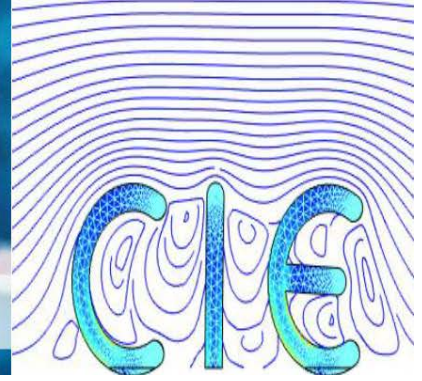


Computers & Information in Engineering Division (CIE)



<https://community.asme.org/computersinformationengineering/default.aspx>

Winter 2021-2022 Newsletter

MESSAGE FROM THE CHAIR

MAHESH MANI



Greetings to all as part of the 2021-2022 edition of the Computers and Information in Engineering (CIE) Division newsletter. CIE Division is a forum for understanding the application of emerging technologies that impact critical engineering issues

of representation, product design and product development. A central event for the division is the Computers and Information in Engineering Conference. Despite the continued challenges and uncertainties due to COVID-19, we had a successful virtual 41st Annual Computers and Information in Engineering Conference held August 17th - August 20th, 2021. The CIE conference serves as a premier venue for the international exchange of technical, scientific, and application knowledge related to the theory and practice of computing to support engineering activities. It provides a forum for researchers, practitioners, educators, and students from industry, academia, and government research labs to share their latest findings and challenges with the broader research community, foster collaborations, and build a sustainable research and education community.

This year, we are pleased to report that there were 88 accepted papers and technical presentations submitted through various technical and special topic sessions, organized around the four Technical Committees of the CIE Division, namely: Advanced Modeling and Simulation, Computer Aided Product and Process Design, Systems Engineering and Information Knowledge Management and Virtual Environments and Systems.

At the conference, Dr. Raju Mattikalli, Boeing Research & Technology, delivered a

keynote on the topic of 'Design of Networked Systems'. In his talk, Dr. Mattikalli highlighted some of the key design challenges and discussed algorithmic solutions as it applies to aerospace products including airplanes, real-time avionics, and perimeter defense systems.

CIE NEWSLETTER

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Following the tradition, several CIE Division awards and best paper awards were presented during the CIE awards session, as part of the conference. As part of the 2021 CIE Division Awards, Professor Soundar Kumara, Pennsylvania State University was honored with the Excellence in Research Award in recognition of research excellence in the discipline of Computers and Information in Engineering. This year both Dr. Tsz-Ho Kwok, Concordia University and Dr. Vinayak R. Krishnamurthy Texas A & M University received the CIE Young Engineer Award in recognition of outstanding contributions and applications of Computers

and Information in Engineering. Dr. Shaurya Shriyam, University of Southern California and Dr. Yanglong Lu Georgia Institute of Technology were both recognized with Best Dissertation Awards. Professor Jitesh H. Panchal's service contributions to the division were recognized with the CIE Distinguished Service Award.

The overall CIE Conference Best Paper Award went to authors Drs Jun Wang and Jida Huang for their paper titled 'Functionally Graded Non-periodic Cellular Structure Design Using a Surrogate Model-Based Optimization Scheme'. Besides this, there were four best paper awards given as part of the CIE technical committees and will be discussed later in this newsletter under the TC reports.

This year we also had the honor of recognizing the Technical Committee Chairs for their outstanding leadership in technical areas of the CIE division. Dr. Seung-Kum Choi for Advanced Modeling and Simulation, Dr. Tsz Ho Kwok, for Computer-Aided Product and Process Design, Dr. Marina Carulli for Virtual Environments and Systems and Dr. Yan Lu for Systems Engineering, Information and Knowledge Management were recognized for Technical committee contributions in 2021. Dr. Krishnanand Kaipa for Advanced Modeling and Simulation, Dr. Chiradeep Sen for Computer-Aided Product and Process Design, Dr. Andrea Vitali for Virtual Environments and Systems and Dr. Bryan O'Halloran, Systems Engineering, Information and Knowledge Management were recognized for their Technical committee contributions in 2020.

Given the virtual nature of the conference, we greatly encouraged student participation through our signature CIE graduate poster session. We are proud to share that the CIE Division selected and supported 23 students from 16 Universities across the world to participate the 2021 CIE Graduate Student Poster Session. The CIE division hopes to see more students participating in the CIE graduate poster session in the future.

Following the huge success of the inaugural ASME CIE Hackathon in 2020, the 2021 ASME-CIE Hackathon was held virtually August 14-15, 2021 and focused on exploring the power of data and cybersecurity for Mechanical Engineering. The 2021 Hackathon was sponsored by the ASME Technical Events and Content (TEC) Sector Council and the ASME Computers & Information in Engineering Division with the goal to build multi-stakeholder (society-university-industry)

relations and impact the quality and quantity of data-skilled mechanical engineers. The ASME-CIE 2021 Hackathon is an emerging event held by ASME and is expected to become one of the signature events of ASME.

This year's conference also featured two exciting expert panels Sessions one on 'Digitalizing the Engineering Organization-next steps' moderated by Dr. Paul Witherell and featured Marc Halpern, Gartner, Michael Grieves, FIT, Raju S. Mattikalli, Boeing, David Cheng, Fluor and Dr. Yan Fu, Ford. The second panel was on 'Generative Design: Succeed or Fail in Product Development' moderated by Dr. Tsz-Ho Kwok featuring Dr. Charlie C.L. Wang, University of Manchester, Dr. Timothy W. Simpson, Pennsylvania State University, Mr. Blake Courter, nTopology and Dr. Hyunmin Cheong, Autodesk Research.

I would like to express my sincere appreciation to the division's volunteers, including members of four Technical Committees, symposium organizers, and paper reviewers, for making the 2021 CIE Virtual Conference a big success. Special thanks to the ASME staff members Andrew Koleba, Barbara Zlatnik, and Stacy Cooper for all their hard work and continued support in organizing the conference.

