International Consortium for Innovation and Collaboration in Learning Engineering (ICICLE) 2024 Conference Proceedings: Solving for Complexity at Scale

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learning engineering

learning engineering proceedings

Learning Engineering Process

This volume presents the proceedings of ICICLE 2024, a conference where industry, K-12, higher education, and government practitioners converged to share insights into complex learning initiatives. The theme "Solving for Complexity at Scale" explored innovative approaches to learning challenges, from personalized tutoring to largescale online courses. The conference facilitated connections among participants from various disciplines and regions, enriching the collective knowledge and fostering new ideas. This compilation of 13 papers showcases the breadth of perspectives within the learning engineering field, highlighting applications of learning sciences, cognitive science, and human-centered design principles. Papers cover key themes such as Learning Engineering Process, Learning Engineering Applications, Learning Technology, Data Science, and Learning Analytics, offering practical insights and lessons learned.

This volume contains the proceedings of the International Consortium for Innovation and Collaboration in Learning Engineering (ICICLE) 2024 Learning Engineering Conference, co-hosted with the Arizona State University Learning Engineering Institute. The ICICLE Conference 2024 Learning Engineering Conference is where industry, K-12, higher education, and government practitioners alike converge to share and explore cutting-edge insights into complex learning initiatives. IEEE International Consortium for Innovation and Collaboration in Learning Engineering (ICICLE) is a volunteer professional organization committed to the development of Learning Engineering as a profession, practice, and process. The conference was co-hosted by the ASU Learning Engineering Institute, which aims to transform learning environments and experiences to empower equitable student engagement, improved learning outcomes, and success across large, diverse populations of learners. The success of this conference was made possible by the active participation and collaboration of the learning engineering community.

Held from July 22-24 in 2024, ICICLE 2024 brought together over 200 educators, researchers, technologists, and learning professionals from public, private and academic sectors in an engaging, hands-on environment. The conference's theme, "Solving for Complexity at Scale," sought to explore innovative approaches to learning challenges, ranging from personalized tutoring to large-scale online courses and everything in between. Participants came from diverse backgrounds to share their expertise, engage in lively discussions, and explore new methodologies, tools, processes and applications in learning engineering.

ICICLE 2024 demonstrated the importance of community-building in the field of learning engineering. The conference facilitated connections among participants from various disciplines and regions, enriching the collective knowledge and fostering new ideas for the future. It featured a variety of engaging sessions, including Lightning Talks, Show and Share Presentations, Active Learning Sessions, and Stations of Exploration. These sessions encouraged active participation, allowing attendees to not only learn but also contribute their own experiences and knowledge. The conference also provided opportunities for attendees to engage with special interest groups (SIGs) and market interest groups (MIGs) that

focused on key topics such as competencies, credentials, curriculum design, and tools development in learning engineering. This proceeding and the companion reflections provide a compilation of our experience.

The current proceedings includes 13 papers from the 75 conference presentations. The contributions in this proceedings reflect the breadth of perspectives within the learning engineering field. Authors came from academia, industry, and nonprofit sectors to present conceptual and empirical studies, as well as advancements in theory and methodology. Therefore, this proceeding highlights innovative applications of learning sciences, cognitive science, learning analytics, and human-centered design principles. These papers showcase how learning engineering is applied across various contexts and at multiple scales, from individual learning experiences to large-scale educational systems.

In this volume, the papers were organized around key themes from ICICLE 2024. Two papers on Learning Engineering Process provide an overview of how learning engineering functions as a process. This is followed by six papers on Learning Engineering Applications, which highlight recent advancements in the field. Five final papers on Learning Technology informed by Learning Engineering provide Best Practices/Case Studies/Lessons Learned offer practical insights, while those on Data Science and Learning Analytics explore the integration of new tools and methods to streamline learning experiences at scale.

Acknowledgments

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As editors for this proceeding, we would like to thank the sponsors, reviewers, and organizing committee for their dedication to making ICICLE 2024 a success. Their support enabled us to create a space for meaningful exchanges and collaboration. We also appreciate the contributions of all the authors whose work has been included in this volume. Their research advances our understanding of how learning engineering can be applied to solve complex educational challenges.



The ICICLE community continues to grow, fostering interdisciplinary and international collaboration to address learning challenges. We invite new and returning scholars, educators, and practitioners to join us in shaping the future of learning engineering!

Special Interest Groups SIGs and Market Interest Groups MIGs

ICICLE's Special Interest Groups SIGs and Market Interest Groups MIGs are integral to the community's success in developing and supporting the field of Learning Engineering. The ICICLE conference and this proceedings volume would not be possible without their members' hard work and dedication. If you would like to learn more about the field, society or SIGs/MIGs, please join us at one of our free online meetings. You can find more information and sign up for our newsletter or meetings at <u>https://sagroups.ieee.org/icicle/</u>.

SIG/MIG	Description
Competencies, Credentialing, Curriculum SIG	A group working to outline the competencies necessary to design and implement projects using the learning engineering model.
Design for Learning SIG	Multidisciplinary SIG for discussing and building examples/cases of human-centered design work within the learning engineering process framework and across implementation levels.
Global Localisation SIG	Group for those interested in adapting the learning engineering process in local contexts globally.
Higher Education MIG	Multidisciplinary MIG for anyone involved in or adjacent to higher education, interested in the applications of learning engineering for quality education, instructional design, and research-informed analytics/improvement.

Military / Government MIG	Group for all involved with learning interventions in government and military globally.
pK-12 MIG	Group for anyone involved in or adjacent to pK-12, interested in the applications of learning engineering for quality education, instructional design, and research-informed analytics/improvement.
Students & Grads SIG	A forum for mutual mentorship and career development for learning engineering and applied learning sciences students, prospective students, and recent graduates from other learning engineering-adjacent programs.
Tools SIG	A group that focuses on identifying and categorizing tools used in learning engineering, including identifying tools that help solve learning engineering problems and tools for collecting and analyzing data.
Workforce MIG	Group for learning and development leaders to discuss and build awareness of technologies for corporate learning projects.



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Scotty D. Craig is an associate professor of human systems engineering within The Polytechnic School of the Ira A. Fulton Schools of Engineering at Arizona State University. Dr. Craig serves as the ASU Learning Engineering Institute's Director, Research and Evaluation and as Director of the ASU Advanced Distributed Learning Initiative Partnership Lab. Dr. Craig is a learning engineer with expertise in cognitive science, design science, and the science of learning (specifically learning technology). He has contributions at the intersection of psychology, education, and technology within the areas of multimedia learning, virtual environments, as well as development and evaluation of learning technology within laboratory and applied settings. Dr. Craig is currently the graduate chair for four areas: Human Systems Engineering Program (MS & PhD), User Experience (MS), Data Science and Analytics in Engineering- Human-Centered Applications (MS) and the new Graduate Certificate for Learning Engineering.





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