han and Jia Deng	Numerical Simulation of the First Layer Printing in Electric Field-Assisted Fused Filament Fabrication for Robust Unconventionally Oriented Additive Manufacturing
Paper 158	Suryank Dwivedi, Pratik Kumar Shaw, Deepak Kumar, Kumari Bimla Mardi and Amit Rai Dixit	Comparative Study on Surface Wettability, Bio-tribology, and Cytotoxicity of Selective Laser Melted 316L SS, CoCrMo, and Ti6Al4V Metallic Biomaterials
Paper 160	Rakeshkumar Karunakaran, Carina Russell, Ali Tamayol and Michael Sealy	Biological response guided by hybrid additive manufacturing for Ti6Al4V titanium alloy
10:30-11:45 200B	**NAMRC - TRACK 5 SMART MANUFACTURING & CPS - Session 11** *Session Chair: Qing (Cindy) Chang | Session Co-Chair: Yuebin Guo*	
Paper 155	Yew Teck Tan, Shaopeng Liu, Sourav Dutta, Denise Feirstein, John Karigiannis, Antoine Lizotte, Anirban Sinha, Tian Yu and Qing Chang	Hierarchical Robot Learning Method for Industrial Fluorescent Penetrant Inspection
Paper 174	Mohammad Shahin, F. Frank Chen, Mazdak	Adapting the GPT Engine for Proactive Customer Insight Extraction in Product Development

	Maghanaki and Ali Hosseinzadeh	
Paper 191	Elhussein Shata, Baihui Chen, Liwen Hu, Qingze Zou, Yuebin Guo, Charif Mahmoudi, Shashank Shekhar and Ivan Seskar	5G-Cloud-based real-time robotic part repairing for advanced manufacturing via computer vision
13:45-15:00 301A	**NAMRC – HAMMER ERC - Session 2** *Session Chair: Bradley Jared | Session Co-Chair:Malachi Landis*	
Paper 264	Austin Ngo, Noah Kohlhorst, Svitlana Fialkova, Bradley Jared, Tony Schmitz, Glenn Daehn, Jennifer Carter, Jian Cao and John Lewandowski	Mechanical Property Improvements of LPBF-AlSi10Mg via Forging to Modify Microstructure and Defect Characteristics
Paper 34	Nathan Wilson, Robert Patterson, Elijah Charles, Malachi Landis, Joshua Kincaid, Ryan Garcia, Gregory Corson and Tony Schmitz	Hybrid manufacturing cost models: Additive friction stir deposition, measurement, and CNC machining
Paper 216	Tiffany Quigley, Bradley Jared, Devon Goodspeed and Aaron Cornelius	Robot Path Planning for Metrology in Hybrid Manufacturing
13:45-15:00 301B	**NAMRC - TRACK 2 MANUFACTURING PROCESSES - Session 11** *Session Chair: Yigit Karpat | Session Co-Chair: Yan Chen*	
Paper 134	Yan Chen and Yingge Zhou	Clinical-Relevant Sized Tubular Capillary Mimicries by Sacrificial Core-Sheath Electrospinning
Paper 148	Fahim Shariar, Umut Karagüzel and Yigit Karpat	Heat partition evaluation during dry drilling of thick CFRP laminates with polycrystalline diamond drills

Paper 138	Jigar Krushna Pathak, Ramesh Babu N. and D.S. Srinivasu	Effect of Laser Beam Incident Angle on Welding of Ti6Al4V with Fiber Lasers
13:45-15:00 200A	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 13** *Session Chair: Soham Mujumdar | Session Co-Chair: Md Selim Ahmed*	
Paper 162	Dayue Jiang and Fuda Ning	Material extrusion additive manufacturing of bi-metal structures: A numerical and experimental study of interfacial microstructure
Paper 163	Shashank Shukla, Raj Kachhadiya, Ramesh Singh, Anil Saigal and Soham Mujumdar	Titanium Surface Functionalization via Directed Energy Deposition of CuNiTi Ternary Alloy
Paper 165	Md Selim Ahmed, Rajendra Hodgir, Soham Mujumdar and Ramesh Singh	Computational Modeling of Multi-Track Multi-Layer Laser Directed Energy Deposition Process
13:45-15:00 301C	**NAMRC - TRACK 5 SMART MANUFACTURING & CPS - Session 12** *Session Chair: Adithyaa Karthikeyan | Session Co-Chair: Abhishek Hanchate*	
Paper 248	Abhishek Hanchate, Akash Tiwari and Satish Bukkapatnam	Toward digitally twinning the process of creating digital twins - A G-code generation scenario
Paper 247	Noel Greis, Monica Nogueira, Harish Cherukuri and Rafi Marandi	Exploration of weak-PGML Method for Efficient Stability Control During Machining Operations
Paper 252	Tapan Ganatma Nakkina, Adithyaa Karthikeyan, Ceyhun Eksin and Satish T.S. Bukkapatnam	Learning graph-Fourier spectra of textured surface images for defect localization
13:45-15:00 200B	**NAMRC - TRACK 5 SMART MANUFACTURING & CPS - Session 13** *Session Chair: Robert Landers | Session Co-Chair: Xingyu Li*	
Paper 202	Zongze Li, Gregory Vogl, Edward Kinzel, Botond Santa and Robert Landers	Machine Tool Thermal Error Measurement and Prediction via Wireless Microscope

Paper 200	Nazmul Hasan, Apurba Saha, Andrew Wessman and Mohammed Shafae	Machine Learning-based Layer-wise Detection of Overheating Anomaly in LPBF using Photodiode Data
Paper 208	Wenjie Lin and Xingyu Li	GRASNet: A Novel Graph Neural Network for Improving Human Action Recognition and Well-Being Assessment in Smart Manufacturing

