

**Proceedings of ASME 2024
International Design Engineering
Technical Conferences and
Computers and Information in
Engineering Conference
(IDETC-CIE2024)**

Volume 6

**36th International Conference on Design
Theory and Methodology (DTM)**

**August 25-28, 2024
Washington, DC**

Conference Sponsors
Design Engineering Division

Computers and Information
in Engineering Division

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

© 2024, The American Society of Mechanical Engineers, 150 Clove Road, Little Falls, NJ 07424, USA
(www.asme.org)

All rights reserved. “ASME” and the above ASME symbols are registered trademarks of the American Society of Mechanical Engineers. No part of this document may be copied, modified, distributed, published, displayed, or otherwise reproduced in any form or by any means, electronic, digital, or mechanical, now known or hereafter invented, without the express written permission of ASME. No works derived from this document or any content therein may be created without the express written permission of ASME. Using this document or any content therein to train, create, or improve any artificial intelligence and/or machine learning platform, system, application, model, or algorithm is strictly prohibited.

INFORMATION CONTAINED IN THIS WORK HAS BEEN OBTAINED BY THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS FROM SOURCES BELIEVED TO BE RELIABLE. HOWEVER, NEITHER ASME NOR ITS AUTHORS OR EDITORS GUARANTEE THE ACCURACY OR COMPLETENESS OF ANY INFORMATION PUBLISHED IN THIS WORK. NEITHER ASME NOR ITS AUTHORS AND EDITORS SHALL BE RESPONSIBLE FOR ANY ERRORS, OMISSIONS, OR DAMAGES ARISING OUT OF THE USE OF THIS INFORMATION. THE WORK IS PUBLISHED WITH THE UNDERSTANDING THAT ASME AND ITS AUTHORS AND EDITORS ARE SUPPLYING INFORMATION BUT ARE NOT ATTEMPTING TO RENDER ENGINEERING OR OTHER PROFESSIONAL SERVICES. IF SUCH ENGINEERING OR PROFESSIONAL SERVICES ARE REQUIRED, THE ASSISTANCE OF AN APPROPRIATE PROFESSIONAL SHOULD BE SOUGHT.

ASME shall not be responsible for statements or opinions advanced in papers or . . . printed in its publications (B7.1.3). Statement from the Bylaws.

For authorization to photocopy material for internal or personal use under those circumstances not falling within the fair use provisions of the Copyright Act, contact the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923, tel:978-750-8400, www.copyright.com.

Requests for special permission or bulk reproduction should be addressed to the ASME Publishing Department, or submitted online at: <https://www.asme.org/publications-submissions/journals/information-for-authors/journalguidelines/rights-and-permissions>

ISBN: 978-0-7918-8840-7

TABLE OF CONTENTS

Concept Chaining Patterns During Ideation Using Digital Tablets	1
<i>Madhurima Das, Jessica Meza, Christine Xu, Maria C. Yang</i>	
Emulating Cognitive Style in Large Language Models.....	11
<i>Vasvi Agarwal, Kathryn Jablokow, Christopher McComb</i>	
Examining the Longitudinal Psychological Safety of Mentored Senior Capstone Design Teams	20
<i>Ana Arpini-Lorenzoni, Robert Hart, Todd W. Polk, Alexander R. Murphy</i>	
Case Study in Agile for Hardware: Aerospace Systems	28
<i>Matthew Peterson, Gregory Mocko</i>	
Designing for Grand Challenges: An Interactive Method for Tackling Coupled Device-System Designs	38
<i>Cole Jetton, Christopher Hoyle, Matthew I. Campbell</i>	
Development and Evaluation of a Process to Advance Orphan Assistive Technology Prototypes for Small Batch Production.....	51
<i>Stephen Sprigle, Xavier Simonelli, Jacob Misch, Taylor Allen, Stephen Chininis</i>	
Investigating Pro-Environmental Attitude for Designing Affective Eco-Feedback.....	61
<i>Sara L. Wilson, Zainab J. Khan, Bianca Lee, Supreetha Krishnan, John E. Fernandez, Maria C. Yang</i>	
Evaluating Design Rationale	75
<i>Yakira Mirabito, Xiaowen Liu, Kosa Goucher-Lambert</i>	
Can Unconscious Verbal Mimicry Measure Empathy in Design?.....	87
<i>Oluwatoba Fabunmi, Saman Halgamuge, Katja Holttä-Otto</i>	
TRIZ-GPT: An LLM-Augmented Method For Problem-Solving	97
<i>Liuqing Chen, Yaxuan Song, Shixian Ding, Lingyun Sun, Peter Childs, Haoyu Zuo</i>	
Valuing Outliers: a Modeling Framework to Consider Non-Traditional Solutions From Non-Traditional Solvers	111
<i>Athul Chakkithara Dharmarajan, Taylan G. Topcu, Jitesh H. Panchal, Zoe Szajnfarber</i>	
A Picture or a Thousand Words: Design Description Crafting to Replicate Human Similarity Judgments in Large Language Models.....	124
<i>Matthew Keeler, Mark Fuge, Aoran Peng, Scarlett Miller</i>	
A Proposed Extension to the Functional Basis for AI/ML-Enabled Cyber-Physical Systems	136
<i>Doreen Valmyr, Ambrosio Valencia-Romero, Christopher McComb</i>	
Barriers to Product Repair: Exploring Motivations and Capabilities Among Operators.....	145
<i>Sami Karsli, Kevin Otto, Wen Li, Amy Bilton, Katja Holttä-Otto</i>	
LLM4CAD: Multi-Modal Large Language Models for 3D Computer-Aided Design Generation.....	154
<i>Xingang Li, Yuewan Sun, Zhenghui Sha</i>	
Augmenting Engineering Design With AI: Introducing the AI Design Assistant (AIDA)	167
<i>Naveen Mathews Renji, Sagar Chakravarthy Mathada Veera, Bei Yan, Ting Liao</i>	