The Executive Committee members for the period of July 1st, 2021 - June 30th, 2022 include Chair: Mahesh Mani (US Department of Energy), Vice Chair: Paul Witherell (National Institute of Standards & Technology), Technical Program Chair: Caterina Rizzi (University of Bergamo), and Secretary: Yayue Pan (University of Illinois Chicago). Marc Halpern (Gartner Inc.) continues to be our Industry Executive. Our past chair, Jitesh Panchal (Purdue University), now serves as the chair of the Honors and Awards Committee, and our division's representative at the ASME Technical & Engineering Communities (TEC) group level. Our Member-at-large include Krishnanand Kaipa (Old Dominion University) and Robert E. Wendrich (University of Twente).

Organization of the 2022 CIE Conference has started, and we are even more excited that the CIE Division leads overall IDETC/CIE Conference 2022. Please see the call for papers and participation towards the end of the newsletter. The CIE division welcomes members of all experience levels as volunteers to continuously strengthen our community. If you are a recent graduate, early-career engineer, new faculty member,

or moving into a new career phase, volunteering is a great way to get involved and to gain a sense of greater achievement. Please contact any one of us in the CIE leadership team, including the members of Executive Committee and Technical Committees listed in the later portion of this newsletter. Please visit the CIE community webpage for details on ongoing virtual events such as panels and seminars:

<https://community.asme.org/computersinformationengineering/b/weblog/default.aspx>

Our awards program has been very successful in recognizing the achievements of our members, and we need your help in identifying deserving colleagues and nominate them. Nomination is the first and important step to allow us to give awards. Please contact

Jitesh Panchal (panchal@purdue.edu), our Awards Chair, with nominations and questions. The details of CIE awards, and nomination process are available at:

<https://community.asme.org/computersinformationengineering/w/wiki/3714.honors-awards.aspx>

On behalf of the division's Executive Committee, I would like to send our new year greetings and best wishes to all members of the CIE community.

Mahesh Mani
CIE Division Chair
2021-2022

CIE 2021 CONFERENCE REPORT

NOTES FROM PAST CHAIR

JITESH PANCHAL



Congratulations to all the organizers of the CIE 2021 conference! Despite all the pandemic-related uncertainties, and the challenges they create in planning for a large-scale international conference, the team successfully organized an outstanding virtual conference. Special thanks to the ASME staff, Andy Koleba and Barbara Zlatnik, for all their support.

The past CIE division chairs, Cameron Turner, Yan Wang, and I are excited to serve as the organizers of the 2022 ASME IDETC/CIE conference. We are looking forward to welcoming the ASME CIE community for a much-awaited face-to-face conference in St. Louis.

As the CIE awards chair for 2021-2022, I would like to inform you that CIE is seeking nominations for the following division-level awards:

- *Young Engineer Award*: to recognize a promising young investigator who is making outstanding contributions to the progress in the application of computers in engineering.
- *Lifetime Achievement Award*: to recognize a person who has had a

significant impact on the use of computers in engineering practice and/or education.

- *Leadership Award*: to recognize outstanding performance in one or more areas of concern to both the computer industry and the various engineering fields.
- *Excellence in Research*: CIE recognizes a person for outstanding research contributions in any field associated with the use of computers in engineering.
- *Distinguished Service Award*: to recognize a person for dedicated service in support of the CIE Division's mission.
- *Best Ph.D. Thesis/Dissertation Award*: to recognize promising young investigators who authored the best Ph.D. thesis of the year in CIE.

Details about these awards are available at: <https://www.asme.org/about-asme/honors-awards/unit-awards#cie>. The award nominations are due on **May 01, 2022**. Please do not hesitate to contact me (email: panchal@purdue.edu) if you have any question about the nomination process.

We look forward to seeing you at CIE 2022 in St. Louis, Missouri.

DIVISION HONORS AND AWARDS

Our division's honors and awards were awarded, as usual, during our annual conference, the CIE 2021 conference that took place virtually due to the pandemic.

2021 CIE EXCELLENCE IN RESEARCH AWARD



Soundar Kumara
engineering.

The 2021 ASME CIE Excellence in Research Award was awarded to Prof. Soundar Kumara at Penn State University, in recognition of his outstanding ability and potential for making significant contributions to the discipline of computers and information in

2021 CIE YOUNG ENGINEER AWARD



Tsz-Ho Kwok



*Vinayak R.
Krishnamurthy*

This year two ASME CIE Young Engineer Awards have been presented in recognition of their outstanding ability and potential for making

significant contributions to the discipline of computers and information in engineering. The two recipients of 2021 ASME CIE Young Engineer Award are Prof. Tsz-Ho Kwok at Concordia University and Prof. Vinayak R. Krishnamurthy at Texas A&M University



Jitesh H. Panchal

2021 CIE DISTINGUISHED SERVICE AWARD

This year's recipient of the Distinguished Service Award was Prof. Jitesh H. Panchal at Purdue University. The Distinguished Service Award recognizes a person for dedicated service in support of the CIE Division's mission.

2021 CIE TC LEADERSHIP AWARDS

Eight awards have been presented in recognition of outstanding leadership, two for each Technical Committee: AMS TC- Seung-Kum Choi from Georgia Institute of Technology and Krishnanand Kaipa from Old Dominion University in Virginia, CAPPD TC - Tsz-Ho Kwok from Concordia University and Chiradeep Sen from Florida Institute of Technology, SEIKEM TC - Yan Lu from NIST and Bryan O'Halloran from Naval Postgraduate School, VES TC - Marina Carulli from Politecnico di Milano in Italy and Andrea Vitali from University of Bergamo in Italy.



