Proceedings of ASME 2024
International Design Engineering
Technical Conferences and
Computers and Information in
Engineering Conference

(IDETC-CIE2024)

Volume 3A

50th Design Automation Conference (DAC)

August 25-28, 2024 Washington, DC

Conference SponsorsDesign 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: 978-0-7918-8836-0

TABLE OF CONTENTS

Boxi Jiang, Yingqian Liao, Kartik Naik, Md Tariquzzaman, Joaquim R. R. A. Martins, Yue Cao, Jing Sun	I
Numerical Estimation of Bidirectional Plant-Control Design Coupling in Control Co-Design	10
A General Framework for Supporting Economic Feasibility of Generator and Storage Energy Systems Through Capacity and Dispatch Optimization	20
Modeling and Control Co-Design of a Floating Offshore Vertical-Axis Wind Turbine System	36
Multi-Split Configuration Design for Fluid-Based Thermal Management Systems	46
Transfer Learning in Multi-Objective Generative Design of Metamaterials	61
Generating Porous Metamaterial Designs Using Variational Graph Autoencoder and Large Language Model	75
Bridging Design Gaps: A Parametric Data Completion Approach With Graph-Guided Diffusion Models Rui Zhou, Chenyang Yuan, Frank Permenter, Yanxia Zhang, Nikos Arechiga, Matt Klenk, Faez Ahmed	85
Cooling-Guided Diffusion Model for Battery Cell Arrangement	96
Multi-Lattice Topology Optimization With Lattice Representation Learned by Generative Models	108
Automated Functional Basis Modeling Using Multi-Label Machine Learning on 3D Models	123
Towards Domain-Adaptive, Resolution-Free 3D Topology Optimization With Neural Implicit Fields	135
Amin Heyrani Nobari, Lyle Regenwetter, Faez Ahmed	
Exploring CausalWorld: Enhancing Robotic Manipulation via Knowledge Transfer and Curriculum Learning	151
Towards Physically Talented Aerial Robots With Intelligent Swarm Behavior Thereof: an Efficient	
Co-Design Approach	163

Automatic Knowledge Extraction for Decision Support in the Structural Design Process	175
DesignQA: Benchmarking Multimodal Large Language Models on Questions Grounded in Engineering Documentation	185
To Quantize or Not to Quantize: Effects on Generative Models for 2D Heat Sink Design	199
Automated Sub-Feature Labeling Using Prompt-Based Pretrained Language Model	214
DrivAerNet: A Parametric Car Dataset for Data-Driven Aerodynamic Design and Graph-Based Drag Prediction	223
Inverse Design With Conditional Cascaded Diffusion Models	236
Advancing Fluid-Based Thermal Management Systems Design: Leveraging Graph Neural Networks for Graph Regression and Efficient Enumeration Reduction	247
Generative Design of Planar Four-Bar Motions Using Conditional Variational Autoencoder	263
Development of an Optimal Variable-Pitch Controller for Floating Axial-Flow Marine Hydrokinetic Turbines	280
Real-Time Thermal Data Assimilation for Power Electronics at the Edge	292
Optimizing Day-Ahead Market Scheduling: Policy Design for Renewable Energy Integration and Imbalance Cost Consideration	298
Integrated Design for Wave Energy Converter Farms: Assessing Plant, Control, Layout, and Site Selection Coupling in the Presence of Irregular Waves	310
Adaptive Agent-Based Control for Lithium-Ion Batteries in Naval Microgrids	322
Physics-Informed Data-Driven Approaches to Electric Vehicle Battery State-of-Health Prediction: Comparison of Parallel and Series Configurations	328
Integrating Cost, Reliability, and Renewable Energy for Robust Microgrid Design and Operations	338

Experimentally Supported Design Optimization of Marine Hydrokinetic Turbine Systems With Adaptive Duct Contraction Control	351
Data-Driven Modeling Adaptive Aerostructures	361
Evolved Structures: Primification Using Load Lines	370
A Graph Algorithm for the Design of Functionally Graded Alloy Components	378
Studying Changes to the Additive Manufacturability of Design Solutions When Prepared and Simulated in Immersive Virtual Reality	393
Multi-Objective Surrogate Optimization of Process Parameters for Additive Manufacturing With Applications in Laser Powder Bed Fusion	407
Inverse-Prediction of Material Property in Fused Filament Fabrication/Fused Deposition Modeling Junghun Lee, Hadiza Yusuf, Conrad Tucker	421
Modeling Demand Spikes in Continuously Evolving Products Using Dynamic Customer Preferences Ian Walter, Philip E. Pare, Jitesh H. Panchal	432
Recalibration of Neural Networks Using Transfer Learning for Streamflow Forecasting	438
Defining a Modelling Language to Support Functional Hazard Assessment	450
Generative Design for Power System Networks Using WGAN and Graph Performance Measures for Guided Generation	463
Augmenting Bayesian Inference-Based Damage Diagnostics of Miter Gates Based on Image Translation	473
Requirements for Designing a Fail-Safe Defense Supply Network	487
A Framework to Support Co-Design Exploration of Manufacturing Supply Networks for Resilience	508

Author Index