Understanding Complex Sketch Recognition Strategies for Intelligent Sketch-Based Design Tools	178
<i>Gaëlle Baudoux, Kosa Goucher-Lambert</i>	
Reading Users' Minds from What They Say: An Investigation into LLM-based Empathic Mental Inference	188
<i>Qihao Zhu, Leah Chong, Maria Yang, Jianxi Luo</i>	
Semi-Automated Mining of Customer Reviews to Identify Design Problems of Cantilever-Style Bassinets	199
<i>William Singhose, Christopher Adams, Rebecca Martinez, Anjnee Rana, Dooroo Kim, Wayne Li</i>	
Crack the Code: Impact of Engineering Design Prompt Objective and Linguistic Characteristics on Understanding and Creativity Perceptions of Students	207
<i>Aoran Peng, Dan Johnson, Scarlett R. Miller</i>	
Assessing Pedestrian Trust in Autonomous Vehicles: a Comparative Study of Immersive Virtual Reality and Non-Immersive Video Media	218
<i>Marufa Islam, Jinjuan She, James Chagdes</i>	
Typology Development for Synthetic Chemistry Sub-Tasks: Towards Human-Robot Collaboration Task Design in the Wet Lab	226
<i>Diane N. Jung, Carson J. Bruns</i>	
We're All in This Together: Evaluating the Impact of Designers' Mood Dynamics on Collaborative Design Project Outcomes	236
<i>Meg Harris, Christine Toh</i>	
Facilitating Success: Exploring the Influence of Design Facilitators' Behaviors on Team Members' Responses and Perceptions of Team Climate and Trust	245
<i>C. J. Witherell, Aliaa Maar, Presley Dougherty, Cynthia Letting, Jessica Menold</i>	
Human-AI Collaboration Among Engineering and Design Professionals: Three Strategies of Generative AI Use	260
<i>Kevin Ma, George Moore, Vikram Shyam, James Villarrubia, Kosa Goucher-Lambert, Eric Reynolds Brubaker</i>	
Navigating Team Dialogues: How Team Dynamics Affect Convergent and Divergent Design Actions During Concept Generation and Selection	273
<i>Presley Dougherty, Cynthia Letting, C. J. Witherell, Nicolas F. Soria Zurita, Elizabeth Starkey, Jessica Menold</i>	
Gender Inclusivity: Exploring Design Dynamics and Psychological Safety in Virtual Engineering Design Dyads	283
<i>Aliaa Maar, Debrina Roy, Jessica Menold</i>	
Beyond the Paper: Exploring the Relationship Between the Participation of Women and the Social Relevance of Research Topics in Engineering Design	304
<i>Ivyann O. Running, Bethany Parkinson, Spencer Magleby, Christine Toh</i>	
Applying Affordance Theory to Improve Design Practices for Physical, Mental, and Social Health Outcomes	314
<i>Hannah E. W. Myers, Christopher S. Mabey, Grace Burlison</i>	
Inspired by AI? A Novel Generative AI System to Assist Conceptual Automotive Design	325
<i>Ye Wang, Nicole B. Damen, Thomas Gale, Voho Seo, Hooman Shayani</i>	

Reverse Engineering Through a Product Teardown Activity and Component-Function Identification	339
<i>Mikala Y. Furiato, Alexander R. Murphy</i>	
Public Engagement and Participatory Design Preparedness: Adapting Participatory Technology Assessment Methods for Design Science	350
<i>Jared Owens, Stephanie Diem, Mahmud Farooque, Aditi Verma</i>	
The Use of Narrative Methods to Generate Engineering Design Knowledge: A Scoping Literature Review.....	360
<i>Robert P. Loweth</i>	
Combining TRIZ and NLP to Identify Promising Problem-Solving Approaches for Emerging Technologies: A Preliminary Study	370
<i>Abhijeet Bhattacharya, Calahan Mollan, Shreya Gupta, Vijitashwa Pandey</i>	
Building Spaces for Design Justice: A Case Study on the Design Justice Pedagogy Summit.....	378
<i>Gillian Roeder, Madhurima Das, Jana I. Saadi, Christina Harrington, Aditi Verma, Cynthia Breazeal, Catherine D'Ignazio, Maria Yang, Anastasia K. Ostrowski</i>	

Author Index