15:15-16:30 301A	**NAMRC – HAMMER ERC - Session 3** *Session Chair: Robert Gao | Session Co-Chair: Tony Schmitz*	
Paper 109	Jake Dvorak, Dustin Gilmer, Ross Zameroski and Tony Schmitz	Milling infiltrated carbon-bonded carbon fiber: Geometric attributes, surface characteristics, and feasibility
Paper 258	David Hoelzle, Brian Thurston, Javier Vazquez-Armendariz, Tyler Babinec, Luis Olivas-Alanis, Stephen Niezgoda, Glenn Daehn, David Dean and Robert Gao	Kinematic analysis of engagement and bending capabilities of a point-of-care, incremental skeletal fixation plate bending system
Paper 4	Tony Schmitz	Physics-informed KNN milling stability model with process damping effects
15:15-16:30 301B	**NAMRC - TRACK 2 MANUFACTURING PROCESSES - Session 12** *Session Chair: Yihao Zheng | Session Co-Chair: Avik Samanta*	
Paper 206	Sarower Kabir, Shah Rumman Ansary, Yunze Li, Meng Zhang and Weilong Cong	Rotary Ultrasonic Surface Machining of Silicon: Effects of Ultrasonic Power and Tool Rotational Speed
Paper 167	Patrick Chernjavsky, Jack Shanks, Yinggang Tian, Yihao Zheng and Rohit	Grit Size Effect on HydroFlex Polishing Dynamics and Performance
Paper 176	Avik Samanta, Hrishikesh Das, Glenn J. Grant and Saumyadeep Jana	Friction Stir Processing: A Thermomechanical Processing Tool for High Pressure Die Cast Al-Alloys for Vehicle Light-weighting
13:45-15:00 301C	**NAMRC - TRACK 3 MATERIAL REMOVAL - Session 6** *Session Chair: Yihao Zheng | Session Co-Chair: Muhammad Jahan*	

Paper 238	Sk Md Alimuzzaman, Jianfeng Ma and Muhammad Jahan	Numerical investigation on machining of additively manufactured CFRP composite with different build orientation and layer width
Paper 243	Jack Shanks, Patrick Chernjavsky, Rohit Dey, Yinggang Tian and Yihao Zheng	Hydrodynamic Flexible Spindle (HydroFlex) Polishing of Turbine Blade Internal Cooling Channels for Oxide Removal
Paper 259	Iqbal Shareef, Durga Kumar Raja Potluri and Gerry Horton	Effect of materials and process parameters on machinability of stainless steels
13:45-15:00 200A	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 14** *Session Chair: Abishek Balsamy Kamaraj | Session Co-Chair: Zahra Lotfizarei*	
Paper 161	Lutfi Taner Tunc, Mohammad Sheikhi, Catalin Moldovan, Eugen Gutiu and Nicolae Balc	Non-planar 5-axis directional additive manufacturing of plastics: machine, process, and tool path
Paper 185	Co Nguyen and Abishek B. Kamaraj	Impact of Lattice Structure on Compressive Performance and Strength to Weight Ratio in Continuous Stereolithography
Paper 189	Zahra Lotfizarei, Amir Mostafapour, Ahmad Barari and Alireza Jalili	Analysis of Metal Fused Filament Fabrication Process Chain for 316L Stainless Steel
13:45-15:00 200B	**NAMRC - TRACK 5 SMART MANUFACTURING & CPS - Session 14** *Session Chair: Sakib Shahrear Avro | Session Co-Chair: Yan Wang*	
Paper 194	Eunsik Choi, Jinhwan Sul, Jungin Kim, Sungjin Hong, Beatriz Izquierdo Gonzalez, Pablo Cembellin and Yan Wang	Quantum Machine Learning for Additive Manufacturing Process Monitoring
Paper 201	Andreas Lianos, Sneha Papineni, Dimitris Lagoudas and Satish Bukkapatnam	Real-time monitoring of the spatiotemporal thermal state of fused filament fabrication process for shape memory polymers
Paper 242	Sakib S Avro, S M Atikur Rahman, Tzu-	A Deep Learning Framework for Automated Defect Detection in Fused Filament Fabrication

	Liang Tseng and Md Fashiar Rahman	

16:45-18:00 301A	**NAMRC – HAMMER ERC - Session 4** *Session Chair: Clayton Cooper | Session Co-Chair: Jose Galarza*	
Paper 68	Tyler Poon, Justin West, Emma Betters, Scott Smith, Christopher Tyler, Andrzej Nycz, Christopher Masuo and Tony Schmitz	Machine tool cross beam design, fabrication, and testing using metal big area additive manufacturing
Paper 198	Clayton Cooper, Jianjing Zhang, Ihab Ragai and Robert Gao	Multi-sensor fusion and machine learning-driven sequence-to-sequence translation for interpretable process signature prediction in machining
Paper 230	Jose Galarza, Jorge Barron Jr., Farid Ahmed and Jianzhi Li	Data-driven roughness estimation of additively manufactured samples using build angles
16:45-18:00 301B	**NAMRC - TRACK 2 MANUFACTURING PROCESSES - Session 13** *Session Chair: Xin Zhao | Session Co-Chair: Zimo Wang*	
Paper 250	Mohammad Alshoul, Xinchen Wang, Zimo Wang and Jia Deng	Investigation of Experimental Parameters in the Electric Field and Mechanical Vibration Integrated AFM-Based Nanopatterning on PEDOT
Paper 210	Ankit Varma, Kewei Li, Laine Mears, Hongseok Choi and Xin Zhao	Effects of temperature and stress evolution on microstructural change and mechanical properties during friction element welding
Paper 223	Xinchen Wang, Mohammad Alshoul, Jia Deng and Zimo Wang	Surface integrity analysis and inspection for nanochannel sidewalls using the selfaffine fractal model-based statistical quality control for the atomic force microscopy (AFM)-based nanomachining process
16:45-18:00 301C	**NAMRC - TRACK CROSS-DISCIPLINARY RESEARCH** *Session Chair: Danish Mohammed | Session Co-Chair: Marcus DiBattista*	
Paper 239	Cristian Garcia-Ponce, Tomas Letelier and Marcus DiBattista	Framework for LLM Applications in Manufacturing