Seung-Kum Choi



Krishnanand Kaipa



Tsz-Ho Kwok



Chiradeep Sen



Yan Lu



Bryan O'Halloran



Marina Carulli



Andrea Vitali

2021 CIE BEST PHD DISSERTATION AWARD

This year two Best Dissertation awards have been assigned for their valuable contribution: one to Dr. Shaurya Shriyam from University of Southern California for his dissertation titled "Contingency Handling in Mission Planning for Multi-Robot Teams" and another one to Dr. Yanglong Lu from Georgia Institute of Technology for his dissertation titled "Physics Based Compressive Sensing for Additive Manufacturing Process Monitoring".

2021 CIE BEST PAPER AWARD

This year's CIE Best Conference Paper Award was presented to Jun Wang and Jida Huang for their paper entitled "Functionally Graded Non-periodic Cellular Structure Design Using a Surrogate Model-Based Optimization Scheme".

SHORT ABSTRACT OF THE 2021 CIE BEST PAPER

Topological tailoring of materials at a micro-scale can achieve a diverse range of extreme physical and mechanical properties. Modification of material properties through customizing the structural pattern paves an avenue for novel functional product design. In this paper, a non-periodic microstructure

design framework is explored for functional parts design with high-strength and functional property gradation. To address the common problem of geometric frustration in non-periodic microstructure design, we employ a smooth transition layer to connect distinct structural patterns and thus achieve functional gradation between adjacent microstructures. The concept of spatial control points is introduced for implementing the transition layer. To pursue a superior macro-structural performance for designing objects, we formulate the control point as design variables and encapsulate it into macro-structural design optimization problems. Given that our objective function involves finite element (FE) simulations, a surrogate model-based optimization scheme is utilized to cope with the computational challenge brought by the FE simulation. Experimental results demonstrate that the proposed design framework can yield both functionally graded light-weight structures and high-strength macro-mechanical performance. The compatibility issues in traditional non-periodic microstructure design are addressed. Comparative studies reveal that the proposed framework is robust and can potentially generate desired functional products with spatially varying properties.

TECHNICAL COMMITTEE REPORTS

ADVANCED MODELING AND SIMULATION (AMS)

SEUNG-KUM CHOI



The Advanced Modeling and Simulation Symposium track provides a venue for researchers to present the original research topics of modeling and simulation, including theoretical advances in modeling and simulation in engineering, advances in finite element methodology, novel numerical techniques, advances in discretization, and industrial applications of modeling and simulation.

The overall number of presented papers was significantly reduced due to the COVID-19 pandemic. We also had to reduce the number of symposium sessions according to the virtual conferencing schedule. A total of 9 papers were accepted among the five

symposiums of AMS. Of these, 8 papers were among the six symposiums organized directly by AMS, and 1 paper was accepted under the symposium jointly organized by CAPPD. A total of 24 papers were accepted among the two symposiums of CIE-General (AI & Additive Manufacturing). The presented topics ranged from applications of advanced simulations related to in-situ monitoring, modeling and design methods for additive manufacturing, and uncertainty quantification for complex systems.

The AMS symposium topics presented via virtual conferencing systems include the following:

- **AMS General (CIE-10):** This symposium covered a wide range of topics on

modeling and simulation that were not included in the special sessions below.

- **Computational Multiphysics Applications (CIE-12):** Computational modeling and simulation of multiphysics systems in engineering requires development of sophisticated models, integration methods, numerical algorithms, and computational techniques. This symposium featured presentations on applying these methods to problems ranging from modeling of wind turbine blade erosion to fluid structure interaction on aircraft structures.
- **Uncertainty Quantification in Simulation and Model Verification & Validation (CIE-13):** Uncertainties are inherent in computational models because of abstraction and numerical treatments. This symposium was conducted in one session. Methods for quantification of uncertainties in simulation and their applications in composite structures, flip-chip package, and welded joints were presented.
- **Material Characterization Methods and Applications (CIE-15):** Material characterization is a crucial modeling process as its ability to capture material constitutive behavior physics has a significant impact on the correctness of computational simulation. This symposium covers a wide range of material characterization issues, including the development of methods and their applications and advancing material characterization for high-performance simulation. This symposium was conducted in one session.
- **Design, Simulation, and Optimization for Additive Manufacturing:** Simulation plays

an important role to understand the detailed processes of additive manufacturing. This symposium was jointly organized by **AMS, SEIKM, and CAPPD**, and was conducted in three sessions. Papers on various aspects of additive manufacturing including material defect reconstruction, hybrid modeling method, toolpath planning, morphological analysis, extrusion parameter analysis, parallelized manufacturing, measured data alignment method, and machine learning methods for additive manufacturing were presented.

There were a total of **23** graduate student posters that were presented. The session was jointly organized and closely coordinated by multiple CIE technical committees.

AMS Technical Committee Best Paper Award

The 2020 AMS Best Paper was awarded to: IDETC2021-71130, "Scalable3-Bo: Big Data Meets Hpc - a Scalable Asynchronous Parallel High-Dimensional Bayesian Optimization Framework on Supercomputers," Ahn Tran on the topic: Computational Multiphysics Applications

2021-2022 AMS TC Leadership

Chair: Seung-Kum Choi, Georgia Institute of Technology, schoi@me.gatech.edu
 Vice-chair: Piyush Pandita, General Electric, piyush.pandita@ge.com
 Anh Tran, Sandia National Laboratories, anhtran@sandia.gov
 Secretary: James Yang, Texas Tech University, james.yang@ttu.edu
 Members-at-large: Ashish Chaudhari, MIT, amchaudhari@mit.edu

COMPUTER-AIDED PRODUCT AND PROCESS DEVELOPMENT (CAPPD)

Tsz Ho Kwok



As part of the 2021 CIE conference, CAPPD organized seven symposia: 1) CAPPD general, 2) Human-in-the-loop for product design, training, and manufacturing, 3) Digital human modeling for design and manufacturing, 4) Product and process design automation for Industry 4.0, 5)

Computational fabrication for product design and development, 6) Design, simulation and

optimization for additive manufacturing, organized jointly with AMS and SEIKM, and 7) an invitation-only panel session.

