

# Precision Convergence Webinar Series

## Evolution of the Intelligent Digital Twin

By *Daniel R. Isaacs*

*CTO & GM: Digital Twin Consortium*

*With special briefing by pioneer Dr. Michael Grieves*

*High-Level Panel of Leaders in Science, Technology, On-the-Ground Action, and Policy*

*Can Digital Twins Serve as Precision Convergence Accelerator?*

Thursday, Dec 14, 2023 | 11 AM to 1 PM EST (2 hours in duration)

*For Remote Participation, please register [HERE](#)*

**ABSTRACT:** A digital twin is a virtual representation of real-world entities and processes, synchronized at a specified frequency and fidelity. They use real-time and historical data to represent the past and present, as well as to simulate predicted futures. Digital twin design is motivated by outcomes, tailored to use cases, powered by integration, built on data, guided by domain knowledge, and implemented in IT/OT systems. Digital twin systems transform business by accelerating holistic understanding, optimal decision-making, and effective action. In research, they power the exploration of multiscale mechanisms in biology, brain, machine, and other natural and human-made systems. Over the last decade, digital twins have evolved toward ever increasing intelligence and spread across virtually every major industry, including transportation logistic to multiple other domains throughout society. The Digital Twin Consortium was formed to drive awareness, accelerate the adoption and address key challenges faced across the digital twin lifecycle. Through collaborative partnerships with industry, academia, and government, the consortium is dedicated to the overall development of digital twins. This session will (1) discuss the evolution from traditional to intelligent digital twins and how with the infusion of AI, data-driven decision-making is accelerated toward achieving optimized outcomes. (2) Explore digital twins to model and predict the progression of diseases to optimize food production processes and reduce waste will showcase the value of Digital Twins through real-world use case examples; (3) Learn how smart cities utilizing intelligent digital twins enable healthier places and enable industry to achieve true sustainable digital transformation (4) discuss with a panel of leading academic and industry experts and business leaders whether digital twins can serve as precision convergence accelerator.



**PRESENTER:** Dan Isaacs is the Chief Technology Officer and General Manager of Digital Twin Consortium. Dan also serves as the Chief Strategy Officer for the Object Management Group (OMG). His responsibilities include developing and implementing a comprehensive strategy to unify OMG community of consortia (AREA, BPM+ Health, CISQ, DTC, IIC, OMG SDO, and Responsible Computing). Dan is responsible for driving advanced technology awareness and adoption towards accelerating sustainable global digital transformation across industries, academia, government, and geographies. Previously, as Director of Strategic Marketing and Business Development at Xilinx, Dan was responsible for emerging technologies, including AI/ML and executing the IIOT ecosystem strategy. Dan has over thirty years of experience working in Automotive, Industrial, Aerospace, and Consumer-based companies, including Ford, NEC, LSI Logic, and Hughes Aircraft. An accomplished speaker, Dan has delivered keynotes, seminars and served as a panelist and moderator at World Forums, Industrial IOT Global conferences and Embedded Systems. He holds degrees in Computer Engineering: EE from Cal State University B.S. in Geophysics from ASU.

**About the series:** The [precision convergence series](#) is launched to catalyze unique synergy between, on the one hand, novel partnerships across sciences, sectors and jurisdictions around targeted domains of real-world solutions, and on the other hand, a next generation convergence of AI with advanced research computing and other data and digital architectures such as [PSC's Bridges-2](#), and supporting data sharing frameworks such as [HuBMAP](#), informing in a real time as possible the design, deployment and monitoring of solutions for adaptive real-world behavior and context.

**The McGill Centre for the Convergence of Health and Economics (MCCHE)** is a virtual world network of scientist, action and policy leaders promoting the weaving of digital-powered interdisciplinary science into person-centered domain-specific solutions at scale to global challenges faced by traditional and modern economy and society worldwide. The MCCHE stimulates lasting collaborations that bridge the many divides in the market, economy, and society that are at the root of these most pressing modern challenges through collaborative of modular convergence innovation platforms.