Paper 234	Uroosa Fatima, Danish Mohammed and Iqbal Shareef	A holistic approach to kitting cart optimization and steel receiving analysis for process improvement
16:45-18:00 200A	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 15** *Session Chair: Avez Shaikh | Session Co-Chair: Wenhao Zhang*	
Paper 187	Wenhao Zhang, Fuda Ning and Yue Zhou	Directed Energy Deposition of Ti6Al4V Wire with Continuous Layer Varied Laser Power
Paper 197	Irving Ramirez-Chavez, Rajeshree Varma, Daniel Anderson, Prince Jeya Lal Lazar, Mandar Shinde, Zachary Goode and Dhruv Bhate	Strain Redistribution in Stochastically Perturbed Single and Dual-Phase Cellular Materials Under Quasistatic Compression
Paper 199	Avez Shaikh, Jacklyn Griffis, Ryan Stebbins, Kazi Shahed, Ankit Saxena, Andrew Ross and Guha Manogharan	Towards Gradient Design of TPMS lattices and Laser Powder Bed Fusion Processing–Role of Laser Strategies and Lattice Thickness
16:45-18:00 200B	**NAMRC - TRACK 5 SMART MANUFACTURING & CPS - Session 15** *Session Chair: Zhaohui Geng | Session Co-Chair: Gregory Purdy*	
Paper 214	John Osho, Esther Akinrinde, Carson Tillery, Ethan Koenig, Kaylee Adams and Gregory Purdy	Manufacturing Floor Mapping and Presence Tracking with a Physics-Based Game Engine
Paper 222	Sachithra Karunathilake, Shahriar Forhad and Zhaohui Geng	Gaze Tracking Embedded Collaborative Robots for Automated Metrology and Reverse Engineering
Paper 228	Yujing Yang, Zehao Ye, Yinan Wang, Chenang Liu and Chen Kan	Recurrence Analysis of 3D Point Clouds for the Detection of Surface Anomalies in Advanced Manufacturing

MSEC SPECIAL SESSIONS

THURSDAY JUNE 20, 2024

09:00-10:15 **200C**	**Doctoral Symposium - 1** *Session Chair: Guha Manogharan*	
141713 [P]	Yujie Shan, and Huachao Mao	Smooth Surface Generation in Vat Photopolymerization-Based 3D Printing
142369 [P]	Tengteng Tang	Electrically Assisted Vat Photopolymerization of Bio-Inspired Functional Materials
142904 [P]	Natalya Kublik, and Bruno Azeredo	Reduction of Total Reflectance in Copper Lpbf at Novel Ultra-High-Speed Regime and Incorporation of Anti-Reflective Nanoporous Copper Powders into Am
142924 [P]	Yaoke Wang	Design and Fabrication of Ultra-Precision Machined Nano-Scale Optical Surfaces

10:35-11:45 **200C**	**Doctoral Symposium - 2** *Session Chairs: Guha Manogharan*	
142562 [P]	Xiaoliang Yan	Deep Learning Based Manufacturing Capability Modeling for Cyber Manufacturing Services
142762 [P]	Azzam Radman	A Deep Reinforcement Learning Approach for Capacity Sharing in Distributed Manufacturing
142908 [P]	Purvee Bhatia	Artificial Intelligence Based Decision-Making to Enhance the Quality of Engineering Systems
142821 [P]	Swarit Anand Singh	Vision-Based In-Line Surface Defect Detection System to Realize Zero Defect Manufacturing During Mass Production of Tapered Rollers

13:45-15:00 **200C**	**Doctoral Symposium – 3** *Session Chairs: Guha Manogharan*	
142717 [P]	Aaqib Ali	The Mechanics and Tribology in Modulation-Assisted Machining
142867 [P]	Sohan Nagaraj	Investigation of Data-Driven Tool Condition Monitoring Systems for Subtractive Manufacturing Processes
142889 [P]	Aishwarya Deshpande	Recycling Metal Cutting Chips Into Consolidated Deposits With Friction Surfacing

09:00-10:15 301D	**AdM1_1 (4): Advances in Metal Additive Manufacturing Processes** *Session Chairs: Hector Siller and Christopher Pannier*	
124321	Lutfun Nipa, Hector R. Siller, Mohin Sharma, Bibhudutta Rout, and Reza A. Mirshams	Irradiation and Hip Impact on Microstructure and Small-Scale Mechanical Properties of Am Nuclear Reactor Materials
122135 [B]	Majed Ali, Abdalmageed Almotari, Anwar Algamal, and Ala Qattawi	Optimizing the Process Parameters in Laser Re-Melting of Lpbf Martensitic Stainless Steel: Preliminary Results
123906 [B]	Sajad Shirzad, Cheng-Hao Chou, Alexandru Versin, Osama Habbal, and Chinedum Okwudire	Metal Paste Extrusion Additive Manufacturing Build Speed Improvement Through Vibration Compensation
09:00-10:15 301E	**MP6_1 (3): Advances in Clean Energy and E-Mobility Manufacturing** *Session Chairs: Alessandro Ascari and Lei Chen*	
124620	Lorenzo Cestone, Hambal Iqbal, Erica Liverani, Alessandro Ascari, and Alessandro Fortunato	Sustainability of Dry Grinding in Gear Manufacturing
125136 [B]	Alejandro Franco, Utkarsh Vijay, and Soorya Saravanan	Combining Physics-Based Modeling and Artificial Intelligence for the Optimization of Battery Manufacturing Processes
124603 [P]	Julia Chen	Transforming Battery Material Manufacturing: Abm Nano's Ball-Milling Technology
09:00-10:15 300B	**AdM1_2 (3): In Situ Monitoring and Non-Destructive Testing of Additive Manufacturing Processes** *Session Chairs: Marwan Haddad and Andy Fan*	
125343 [B]	Xianzhe Fu, Kwangtae Son, and Zhaoyan Fan	A Novel Synthesized Thermography (Syntg) Approach for In-Situ Defect Detection in Laser Powder Bed Fusion
130353 [B]	Aditya Chivate, Zebin Li, Prachi Kamble, Hongyue Sun, and Chi Zhou	Investigating Jet Stability in Inkjet Printing Through a Novel Sensing Modality
124538 [B]	Erfan Ziad, Feng Ju, Zhuo Yang, and Yan Lu	Pyramid Learning Based Part-to-Part Consistency Analysis in Laser Powder Bed Fusion

