

Hasti Lab School of Modeling, Simulation, and Training University of Central Florida 3100 Technology Pkwy, Orlando, FL 32826 vhasti@ucf.edu

IEEE Digital Twin Parallel Intelligence Conference (DTPI) 2025

Workshop Title: Advanced Modeling and Simulation Techniques for Digital Twins

1-day workshop

22nd April 2025, 9 AM – 4 PM GT Hotel and Conference Center Atlanta (Midtown), GA

Workshop Chair: Dr. Veeraraghava Raju Hasti, SMST, UCF

Scope and Objectives:

Scope:

As Digital Twin (DT) technologies continue to evolve, the integration of advanced modeling and simulation techniques has become critical to achieving accurate, adaptive, and real-time digital representations of complex physical systems. This workshop aims to provide a focused platform for experts from academia and industry to exchange ideas, showcase innovations, and discuss challenges in realizing scalable and intelligent Digital Twins through high-fidelity physics-based modeling, AI-enabled surrogate models, data assimilation, and immersive technologies.

This 1-day workshop, held in conjunction with the IEEE Digital Twin and Parallel Intelligence (DTPI) Conference 2025, brings together leading researchers and practitioners to explore cutting-edge advancements at the intersection of modeling & simulation, artificial intelligence, and real-time system integration. The workshop covers a wide spectrum of applications including aerospace, energy systems, manufacturing, and industrial automation.

Objectives:

- 1. **Highlight state-of-the-art advancements** in high-fidelity physics-based simulations, AI-driven surrogate modeling, and hybrid approaches for real-time and scalable Digital Twin implementations.
- 2. **Foster cross-disciplinary collaboration** between academia and industry to address technical and operational challenges in Digital Twin development, validation, deployment, and lifecycle management.
- 3. Showcase practical use cases and deployment strategies from leading industry experts in aerospace, energy, and manufacturing, with emphasis on operational efficiency, predictive maintenance, and system optimization.



Hasti Lab School of Modeling, Simulation, and Training University of Central Florida 3100 Technology Pkwy, Orlando, FL 32826 vhasti@ucf.edu

- 4. **Explore emerging technologies** such as AR/VR integration, real-time data assimilation, multiagent architectures, and physics-informed machine learning for next-generation digital twins.
- 5. **Engage in interactive discussions** through expert panels and talks to identify open research challenges, future directions, and the role of standards and infrastructure in supporting digital twin ecosystems.
- 6. Create networking opportunities

Workshop Schedule

9:30: Welcome to the Workshop

Industry Talks:

9:30 – 10:00: Digital Twin Implementation Challenges, Marlon Rodgers, Lockheed Martin Corporation

10:00 - 10:30: Exploring Multi-Modal RAG Pipelines for Digital Twin Accuracy, Ravi Gupta, Intel

10:30 - 10:45 BREAK

10:45 – 11:15: Leveraging AR/VR for Enhanced Maintenance and Operation, Guneet Bhatia, Siemens Energy Innovation

11:15 – 11:45: Navigating the Large Gas Turbine Digital Twin Landscape, Alexander Spitzer, Siemens Energy Innovation

11:45 – 12:15: AI Simulation and Optimization for Industrial Applications to Enhance Adoption, Dr. Junda Zhu, Honeywell

12:15 – 1:30 LUNCH BREAK

Industry Panel:

1:30 – 2:15: Panel with Industry (Siemens, Honeywell, Intel, Lockheed Martin)

Academic Talks:

2:15 – 2:30: Challenges in the Development of High-fidelity Methods for Modeling and Simulation of Operating Nuclear Reactor Cores, Dr. Farzad Rahnama, Nuclear Engineering, Georgia Tech

2:30 – 2:45: Physics-driven AI for Effective Digital Twins, Dr. Truong Nghiem, ECE, UCF



Hasti Lab School of Modeling, Simulation, and Training University of Central Florida 3100 Technology Pkwy, Orlando, FL 32826 vhasti@ucf.edu

2:45 – 3:00: Artificial Intelligence Enabled Surrogate Modeling for Real-Time Digital Twins, Dr. Veeraraghava Raju Hasti, SMST, UCF

3:00 - 3:15 BREAK

3:15 – 3:30: Real-Time Data Assimilation Techniques for Dynamic State Estimation and Online Model Calibration in Digital Twins with Discrete Simulations, Dr. Bulent Soykan, IST, UCF

3:30 – 3:45: A Generic Digital Twin Ecosystem for Computer Numerical Control Manufacturing processes, Dr. Konstantinos Mykoniatis, Auburn University

3:45 – 4:00: Multi-Agent Based Digital Twin Architecture for Digitalizing Assembly Operations, Dr. Konstantinos Mykoniatis, Auburn University

4:00: Workshop Conclusion