**The Pittsburgh Supercomputing Center** is a joint computational research center between Carnegie Mellon University and the University of Pittsburgh. Established in 1986, PSC is supported by several federal agencies, the Commonwealth of Pennsylvania and private industry. PSC provides university, government, and industrial researchers with access to several of the most powerful systems for high-performance computing, communications, and data-handling available to scientists and engineers nationwide for unclassified research. PSC advances the state-of-the-art in high-performance computing, communications and informatics and offers a flexible environment for solving the largest and most challenging problems in computational science.

## Co-Chairs:



**Laurette Dubé**, PhD is the founding Chair and Scientific Director of the McGill Centre for the Convergence of Health Economics. She holds the James McGill Chair of Consumer and Lifestyle Psychology and Marketing. Her work has been published in top disciplinary journals in Psychology, Management and Medicine as well as in multidisciplinary journals. She holds an MBA in finance, and a PhD in behavioural decision making and consumer psychology. During her 2020-2021 sabbatical, she is a visiting scholar at the National Research Council of Canada and at the Pittsburgh Supercomputing Center, Carnegie Mellon, USA



**Sergiu Sanielevici**, Ph.D. is Director of Support for Scientific Applications at the Pittsburgh Supercomputing Center, a joint project of Carnegie Mellon University and the University of Pittsburgh. He has served as the Deputy Director of the Extended Collaborative Support Service of the US NSF XSEDE project and as the manager of its Novel and Innovative Projects program, fostering non- traditional and interdisciplinary applications of advanced computing and data resources since 2011. He is currently the Principal Investigator of the Bridges-2 project and co-Principal Investigator of the Neocortex project at PSC. Dr. Sanielevici is a proud alumnus of McGill University (Ph.D., Physics, 1986).

## Special Digital Twin Briefing:



Dr. **Michael Grieves** is an internationally renowned expert on Digital Twins, a concept he originated, and Product lifecycle Management (PLM) a discipline he wrote the seminal book for. Dr. Grieves has over five decades of executive, board, and technical experience in both global and entrepreneurial technology and manufacturing companies. He has consulted and done research at some of the top global organizations (NASA, Boeing, GM, Unilever) and has served as a senior executive and/or board member at Fortune 1000 companies, entrepreneurial organizations, and a university. Dr. Grieves is a frequent keynote speaker globally. He was the keynote speaker for ANNSIM, NAMRC, and many others. Dr. Grieves was the Holst Memorial Award speaker in 2022. Academically, he has had appointments and has done research and/or taught at the University of Michigan, Purdue University, and University of Iowa. He currently has an appointment at the University of Central Florida. Dr. Grieves has a BS Computer Engineering from Michigan State, and MBA from Oakland University, and his doctorate from Case Western Reserve University.

## Panelists:



**Viktor Jirsa** is Director of the Inserm Institut de Neurosciences des Systèmes at Aix-Marseille-Université in Marseille, France. Dr. Jirsa received his PhD in 1996 in Theoretical Physics and Applied Mathematics and has since then contributed to the field of Theoretical Neuroscience, in particular through the development of large-scale brain network models based on realistic connectivity. His work has been foundational for network science in medicine with translations to clinical applications. Dr. Jirsa serves as Chief Science Officer of the European digital neuroscience infrastructure EBRAINS and lead investigator in the Human Brain Project (HBP) (<https://www.humanbrainproject.eu/>). Dr. Jirsa has been awarded several international prizes for his research including the first HBP Innovation prize (2021) and Grand Prix de Recherche en Provence (2018) and has published more than 160 scientific articles.



**Raghu Machiraju** is a Professor of Biomedical Informatics, Computer Science and Engineering (CSE), and Pathology at the Ohio State University (OSU). He founded the \$170M, 55-faculty strong, Translational Data Analytics Institute dedicated to the adoption of data science and analytics on the campus of Ohio State. Currently, he is the Associate Chair for Growth in the Department of Computer Science and Engineering and an essential member of a leadership team overseeing tremendous growth in size and reputation. As an independent researcher, he has contributed to developing machine learning methods to characterize unsteady flow, model state transitions of a functioning brain, integrate multiple omics data to predict patient outcomes with both semi-supervised and unsupervised tools, create weakly supervised models that rely on weak labels and enable robust grading of large whole slide histopathology images, and develop tools of GenAI to convert text describing branching processes to flow graphs.