125343 [B]	Xianzhe Fu, Kwangtae Son, and Zhaoyan Fan	A Novel Synthesized Thermography (Syntg) Approach for In-Situ Defect Detection in Laser Powder Bed Fusion
125181 [B]	Weijun Shen, Dharmaraj Veeramani, and Hantang Qin	Reducing Warping in Abs 3D Printed Parts Through Infill Modification
09:00-10:15 300C	**MEA5_1 (3): Innovations in Equipment Design, Control and Automation** *Session Chairs: Chandra Nath and Huitaek Yun*	
121212	Jesse Goodwin, Kathryn Kelly, Melisa Foley, Christopher Saldana, Thomas Kurfess, and Kyle Saleeby	Positioning Accuracy in a Concurrent Robot-Cnc Hybrid Manufacturing System
124417	Wenhan Tang, and Fuzhu Han	A Novel Water Jet Guided Laser Machining Depth Measurement Method Based on Water Jet Resistance
JMSE 23-1548 [J]	Chung-Yu Tai, and Yusuf Altintas	A Physics-based Model-data-driven Method for Spindle Health Diagnosis, Part I: Modeling of Geometric Faults
09:00-10:15 300D	**AMM2_1 (2): Advances in Digital Twins of Manufacturing Processes and Systems** *Session Chairs: Mihaela Banu and Weihong "Grace" Guo*	
124624	Nathan Gill, Max Millard, Brennan Sparks, and Ping Ren	Exploring the Synergistic Effects of Combined Infill Structures in Fdm for Enhanced Mechanical Performance
125094	Arivazhan Anbalagan, Marcus Kauffman, and Tengfei Long	Advancing Digital Twin Technology in Manufacturing: A Comprehensive Study on Data Capture and Simulation of End Mills
124400 [B]	Zixun Li, and Zhengtao Gan	Phase-Field Modeling of Grain Evolution and Recrystallization in Friction Stir Processing
10:30-11:45 301D	**AdM1_1 (4): Multi-Material Processing in Additive Manufacturing** *Session Chairs: Monique McClain and Mostafa Yourdkhani*	
Invited Talk 10:30-11:45	Speaker – Alex Chortos	Multimaterial Direct Write 3D Printing of Soft Sensors and Actuators

141899 [P]	Ibrahim Al Qabani, Karin Goldberg, Hossein Taheri, Drew Snelling, Genevieve Baudoin, Rafael Quirino, and Scott M. Thompson	Examining the Printability of Unrefined Sand via Binder Jet Additive Manufacturing: A Numerical Study
10:30-11:45 301E	**AdM1_2 (4): In Situ Monitoring and Non-Destructive Testing of Additive Manufacturing Processes** *Session Chairs: Marwan Haddad and Andy Fan*	
124715	Brian Johnstone, Caroline Massey, Mat Lewis, William Huggins, Kyle Saleeby, and Christopher Saldana	Quantifying Trapped Powder in Electron Beam Powder Bed Fusion
124781	Dongqing Yan, Zhaoyan Fan, and Somayeh Pasebani	Correlation Study Between the In-Situ Thermal Signatures and Surface Roughness Produced by Laser Powder Bed Fusion
124322	Zhuo Yang, Jaehyuk Kim, Brandon Lane, and Yan Lu	Measuring Overhang Down-Skin Dross Depth and the Dependence on Melt Pool for Laser Powder Bed Fusion Additive Manufacturing
10:30-11:45 300B	**BioM3_2 (3): Advances in Manufacturing of Tissue Constructs/Medical Implants and Bioinspired Materials/Structures for Healthcare Applications** *Session Chairs: Md Ahasan Habib and Yang Yang*	
120957	Rana Dabaja, Abdul Sayeed Khan, and Mihaela Banu	Mechanical Behavior Analysis of a Functionally Graded Porous Dental Implant
125275	Slesha Tuladhar, and Bashir Khoda	Rheological Investigation of Algae Infused Hydrogel Precursors
125393	Sampa Halder, Imtiaz Qavi, and George Tan	Investigating the Effect of Aligned Microtube Density on the Mechanical Strength of Hydrogel Scaffolds
10:30-11:45 300C	**MP6_3 (3): Advances in Surface Engineering: Process, Metrology, and Property/Performance** *Session Chairs: Yinan Wang and Yifei Jin*	
125163	Md Tahjib Rafat, Karl Haapala, and Zhaoyan Fan	A Review of Contemporary Approaches to Identify Influential Parameters on Surface Roughness in Incremental Sheet Forming