In total, 29 draft papers were submitted to CAPPD and 27 were accepted, corresponding to an acceptance rate of 93%. The CAPPD panel session hosted four speakers, who discussed the practical issues of generative design and its applications in product development. As in the past, the CAPPD technical committee continued to organize the CIE Graduate

Student Poster Session. Despite the challenges posed by the pandemic, thanks to the outstanding efforts of the CAPPD secretary, Anand Balu Nellippallil, this year's poster session drew 23 poster submissions from 16 different institutes in the United States, United Kingdom, China, and Ethiopia.

CAPPD Technical Committee Best Paper Award

The 2021 CAPPD Best Paper Award was awarded to: IDETC2021-68237, "Finding Features of Positioning Error for Large Industrial Robots Based on Convolutional Neural Network" by Daiki Kato, Kenya Yoshitugu,

Naoki Maeda, Toshiki Hirogaki, Eiichi Aoyama, and Kenichi Takahashi, in the symposium of product and process design automation for Industry 4.0.

2021-2022 CAPPD TC Leadership

Chair: Ehsan T. Esfahani, University at Buffalo (ehsanef@buffalo.edu)

Vice Chair: Anand Balu Nellippallil, Florida Institute of Technology (anellippallil@fit.edu)

Secretary: Jida Huang, University of Illinois at Chicago (jida@uic.edu)

Past Chair: Tsz Ho Kwok, Concordia University (tszho.kwok@concordia.ca)

VIRTUAL ENVIRONMENTS & SYSTEMS (VES)

MARINA CARULLI



The Virtual Environment & Systems (VES) Symposium track hosted a total number of 11 technical papers organized in 3 sessions. VES Symposium provides a forum to researchers to share their experiences and knowledge on a variety of topics such as:

Design Tools and VR- Systems; Portable and wearable VR Systems, Multisensory Interactive Technologies; Simulation and Interaction; Enhanced Visualization and Motion-Based Design Systems; Methods and Tools for Developing Virtual Environments in Design Engineering, Multiple Realities (i.e. VR-AR-MR-XR) and Blended Spaces; Immersive Learning and Education with VR and AR based systems; Gamification through Virtual Environments; Methods, Processes and Strategies for Technology, User Experience and User Interfaces, Natural User Interface for VR and AR, Artificial Intelligence and Machine Learning Approaches for Virtual Environments. These topics have been organized into 3 main themes as follows:

- Data Management: Big Data and Deep Learning in Virtual Environments for Design Engineering;
- Tracking and Sensing (Strategies, Hardware, and Software): Emerging Technologies and New Challenges;
- Interactive and Multisensory User Interfaces.

The VES community has expressions of interest and focus on the use of virtual reality technologies applicable to a plethora of domains. The design and

operation of engineered and/or cyber-physical systems present unique challenges and opportunities for integrating human intelligence, cognition, multi-sensory aspects, and decision-making with computer intelligence. Issues related to enabling humans to visualize, simulate and make decision in the context of large amounts of data, choice-architecture on information and as one of many agents or stakeholders in D&E processes. Over the years the VES Community reached and demonstrated high scientific quality in their sessions, contributions and outreach/crossover to other domains and disciplines. The VES community is always looking for researchers and domain-experts (including cross-domains, multi-disciplinary) to expand and strengthen their platform and research endeavors. Please feel free to contact us (see below) if you are interested to join, participate or get involved.

VES Technical Committee Best Paper Award

The 2021 VES Best Paper was awarded to: IDETC2021-66731, "Automated and Adaptive Geometry Preparation for AR/VR-Applications" by Maximilian Peter Dammann, Wolfgang Steger, and Ralph Stelzer

on the topic of Methods, Processes, and Technologies for VR, AR, and MR.

2021-2022 VES TC Leadership

Chair: Marina Carulli, Politecnico di Milano, marina.carulli@polimi.it

Vice-Chair: Vinayak Krishnamurthy, Texas A&M Engineering University, USA

Secretary: Christian E. Lopez Bencosme, Lafayette College, USA

Member-at-large: Andrea Vitali, University of Bergamo, andrea.vitali@unibg.it

SYSTEMS ENGINEERING, INFORMATION AND KNOWLEDGE MANAGEMENT (SEIKM)

ZHUO YANG



The goal of the Systems Engineering, Information, and Knowledge Management (SEIKM) Technical Committee (TC) is two-fold; (i) to serve the SEIKM community in the broad computer and information engineering field through activities promoting the dissemination of new knowledge

and new technology, and (ii) to advance research related to design, engineering, and operation of systems where complexity, connectivity, uncertainty, knowledge discovery, and management present unique challenges. As the interest in IoT, big data, machine learning and AI, cyber-physical systems, digital twin, and sociotechnical systems has grown, there is room for significant collaborative research impact from our community. To help both the research community as well as industry, several efforts have been made by the SEIKM TC in the last year, including the CIE 2021 virtual conference, ASME-CIE Hackathon event.

For the CIE 2021 virtual conference, eight sessions were organized/co-organized by the SEIKM TC. The number of total research article submissions was 27, plus 14 submissions to the joint sessions. The number of accepted was 26 + 13. The acceptance rate was 95%. Twenty research articles were presented in the topic areas of *SEIKM General*, *Design Informatics*, and *Systems and complex Systems Engineering*. To continue showcasing and highlighting the need of emerging big data and AI technology to address the challenges associated with the systems engineering and design (SE&D) research, SEIKM TC at the 2021 ASME IDETC/CIE organized the machine learning and AI session the second time. Due to the topic's popularity among CIE, the session was held at the CIE level. The research focused on new computational approaches and computational reasoning to enable advances in systems engineering design and operations. This research that accepted 14 research articles. At the same time, the new session developed last year titled *Enabling Digital Technologies for Smart Product-Service System Development* attracted 5

papers. This session covered the developing the product-service system using advanced digital technologies and methods. The 2021 SEIKM Best Paper was awarded to: IDETC2021-72099 - "Deep Learning-Based Surrogate Modeling via Physics-Informed Artificial Image (PIAI) for Strongly Coupled Multidisciplinary Engineering Systems, by Sungkun Hwang and Seung-Kyum Choi from Georgia Institute of Technology

