

From Simulation to Digital Twin: The New Intelligence Layer in Engineering

BIOGRAPHY

José Valenzuela del Río heads a Research Group in the Simulation and Digital Twin at Siemens Foundational Technology. His group researches on the latest Simulation and Digitalization technologies, Artificial Intelligence, Software and advanced Visualization methods to create the next-generation, high-fidelity, interactive Digital Twins and their applications to the Industrial Metaverse. Previously, José developed and advanced innovative technologies for fast simulations in industrial applications for Siemens. His work spans all asset lifecycle stages and impacts various industries, including Health, Infrastructure, Energy, and Automotive. José previously worked for 7 years at the Gas Turbine R&D team at Siemens Energy. His responsibilities included the development of simulation, digitalization and optimization tools for gas turbine designers. He also contributed to the system design of the flagship gas turbine frame. José holds a PhD in Aerospace Engineering from the Georgia Institute of Technology, which he earned with a thesis on efficient design space exploration for rotorcrafts.



ABSTRACT

Engineering is undergoing a profound transformation as digital technologies evolve from traditional offline simulation toward continuously real-time, data-driven digital twins. This seminar explores how this shift is creating a new intelligence layer that fundamentally changes the way products, systems, and industrial assets are conceived, engineered, and operated. We examine the technological foundations enabling this transition - including high-fidelity multi-physics simulations, AI-enabled real-time assessments, and connectivity - showing how these capabilities merge to form accurate, adaptable, virtual representations which can augment decision-making at asset design and operation. Through illustrative examples, we discuss how digital twins enhance decision-making across the product lifecycle: accelerating R&D through virtual experimentation, improving system integration and validation, and enabling predictive and prescriptive capabilities. By tracing the path “from simulation to digital twin,” the presentation positions digital twins as the new intelligence layer in engineering—one that unlocks continuous optimization, safer and more sustainable operations, and unprecedented agility in complex system development.