124815 [B]	Uday Kumar, Kokkiligadda Jhansi, Hitensinh Vaghela, and Parasuraman Swaminathan	Effect of Surface Treatments on the Thermal Emissivity of 304l Austenitic Stainless Steel
JMSE 22-1566 [J]	Frank E. Pfefferkorn	Radius of Contact During Friction Surfacing: Effect of Spindle Speed and Rod Diameter
10:30-11:45 300D	**MP6_4 (3): Deformation Processing of Metals and Alloys** *Session Chairs: Wilfredo Moscoso and Yang Guo*	
124356	Jobin Thomas Matthews, and Dinakar Sagapuram	Direct Measurement of Tool-Chip Contact Stresses in Machining Using Digital Photoelasticity
124723	Shwetabh Yadav, Harshit Chawla, and Dinakar Sagapuram	In Situ Observations of Shear Localization and Fracture in Machining
130324 [B]	Shivaprasad Cherukupally, Vishwanath Nagallapati, Praveen Konka, Suryakumar Simhambhatla, and Venkata Reddy Nallagundla	Judicious Hybridization of Incremental Forming and Additive Manufacturing to Enhance Product Complexity Through Nonplanar Substrate/deposition
13:45-15:00 301D	**AdM1_2 (5): In Situ Monitoring and Non-Destructive Testing of Additive Manufacturing Processes** *Session Chairs: Andy Fan and Marwan Haddad*	
124117	Md Zahirul Islam, Md Atikur Rahman, Luke Gibbon, Eric Hall, and Chad A. Ulven	Comparing Poisson Ratio Measurement of 3D Printed Continuous Fiber Reinforced Composites: Digital Image Correlation (DIC) vs. Video-Extensometer
124650	Hanyao Lyu, Pinyi Wu, and Chinedum Okwudire	MScan: An Automated Fault Detection System for Desktop Fused Filament Fabrication 3D Printers Utilizing a Non-contact Sensor
126798	Jeremy Cleeman, Adrian Jackson, Anadkumar Patel, and Rajiv Malhotra	Toolpath Synthesis and Mechanical Properties in Multiplexed Fused Filament Fabrication
13:45-15:00 301E	**MS7_1 (4): AI for Smart Manufacturing Systems** *Session Chairs: Shenghan Guo and Ran Jin*	

124409	Shenghan Guo, Hasna Ouidadi, and Boyang Xu	Support-Structure Decision in 3D Printing with Unsupervised Computer Vision
124455	Zongshuo Li, Ding Huo, Markus Meurer, and Thomas Bergs	Efficient Cutting Tool Wear Segmentation Based on Segment Anything Model
125075	Premith Kumar Chilukuri, Binyang Song, Sungku Kang, and Ran Jin	Generating Optimized 3D Designs for Manufacturing Using a Guided Voxel Diffusion Model
13:45-15:00 300B	**AMM2_2 (3): Advances in Manufacturing and Processing of Polymers and Composites** *Session Chairs: Erina B Joyee and Kenan Song*	
140712 [P]	Unghyeon Cho, Hyewon Shin, Nahyun Kim, Byeong Kwon Kang, Seongbin Choi, and Sang Won Lee	Development of Stress–strain Curve Prediction Model of Composite Material Based on Long Short-Term Memory Algorithm
141837 [P]	Kelvin Fu	Core-Shell Structured Tow-Pregs Enabled Additive Manufacturing of Continuously Reinforced Thermoset Composites
131632 [B]	Marisa Bisram, Yunyun Wu, Kevin Chen, and Jian Cao	Manufacturing Novel Textile Wearables Through Kirigami-Inspired Computerized Embroidery Stitching
13:45-15:00 300C	**MP6_2 (4): Advances in Machining and Metrology** *Session Chairs: Takashi Matsumura and Tatsuya Sugihara*	
130340 [B]	Wolfgang Lortz	An Industry 4.0 Project with Data Integration - From Part Design to Chip Flow and Physics-Based Machine Learning for Almg 5
125067 [B]	Jingyun Wang, Zeyuan Yang, Sijie Yan, Wenqi Cai, and Yisheng Yang	Dynamic Contact Force Alignment Strategy Against Abrasive Wear in Robotic Compliant Disc Grinding for Uniform Material Removal
123611 [B]	Khalid Mahmood	Parametric Investigation of Abrasive Water Jet Cutting of Titanium Alloy
130735 [B]	Tatsuya Sugihara, Hikaru Suzuki, and Toshiyuki Enomoto	Potential of Alcohol as a Lubricant in Cutting of Aluminum Alloys
130793 [B]	Takashi Matsumura, Daisuke Morii, and	Surface Characterization in Milling of Aluminum-Lithium Alloy

	Shoichi Taimura	
13:45-15:00 **300D**	**MP6_4 (4): Deformation Processing of Metals and Alloys** *Session Chairs: Dinakar Sagapuram and Jinjin Yang*	
125277 [B]	Nicholas Letendre, Abrar Ebrahim, Shayan Darzi, and Jinjin Ha	Analysis of Friction Effect on Backward Extrusion of Wire Splicing
125217 [B]	Osian Leahy, Burak Sencer, and Yang Guo	Brief Paper: A Study of Forces and Energy Consumption in Constrained Cutting of OFHC Copper
123807 [B]	Reeturaj Tamuly, Ravi Kumar Digavalli, and Sivanandan Aravindan	Numerical Simulation of Warm Extrusion of a Novel Mg-Zn-Ca Alloy Using Different Constitutive Models with Experimental Validation
131757 [B]	Homar Lopez-Hawa, Wilfredo Moscoso-Kingsley, and Viswanathan Madhavan	Numerical Validation of Fin Cutting as Mechanical Test Under Extreme Thermomechanical Conditions
15:15-16:30 **301D**	**AdM1_1 (5): Advances in Metal Additive Manufacturing Processes** *Session Chairs: Ho Yeung and Vinh Nguyen*	
125516 [B]	Reza Mirshams, Dan Nguyen, Hector Siller, and Ravi Shankar Haridas	Impact of Residual Stresses on Mechanical Properties of Additively Manufactured Alloys via Laser Powder Bed Fusion (Lpbf)
124647 [B]	Nicholas Hendrickson, Saleh Valizadeh Sotubadi, and Vinh Nguyen	Improving the Efficiency of Waam-Based Hybrid Manufacturing Through Selective In-Situ Machining Based on Height Error Prediction
130242 [B]	Saurabh Tripathi, and Cheruvu Siva Kumar	Discrete Element Based Modeling of Powder Spreading Dynamics for Laser Powder Bed Fusion Process
121879 [B]	Ali Alshami, and Abdelrahman Shuaib	Finite Element Modeling of Laser Powder Bed Fusion Process Used for Consolidating W-25 wt.%re Alloy Pin Tool for Friction Stir Welding
15:15-16:30 **301E**	**MP6_1 (4): Innovative Joining Processes for Advanced Materials** *Session Chairs: Alessandro Ascari and Erica Liverani*	
126299	Rehab Al Botros, Maria Teresa Pari, Alessandro Fortunato, Dariusz	Effect of Static Laser Beam Shaping on Lateral and Vertical Gap Bridging for