With support from ASME, the SEIKM has successfully organized the hackathon event as part of pre-conference activity for CIE 2021. Both events offered three data science problems open to student participants. One problem is about *Digital Manufacturing - Obfuscating the design with security features* provided by New York University (NYU) Tandon school of Engineering. The second problem, *Automated Testing in Production Planning in Test based Engineering*, is provided by Siemens. The third problem is *Melt Pool Monitoring Data Registration for Powder Bed Fusion Additive Manufacturing* provided by the National Institute of Standards and Technology. Plus, the traditional MEME challenge of ASME Hackathon. This year, three problems shoot from different angle to provide diversity to the event. The NYU problem is close to engineering puzzle problem but without limitation of tools or approaches. The Siemens problem is a traditional process prediction problem that allow the participants to play such machine learning algorithms. The NIST problem focuses on manufacturing data at preprocessing stage. SEIKM TC, working together with volunteering mentors and judges from various organizations and institutes, was able to organize the competing hackathon teams to develop and present solutions for the problems within 24 hours. To make the competition more attractive, the organizing committee also offered multiple tutorials sessions as well as a special meme challenge during the event.

The CIE hackathon event has attracted 36 participants from 16 institutes where majority are from US universities. They formed 12 teams and competed for the two

problems. This year, each team can choose as many problems as they want to compete. Finally, Problem 1 to 3 has 4, 7, and 5, respectively. At the end of the hackathon, the teams were asked to submit their findings and give a 15 minutes presentation. Judges sitting in three parallel presentation sessions gave scores to each team based on their technical approach, result and overall presentation skill. There is one team win the title of two problems.

SEIKM Technical Committee Best Paper Award

The 2021 SEIKM Best Paper was awarded to:
IDETC/CIE-72099, "Deep Learning-Based Surrogate Modeling via Physics-Informed Artificial Image (PIAI) for Strongly Coupled Multidisciplinary Engineering Systems" by Sungkun Hwang and Seung-Kyum Choi.

2021-2022 SEIKM TC Leadership

Chair: Zhuo Yang, University of Massachusetts Amherst, zhuoyang@umass.edu

Vice Chair: Dazhong Wu, University of Central Florida (dazhong.wu@ucf.edu)

Secretary: Douglas Van Bossuyt, Naval Postgraduate School, douglas.vanbossuyt@nps.edu

Past Chair: Yan Lu, National Institute of Standards and Technology (yan.lu@nist.gov)

ASME Hackathon Chair: Hyunwoong Ko hyunwoong.ko.1@gmail.com

TC Student Committee Member: Cheng Chen, Univ. of George Cheng.C@uga.edu

ASME 2021 HACKATHON

Virtual Event

ASME - CIE Hackathon
AUGUST 14TH - 15TH

ZHUO YANG

The idea of organizing an ASME hackathon was initiated in 2019 within the SEIKM TC, and the goal was to build a platform and a mechanism that could enable multi-stakeholder relations and efforts including both academia and industry and a broader society to impact the quality and quantity of data-skilled mechanical engineers as data science plays a more and more important role in Mechanical Engineering.

The ASME-CIE Hackathon attempts to provide an open mechanism for researchers to explore new statistical and machine-learning techniques appropriate for the use of unstructured text, images, audio, etc., in design, manufacturing, and complex systems engineering, and on the other hand, to develop new educational pathways to train the next generation of data-skilled mechanical engineers.

With support from ASME, the SEIKM has successfully organized the hackathon event as part of pre-conference activity for CIE 2021. Both events offered three data science problems open to student participants. One problem is about *Digital Manufacturing - Obfuscating the design with security features* provided by New York University (NYU) Tandon school of Engineering. The second problem, *Automated Testing in Production Planning in Test based Engineering*, is provided by Siemens. The third problem is *Melt Pool Monitoring Data Registration for Powder Bed Fusion Additive Manufacturing* provided by the National Institute of Standards and Technology. Plus, the traditional MEME challenge of ASME Hackathon. This year, three problems shoot from different angle to provide diversity to the event. The NYU problem is close to engineering puzzle problem but without limitation of tools or approaches. The Siemens problem is a traditional process prediction problem that allow the participants to play such machine learning algorithms. The NIST problem focuses on

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In summary, the 2021 CIE Hackathon is the second Hackathon event within ASME. This channel provides students with opportunities to work on the real manufacturing data of frontier technology. This is very beneficial to students' learning and transfers their classroom knowledge to working knowledge in solving practical problems of real work.

WINNERS OF ASME-CIE 2021 HACKATHON

Problem 1: Digital Manufacturing - Obfuscating the design with security features

First Place: Team Yellow Jackets - Lance Lu, Patrick Jung, Nathan DeVol

Second Place: Team Tesseract - Daniel S. Chang, Bhairav Phukan, Gursharan Singh

Third Place: Team Stochastics - Yinshuang Xiao, Xiaotong Sun, Qingyu Xiao

Problem 2: Automated Testing in Production Planning in Test based Engineering

First Place: Team Crouching Tigers - Haedong Kim; Hankang Lee

Second Place: Team SRSL - Venkat Nemani, Ankush Mishra, Adam Thelen

Third Place: Team Big Red Boilermakers - Adam Dachowicz, Karim A. ElSayed, and Molla H. Rahman

Problem 3: Melt Pool Monitoring Data Registration for Powder Bed Fusion Additive Manufacturing

First Place: Team Yellow Jackets - Lance Lu; Patrick Jung; Nathan DeVol

Second Place: Team F&L (temporal) - Sepehr Fathizadan, Lu Liu

Third Place: Team Yoda - Runsang Liu, Siqi Zhang

ASME CIE HACKATHON ORGANIZERS

Yan Lu



Zhenghui Sha

POSTER SESSION AND AWARDS

The ASME-CIE Graduate Research Poster session is an opportunity for graduate students in the preliminary phase of their research programs (MS or within 2 years of starting a PhD) to present their current work to the CIE research community. This session provides the students a chance to obtain external feedback on their preliminary research that may not yet be ready for presentation at the conference in archival form.