	Ceglarek, Bryan Paolini, and Pasquale Franciosa	Welding of Rectangular Copper Hairpin Windings
126623	Leonardo Caprio, Simon D'arcangelo, Davide Chesi, Daniele Nocciolini, Rubino Corbinelli, Barbara Previtali, and Ali Gökhan Demir	Laser Hairpin Stripping with a New Generation Co2 Laser at Lower Wavelength for E-Drive Manufacturing
125666	Jun Ma, Sigmund A Tronvoll, Jørgen Blindheim, Geir Ringen, and Torgeir Welo	Reconfigurable Tooling for Customized Stretch Forming of Profiles
15:15-16:30 300B	**AMM2_3 (2): Convergent Manufacturing of Advanced Materials for Hybrid Manufacturing Systems and Products** *Session Chairs: Thomas Feldhausen and Saeed Farahani*	
121937	Alan Burl, Lauren Heinrich, Christopher Saldana, and Thomas Feldhausen	Failure Initiation Point Control in Blown Powder Directed Energy Deposition
125490 [B]	Kazi MD Masum Billah, Vipin Kumar, Neel Rathod, Akash Phadatare, David Nuttal, Tyler Smith, Uday Vaidya, Seokpum Kim, Vlatismil Kunc, and Ahmed Arabi Hassan	Experimental Investigation of Short Fiber Reinforced Thermoplastic Composite Joining in an Integrated Additive Manufacturing and Compression Molding System
124554 [B]	Shaowei Jiang, Haibo Liu, Yueshuai Zuo, Daomian Sun, Jianming Li, Lingsheng Han, Kuo Liu, and Yongqing Wang	Structure Optimization of Milling Cutter for Superalloy Honeycomb Core Low Cutting Vibration Machining
15:15-16:30 300C	**NMM8_1 (2): Advances in Meso, Micro and Nano Manufacturing in Industry 4.0** *Session Chairs: Ashif Iquebal and Sekhar Rakurty*	
122447	Papia Sultana, Bonqiang Qian, Changhee Son, Glennys Mensing, and Placid Ferreira	High Volume Production of Repeatable High-Enhancement Sers Substrates Using Solid-State Superionic Stamping (S4)
141791 [P]	Hongbo Zhang	One-Shot Fast 3D Phase Imaging of Mems Devices for High Precision Semiconductor Manufacturing

JMNM-23-1038 [J]	Bashir Khoda	Controlling surface of rods with entrained particle as asperities
15:15-16:30 300C	**QR9_1 (2): Bridging Academic Research and Industrial Practices on Machine Learning for Advanced Manufacturing** *Session Chairs: Shaopeng Liu and Peng Wang*	
125432	Rayne Wolf, Liangkui Jiang, Khawlah Alharbi, and Hantang Qin	In-Situ Monitoring and Recognition of Printing Quality in Electrohydrodynamic Inkjet Printing via Machine Learning
130229	Partha Protim Mondal, Placid Ferreira, Shiv Kapoor, and Patrick Bless	A Bayesian Network-Based Control Charting Framework for Identifying the Root Causes of Process Shifts in Multistage Manufacturing Systems
141659 [P]	Shashi Bhushan Gunjan, and D.S. Srinivasu	A New Approach to Predict the Reliability of a Product by Considering the Production Factory Lifecycle Information
16:45-18:00 301D	**AdM1_4 (5): Smart Additive Manufacturing** *Session Chairs: Molong Duan and Jiajun Xu*	
126776 [P]	Jiajun Xu	Predicting Hardness Performance of Additive Manufactured Parts Using Machine Learning with Data Normalized Technics
140578 [P]	Raghav Gnanasambandam, Chaoran Dou, and Zhenyu Kong	Physics Informed Neural Networks for Multi-Physics Modeling of Metal Additive Manufacturing
141018 [P]	Chaohan Dou, Raghav Gnanasambandam, Jihoon Chung, Yuhao Wu, and Zhenyu Kong	Reinforced Scan: A Scanning Strategy in Pbf Additive Manufacturing Empowered by Reinforcement Learning
141657 [P]	Seungwoo Paek, Junsoo Ahn, Hyewon Shin, Yongho Lee, and Sang Won Lee	Development of the Integrated Digital Twin with Multi-Functional Modules for Real-Time Monitoring of Directed Energy Deposition System
JMSE 23-1400 [J]	Michael Biehler, and Jianjun Shi	AUDIT: Functional Qualification in Additive Manufacturing via Physical and Digital Twins
16:45-18:00 301E	**BioM3_2 (4): Advances in Manufacturing of Tissue Constructs/Medical Implants and Bioinspired Materials/Structures for Healthcare Applications**	

	Session Chairs: Yifei Jin and Cindy Li	
123878	Brandon Coburn, and Roozbeh (Ross) Salary	Investigation of Material Trasport Through Triply Periodic Minimal Surface (Tpms) Bone Scaffolds Using Computational Fluid Dynamics (Cfd)
125474	Shah Limon, Rokeya Sarah, and Md Ahasan Habib	Viscosity Inference of Hybrid Bioink Using Decision Tree-Based Machine Learning Method
JMSE 23-1132 [J]	Atul Rajput, and Manas Das	A Hybrid-Electrochemical Magnetorheological (H-ECMR) Finishing Process for Surface Enhancement of Biomedical Implants
16:45-18:00 300B	**LCE4_2 (3): Systems Engineering and Digital Technologies for Circular Economy** *Session Chairs: Jing (Julia) Zhao and Matthew Triebe*	
125056	Thomas Maani, Sidi Deng, and John Sutherland	Disassembly Analysis to Promote Rare Earth Permanent Magnet Recovery from End-of-Life Electric Vehicle Motors
125254	Abheek Chattejee, Nehika Mathur, Daniel Figola, Matthew Triebe, Buddhika Hapuwatte, Ashley Hartwell, and KC Morris	Quantifying High-Density Polyethylene Flows in the United States of America Using Material Flow Analysis
125107 [B]	Amira Bushagour, Hadear Hassan, and Astrid Layton	Cyclicity as an Early Circular Economy Design Tool for Emerging Technologies
16:45-18:00 300C	**MEA5_2 (2): Semiconductor Manufacturing: Metrology, Inspection, Systems, and Processes** *Session Chairs: ChaBum Lee and Jiyong Park*	
123370 [B]	Zemenu Endalamaw Amogne, and Jia-Hong Chou	Optimized Deep Convolutional Neural Network for Wafer Map Defects Classification
124600 [B]	Adeeb Alam, Md Rafiul Hassan, and Bashir Khoda	Particle Analysis from Heterogeneous Background with Deep Learning Tool
125207 [B]	Hyun Jae Lee, Gugyeong Sung, Heebum Chun, and Chabum Lee	Particle Inspection by Single Camera-Based 3D Stereoscopy
16:45-18:00 300E	**MP6_2 (5): Advances in Machining and Metrology** *Session Chairs: Xiaoliang Jin and Bruce Tai*	

121950	Ju Hyung Ha, Joon Hyeok Choe, Ji Soo Kim, and Dong Min Kim	Comparative analysis of TI6AL4V deep hole cutting performance and machining quality using vibration-assisted drilling
JMSE 23-1725 [J]	Minghui Yang, and Chaoqun Wu	Characterization of serrated chip formation based on in-situ imaging analysis in orthogonal cutting
JMSE 23-1431 [J]	Aaron Cornelius, Jaydeep Karandikar, and Tony Schmitz	Process damping identification using Bayesian learning and time domain simulation
JMSE 23-1389 [J]	Behnam Karimi	Chatter Avoidance by Spindle Speed and Orientation Planning in 5-axis Ball-End Milling of Thin-Walled Blades

FRIDAY JUNE 21, 2024

Time	Location	Event
7:00-12:00	Henley Concourse	Registration/ Information
7:30-8:30	Cumberland Concourse	Breakfast
9:00-10:15	301ABCDE, 300B	Paper Session XV
10:15-10:45	Cumberland Concourse	Morning Break
10:30-11:45	301ADE, 300B	Paper Session XVI
12:00-13:00	Ballroom DEFG	Boxed Lunch
13:00-15:00	ORNL MDF	Tour 1
13:00-15:00	DENSO Manufacturing Tennessee	Tour
14:00-16:00	ORNL MDF	Tour 2

NAMRC TECHNICAL SESSIONS

FRIDAY JUNE 21, 2024

09:00-10:15 301B	**NAMRC – HAMMER ERC - Session 5** *Session Chair: Steven Williams | Session Co-Chair: Tony Shi*	
Paper 186	Tony Shi, Mason Ma, Jiajie Wu, Chase Post, Elijah Charles and Tony Schmitz	AFSD-Physics: Exploring the governing equations of temperature evolution during additive friction stir deposition by a human-AI teaming approach
Paper 7	Tony Schmitz, Elijah Charles and Brett Compton	Analytical temperature model for spindle speed selection in additive friction stir deposition
Paper 172	Steven Williams, Evan Gitto and Bradley Jared	Interpass Temperature Impact on Bead Geometry of Mild Steel in Wire-Arc Additive Manufacturing
09:00-10:15 301A	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 16** *Session Chair: Muhammad Jahan | Session Co-Chair: Jennifer Bennett*	
Paper 241	Varad Maitra, Colleen Arrasmith and Jing Shi	Explainable Artificial Intelligence for Predicting Properties of Ti-6Al-4V by Metal Additive Manufacturing
Paper 233	Nabin Bastola, Jianfeng Ma and Muhammad Jahan	Design and Numerical Investigation of the 3D Reinforced Reentrant Auxetic and Hexagonal Lattice Structure for Energy Absorption Properties
Paper 236	John Byers, Michael Larsen, Samantha Webster and Jennifer Bennett	Assessing melt pool temperature independence from mechanical properties via photodiode-based plank thermometry (PDPT)
09:00-10:15 301C	**NAMRC - TRACK 5 SMART MANUFACTURING & CPS - Session 16** *Session Chair: Laine Mears | Session Co-Chair: Aditya Rane*	
Paper 261	Matthew Krugh, Flanagan Waldherr, Christoph Kuepper, Dominik Fuerst and Laine Mears	Testing Scenario for Comparison of Real-time Locating System in Automotive Manufacturing
Paper 170	Niloofar Rezaei, Seyed Alireza Vaezi and Jaime Camelio	Decoding the Silent Language: A Framework for Advanced Visual Emotion Recognition to Enhance Worker Well-being on IIoT-Enabled Manufacturing
Paper 193	Aditya Rane, Stephanie Hart,	Surrogate-assisted multi-objective Bayesian optimization for improved rheological design of bioinks