This year the CIE Division selected and supported 23 students from 16 Universities to participate in the CIE Graduate Student Poster Session. The 2021 CIE poster session awardees are listed below.

1. Bhavika Jain, "ML-Based Modeling of Communication and Decision Making in Design Teams," Purdue University and Plaksha University.
2. Abdulrahman Alqoud, "Decision-Based Framework for Retrofitting SMEs Legacy Systems in the Context of Industry 4.0," University of Liverpool.
3. Angshuman Deka, "Energy Savings Using Part Decomposition for Assembly-Based Design in Additive Manufacturing," University at Buffalo.
4. Shuai Ma, "Predicting Mechanical Properties of 3d Printed Lattice Structures," Chongqing University.
5. Zhangyue Shi, "Surface Morphology Analysis Using Robust Autoencoder in Additive Manufacturing with Laser Engineered Net Shaping," Oklahoma State University.
6. Yinshuang Xiao, "Robust Design of Complex Socio-Technical Systems Using Complex Networks," University of Arkansas.
7. Shehu Sani, "Developing a Digital Twin Framework for Improving Resilience in Military Supply Chain (Msc) of Defense Industries," University of Liverpool.
8. Yi Liu, "A Conceptual Design Method for Heavy Equipment Using Resilient Principles," Sichuan University.
9. Gina Dello Russo, "Modeling Consumer Behavior in Energy Systems," Stevens Institute of Technology.
10. Haihan Wang, "Modular Design and Simulation Optimization of Indoor Assembled Heavy-Duty Installation Transportation Equipment," Sichuan University.
11. Hanbing Xia, "Optimization of Automotive Reverse Supply Chain Based on AI Techniques," University of Liverpool.
12. Ziqing Li, "Data-Driven Recommender System for Crowdsourcing Initiatives Design," Beijing Institute of Technology.
13. Mohammed Khan, "Platform for Framing the UK SME Digital Servitization Journey," University of Liverpool.
14. Junya Tang, "Exploring Machine Learning for Business Process Knowledge Extraction and Management," Tongji University and Cardiff University.
15. Yanzhang Tong, "Integrating Hedonic Quality for User Experience Modelling," Cardiff University.
16. Sandeep Krishnakumar, "Going Digital: Evaluating the Effect of the Rapid Transition to Virtual Learning Due to Covid-19 on Student Experiences in an Engineering Design Course," The Pennsylvania State University.
17. Yuwei Wan, "Exploiting Graph-Structured Data for Multi-Faceted Conceptual Modelling," Cardiff University.
18. Omey Manyar, "A Digital Twin Based Robotic Grasp Planning for Deformable Objects," University of Southern California.
19. Arsalan Lambay, "A Data-Driven Approach of Detecting Human Fatigue for Adaptation in Human-Robot-Collaboration," Cardiff University.
20. James Ndodana, "Online Filtering of Wheel Flange Measurements," Addis Ababa University.
21. Jicmat Ali, "A Grasp-Planning Framework for Sheet Metal Multi-Type Grippers Using an Evolutionary Approach," Florida Institute of Technology.
22. Huiru li, "Uncertainty Quantification with Label-Free Regression," Indiana University - Purdue University Indianapolis.
23. Neel Dhanaraj, "A Mobile Manipulator System for Accurate and Efficient Spraying on Large Surfaces," University of Southern California.

THE INDUSTRY-ACADEMIC PANEL

On Thursday, August 19, the ASME CIE division held a panel with industry and academic participants entitled "**Digitalizing the Engineering Organization: The Next Steps.**" In this panel we heard from industry experts in the oil and gas, aerospace, and automotive industries about how their companies adopted new generation digitalization technologies describing the successes and challenges they faced.

The panelists included: Marc Halpern- Research Vice President, Gartner, Inc.; Michael Grieves, chief scientist of advanced manufacturing and the executive vice president of operations at the Florida Institute of Technology; Raju S. Mattikalli- Technical Fellow - Boeing Corporation; David Cheng -Technical Director and Fluor Fellow, Fluor Corporation; and Yan Fu -Senior Manager, Strategy and Enterprise Analytics · Ford Motor Company. Paul Witherell of the National Institute of Standards and Technology (NIST) and Kieran Kavanagh of Envysor moderated the panel.

AWARD NOMINATIONS

NOMINATE YOUR COLLEAGUES FOR CIE DIVISION AWARDS

- Best Paper Award
- Best Ph.D. Thesis/Dissertation Award
- Distinguished Service Award
- Excellence In Research Award
- Leadership Award
- Lifetime Achievement Award
- Young Engineer Award

For details visit: <https://www.asme.org/about-asme/get-involved/honors-awards/unit-awards>

Submit to **Jitesh Panchal** (panchal@purdue.edu)

UPDATES FROM ASME JOURNAL OF COMPUTING AND INFORMATION SCIENCE IN ENGINEERING (JCISE)

SATYANDRA K. GUPTA, EDITOR, JCISE



OVERVIEW

The field of computing and information science is seeing significant growth. New developments in these areas are expected to impact all facets of engineering. ASME Journal of Computing and Information Science in

Engineering publishes articles related to Algorithms, Computational Methods, Computing Infrastructure, Computer-Interpretable Representations, Human-Computer Interfaces, Information Science, and/or System Architectures that aim to improve some aspect of product and system lifecycle (e.g., design, manufacturing, operation, maintenance, disposal, recycling etc.). Applications considered in JCISE manuscripts should be relevant to the mechanical engineering discipline. Papers can be focused on fundamental research leading to new methods, or adaptation of existing methods for new applications. Topic areas covered by JCISE include:

- Advanced Computing Infrastructure
- Artificial Intelligence
- Big Data and Analytics
- Collaborative Design
- Computer Aided Design
- Computer Aided Engineering
- Computer Aided Manufacturing
- Computational Foundations for Additive Manufacturing
- Computational Foundations for Engineering Optimization
- Computational Geometry
- Computational Metrology
- Computational Synthesis
- Conceptual Design
- Cyber manufacturing
- Cyber Physical Security for Factories
- Cyber Physical System Design and Operation
- Data-Driven Engineering Applications
- Engineering Informatics
- Geometric Reasoning

- GPU Computing for Design and Manufacturing
- Human Computer Interfaces/Interactions
- Industrial Internet of Things
- Knowledge Engineering
- Information Management
- Inverse Methods for Engineering Applications
- Machine Learning for Engineering Applications
- Manufacturing Planning
- Manufacturing Automation
- Model-based Systems Engineering
- Multiphysics Modeling and Simulation
- Multiscale Modeling and Simulation
- Multidisciplinary Optimization
- Physics-Based Simulations
- Process Modeling for Engineering Applications
- Qualification, Verification and Validation of Computational Models
- Symbolic Computing for Engineering Applications
- Tolerance Modeling
- Topology and Shape Optimization
- Virtual and Augmented Reality Environments
- Virtual Prototyping

ASSOCIATE EDITORS

Current JCISE Associate Editors include:

- Gaurav Ameta, Siemens Corporate Technology
- Nabil Anwer, LURPA - Ecole Normale Supérieure Paris-Saclay
- Monica Bordegoni, Politecnico di Milano
- Matthew Campbell, Oregon State University
- Yong Chen, University of Southern California
- Chih-Hsing Chu, National Tsing Hua University
- Jonathan R. Corney, University of Strathclyde
- Ehsan Esfahani, State University of New York at Buffalo
- Francesco Ferrise, Politecnico di Milano

- Balan Gurumoorthy, Indian Institute of Science
- Bin He, Shanghai University
- Ajay Joneja, Hong Kong Univ of Science & Technology
- Ashok Kumar, University of Florida
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- Chris Paredis, Clemson University
- Anurag Purwar, Stony Brook University
- Rahul Rai, Clemson University
- P.V.M. Rao, Indian Institute of Technology Delhi
- Caterina Rizzi, University of Bergamo
- Kazuhiro Saitou, University of Michigan
- Yu Song, Delft University of Technology
- Krishnan Suresh, University of Wisconsin
- Atul Thakur, Indian Institute of Technology Patna
- Charlie C.L. Wang, University of Manchester
- Jun Wang, Nanjing University of Aeronautics and Astronautics
- Yan Wang, Georgia Institute of Technology
- Kristina Wärmefjord, Chalmers University of Technology

JOURNAL STATISTICS FOR PAPERS SUBMITTED IN 2020

Submitted Papers: 347

Accepted Papers: 79

We are now publishing 6 issues per year.

SPECIAL ISSUES

JCISE published a special issue called "Highlights of CIE 2020" in [October 2021](#). This issue featured 8 papers. Mahesh Mani and Caterina Rizzi served as Guest Editors for this special issue.

Digital twin (DT) is the real-time digital replica of a physical entity and system, which enables the seamless integration

between digital models and physical devices so that the operation, monitoring, control, and upgrade of the system as well as personnel training can be performed in a cyber-physical mixture mode. DTs integrate technologies such as multiphysics multiscale modeling, internet of things, smart sensing, machine learning, and model-based control. DTs build a bridge between the physical world and the virtual world by mapping the whole life cycle of physical systems with real-time sensor data and maintaining the complete digital trace. In the era of Industry 4.0, DT is becoming a powerful engine in the intelligent design products and intelligent manufacturing. DT enables data-driven design and optimization, evidence based sustainable design, real-time diagnostics and prognostics, plug-n-play customization, and modular improvement. This special issue, "Digital Twin-Driven Design and Manufacturing," was published [June 2021](#) and included 12 Research Papers, 2 Review Articles, 1 Technical Brief, and a Guest Editorial. Bin He, Yu Song, and Yan Wang served as Guest Editors for this special issue.

Over the next year, JCISE is planning the following special issues/sections:

- Highlights of CIE 2021 (June 2022)
- Special Section: Selected Papers from IMECE 2021 (August 2022)
- Special Section on Symbiotic Human-AI Partnership for Next Generation Factories ([October 2022](#))
- Special Issue on Data Wrangling to Support Research on Engineering Design and Manufacturing ([December 2022](#))
- Special Issue on Machine Intelligence for Engineering Under Uncertainties ([February 2023](#))

NEW DIGITAL MEDIA INITIATIVES

In 2021, JCISE formed a Digital Media Board (DMB) to oversee the journal's online promotional initiatives. Members include: JCISE Associate Editor Yan Wang (Georgia Institute of Technology), Vinayak Raman Krishnamurthy (Texas A&M University), and Douglas Van Bossuyt (Naval Postgraduate School).

With the DMB's support, the journal has launched a series of initiatives intended to work in concert to raise the visibility of the journal: webinars featuring recent

journal publications, [YouTube channel](#), [LinkedIn page](#), and companion website, www.asmejcise.org.



IDETC-CIE 2022
International Design Engineering
Technical Conferences & Computers
and Information in Engineering
Conference

St. Louis Union Station Hotel, St. Louis Missouri

Conference: August 14 – 17, 2022

Exhibition: August 15 – 17, 2022

42ND ASME COMPUTERS AND INFORMATION ENGINEERING CONFERENCE (CIE)

CALL FOR PAPERS

<https://event.asme.org/IDETC-CIE>

The CIE Division is excited to put out all call for papers for the 42nd CIE Conference, to be held in August 14-17, 2022, St. Louis, Missouri, USA. All four CIE tracks are soliciting papers in all aspects of computer applications on experimental, numerical, or analytical studies, with emphasis on the highlighted topic areas.