	Srikanthan Ramesh and Akash Deep	

10:30-11:45 301A	**NAMRC - TRACK 4 ADDITIVE MANUFACTURING - Session 17** *Session Chair: Paolo Parenti | Session Co-Chair: Hanyu Zhu*	
Paper 213	Hanyu Zhu, Vincent Wang and Wei Li	A 3D Printing-based Hybrid Manufacturing Method for Highstrength Polymeric Medical Implant Fabrication
Paper 212	Audai Al-Akailah and Fuda Ning	Theoretical Modeling of Feedstock-Laser Energy Interaction in Directed Energy Deposition with Simultaneous Wire and Powder Feeding
Paper 219	Paolo Parenti, Francesca Zaio, Matteo Ambrosetti, Stefano Foletti, Gianpiero Groppi, Enrico Tronconi, Alessandra Beretta and Bianca Maria Colosimo	Pure copper extrusion Additive Manufacturing of lattice structures for enabling enhanced thermal efficiency in hydrogen production

09:00-10:15 301D	**AdM1_4 (6): Smart Additive Manufacturing** *Session Chair: Uduak Inyang -Udoh Azadeh Haghighi*	
125242 [B]	Eonyeon Jo, Lu Liu, Feng Ju, Nikhil Garg, Soydan Ozcan, Uday Vaidya, and Seokpum Kim	Effect of Layer Time Control via Physics-Based Model on Layer Temperature in Extrusion-Based Large Format Additive Manufacturing
124645 [B]	Lee Clemon, Rhys Edwards, and Danial Rizvi	Material Extrusion Infill Strength Under Different Toolpaths
125118 [B]	Todd Godderidge, Halil Tekinalp, Soydan Ozcan, Nikhil Garg, and Seokpum Kim	Reducing Warpage in Additive Manufacturing Through Novel Toolpath Design
125150 [B]	Junjiang Ye, Md Moktadir Alam, and Chinedum Okwudire	A Preliminary Study on Depowdering of Fragile Objects Using Robots in Binder Jetting Additive Manufacturing
09:00-10:15 301E	**MP6_1 (5): Advances in Clean Energy and E-Mobility Manufacturing** *Session Chairs: Erica Liverani and Lei Chen*	
124948	Vincenzo Ferraro, Corrado Sciancalepore, and Adrian Hugh Alexander Lutey	Accurate Energy Consumption Prediction for Cleaner Additive Manufacturing Processes
125491	Zipeng Guo, Licheng Liang, Jason Armstrong, Shenqiang Ren, and Chi Zhou	Additive Manufacturing of Wheat Straw for Sustainable Thermal Insulation Applications
JMSE 23-1580 [J]	Lei Chen	Resonant Acoustic Vibration-Assisted Cathode Stripping for Efficient Recycling of Spent Li-ion
09:00-10:15 300B	**MP6_2 (6): Advances in Machining and Metrology** *Session Chairs: Xiaoliang Jin and Ankit Agarwal*	
JMSE 23-1060 [J]	Ankit Agarwal	Evaluation of Contrived Wear Methodology in End Milling of Inconel 718
JMSE 23-1233 [J]	Shengqiang Zhao, and Xiaowei Tang	Parametric Characterization and Distribution Consistency Evaluation of Machining-Induced Residual Stresses

10:30-11:45 301D	**AdM1_1 (6): Advances in Metal Additive Manufacturing Processes** *Session Chair: Hector Siller*	
JMSE 23-1526 [J]	Henry Davis, and Robert Davis	Sacrificial Powder Pressure Control for Infiltration of Microscale Printed Metal Parts
JMSE 23-1594 [J]	Ji Ho Jeon	In-situ Analysis of the Effect of Ultrasonic Cavitation on Electrochemical Polishing of Additively
JMSE 23-1243 [J]	Yongxiang Hu	Tilting behaviors of metal microjet in laser-induced forward transfer
10:30-11:45 301E	**BioM3_1 (2): Advances in Design, Manufacturing, and Analysis of Biomedical Devices** *Session Chairs: Yi Wang and Dongyang Yi*	
130739	Dingyifei Ma, Xiaoqing Hu, Tianlong Chang, Shahid Hussain, Lian Xia, and Jiang Han	In-Situ Process Monitoring and Optimization for Extrusion-Based Silicone Additive Manufacturing
131651	Zhen Wang, Yingda Hu, Tian Xu, Shilun Du, and Yong Lei	Virtual Navigation-Guided Remote Control System for Pulmonary Puncture Localization Assistance
10:30-11:45 300B	**AdM1_4 (7): Smart Additive Manufacturing** *Session Chairs: Prahalada Rao and Elham Mirkoohi*	
124641	Ehsan Vaghefi, Seyedmehrab Hosseini, and Elham Mirkoohi	A Deep MLP-CNN Model Using Metadata to Predict Melt Pool Morphology in LPBF: Effect of Geometrical Factors
JMSE 23-1666 [J]	Hasnaa Ouidadi, and Shenghan Guo	3D X-ray Computed Tomography Image Segmentation and Point Cloud Reconstruction for Internal Defect Identification in Laser Powder Bed Fused Parts
JMSE 23-1608 [J]	Tony Shi	AFSD-Nets: A Physics-Informed Machine Learning Model for Predicting the Temperature Evolution during Additive Friction Stir Deposition

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