TRACK SYMPOSIUMS

- Advanced Modeling and Simulation (AMS)
- Computer-Aided Product and Process Development (CAPPD)
- Virtual Environments and Systems (VES)
- Systems Engineering Information Knowledge Management (SEIKM)

TRACK SYMPOSIUM TOPICS

- AMS: Inverse Problems in Science and Engineering
- AMS: Computational Multiphysics Applications
- AMS: Uncertainty Quantification in Simulation and Model Verification & Validation
- AMS: Simulation in Advanced Manufacturing
- AMS: Material Characterization Methods and Applications
- AMS Panel (Call for proposals)
- CAPPD: Human in the Loop for Product Design, Training, and Manufacturing
- CAPPD: Digital Human Modelling for Design and Manufacturing
- CAPPD: Product and Process Design Automation for Industry 4.0
- CAPPD: Computational Fabrication for Product Design and Development
- SEIKM: Design Informatics
- SEIKM: Smart Manufacturing Informatics
- SEIKM: Systems Engineering and Complex Systems

- SEIKM: Knowledge Capture, Reuse, and Management
- SEIKM Special Session: Mission Engineering
- VES: Technologies for VR, AR, and MR (Methods, Processes, and Applications)
- VES: Video Presentation Exhibit: Visualization and Virtual Demonstration of Prototypes and Simulations

CIE JOINT TOPICS

- AMS/CAPPD: Digital Twin: Advanced Human Modeling and Simulation in Engineering
- AMS/CAPPD/SEIKEM: Design, Simulation and Optimization for Additive Manufacturing
- AMS/CAPPD/SEIKEM: Artificial Intelligence and Machine Learning in Design and Manufacturing
- SEIKEM/DTM: Human System Integration
- Graduate Student Poster Symposium

CIE PANELS

- AMS Panel (Call for proposals)
- SEIKEM Panel: Digital Twin
- VES PANEL: Virtual, Augmented, and Mixed Reality Panel (Call for proposals)

Selected papers will be published in ASME *Journal of Computing and Information Science in Engineering* (JCISE). Five Best Papers will be awarded, including CIE Conference Best Paper and AMS, CAPPD, SEIKM and VES Best Paper.

CONFERENCE ORGANIZERS:

Conference Chair: Paul Witherell
National Institute of Standards & Technology (NIST), Gaithersburg, MD 20899, USA,
paul.witherell@nist.gov

Program Chair: Caterina Rizzi
University of Bergamo
Bergamo, Italy, caterina.rizzi@unibg.it

RELEVANT JOURNALS, CONFERENCES & JOURNALS SPECIAL ISSUES



JOURNAL OF COMPUTING AND INFORMATION SCIENCE IN ENGINEERING

The Journal of Computing and Information Science in Engineering publishes archival research results and advanced technical applications. The scope includes: Solid and Geometric Modeling; Computational geometry; Reverse Engineering; Virtual Environments and Haptics; Tolerance Modeling and Computational Metrology; Rapid Prototyping; Internet-Aided Design, Manufacturing and Commerce; Information Models and Ontologies for Engineering Applications; PDM/Enterprise Information Management; AI/Knowledge Intensive CAD/CAM; Engineering Simulation and Visualization, including FEA and Meshing; Creative IT; and Computational Algorithms/Software Development for mechanical product development.

<http://computingengineering.asmedigitalcollection.asme.org/journal.aspx>



Founded in 1880 as the American Society of Mechanical Engineers, ASME is the premier professional membership organization for more than 127,000 mechanical engineers and associated members worldwide. ASME also conducts one of the world's largest technical publishing operations in the world, offering thousands of titles including some of the profession's most prestigious journals, conference proceedings, and ASME Press books.

The ASME Digital Collection, previously known as The ASME Digital Library, is ASME's repository of current and archival literature featuring:

- ASME's Transaction Journals from 1960 to present.
- ASME's Conference Proceedings from 2002 to present.
- ASME Press eBooks selected from 1993 to present.

<http://asmedigitalcollection.asme.org/index.aspx>

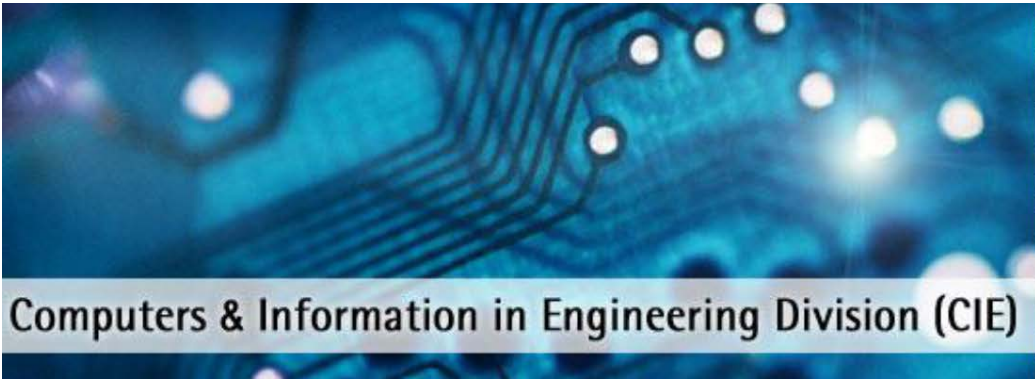
initiatives have been shared between CIE and IMECE communities.

For further information see:

<https://event.asme.org/IMECE>



The International Mechanical Engineering Congress and Exposition (IMECE) is ASME's largest research and development conference focused primarily on mechanical engineering, but encompasses perspectives from many engineering disciplines. As per the latest revision to our ASME Anywhere policy, the 2022 conferences will be held in person. Exact dates and venue locations will be posted shortly. At IMECE one can experience stimulating innovation from basic discovery to translational application of new approaches and foster collaborations that engage stakeholders and partners not only from academia, but also from national laboratories, industry and government funding bodies. During last years,



Computers & Information in Engineering Division (CIE)



ISSUE EDITOR

Yayue Pan

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