**Michael Batty** is Bartlett Professor of Planning at University College London where he is Chair of the Centre for Advanced Spatial Analysis (CASA). He has worked on computer models of cities and their visualisation since the 1970s and has published several books, such as *Cities and Complexity* (MIT Press, 2005) which won the Alonso Prize of the Regional Science Association in 2011, and most recently *The New Science of Cities* (MIT Press, 2013). His research group is working on simulating long term structural change and dynamics in cities as well as their visualisation. He is a Fellow of the British Academy (FBA), the Academy of Social Sciences (FACSS) and the Royal Society (FRS), was awarded the CBE in the Queen's Birthday Honours in 2004 and the 2013 recipient of the Lauréat Prix International de Géographie Vautrin Lud (generally known as the 'Nobel de Géographie'). In 2015 he received the Founders Medal of the Royal Geographical Society for his work on the science of cities. In 2016 he received the Gold Medal of the Royal Town Planning Institute, and the Senior Scholars Award of the Complex Systems Society. He has Honorary Doctorates from the State University of New York and from the University of Leicester.



Dr. **Anastasia V. Sergeeva** is an Associate Professor at the KIN Centre for Digital Innovation, School of Business and Economics, Vrije Universiteit Amsterdam. She holds a PhD in Management from the Graduate School of Management of St. Petersburg State University and a master's in management from the same school. Her research interests include technology-mediated organizational change, transformation of professional work and emergence of new forms of organizing due to digital technologies. Dr. Sergeeva specializes in qualitative and ethnographic methods and integrates theories from sociology, anthropology, and philosophy to trace what happens to work "in the wild" once novel technology is taken up. Dr. Sergeeva studied these topics in diverse settings, such as predictive policing in the work of field officers, artificial intelligence for hiring, surgical robotics, intraoperative MRI used for brain surgery, patient portals for empowering patients, machine learning for seed analysis in agriculture and others. Dr. Sergeeva is a Senior Editor at *Organization Science*.



**Steve Simske** received a post-Doctoral degree in aerospace engineering and a post-Doctoral degree in Electrical and Computer engineering from the University of Colorado. From 1994 to 2018, he was an engineer (HP Fellow since 2011), Vice President, and Director at HP Labs. Since 2018, he is a Faculty Professor of Systems Engineering at Colorado State University (CSU). He is the author of more than 500 publications and more than 240 US patents. His research interests include analytics, systems security, sensing, signal and imaging processing, printing and manufacturing, and situationally aware robotics. Dr. Simske is an IEEE Fellow, an NAI Fellow, an IS&T Fellow, and its immediate past President (2017- 2019). Steve completed a CSU Faculty Institute for Inclusive Excellence (FIIE) Fellowship in 2020 and was a CSU Best Teacher awardee in 2022. In his 20+ years in the industry, he directed teams to research 3D printing, education, life sciences, sensing, authentication, packaging, analytics, imaging, and manufacturing.



**Jeff White** is the CTO for Edge at Dell Technologies. Jeff leads the research and development of Edge technologies for product and operations at Dell. His focus areas include edge application resource management, infrastructure scheduling algorithm design, edge data management, AI/ML design and emerging networking. Jeff has also held senior roles at early-stage artificial intelligence/machine reasoning-based robotic process automation technology provider and served as CTO of Elefante Group, a stratospheric wireless communications platform. He also held senior positions at Hewlett Packard Enterprise, Ericsson and Alcatel-Lucent. Prior Jeff worked at AT&T in technology and operations roles.



**Shawn Brown** is currently the Senior Director of the HPE Cray Programming Environment at HewlettPackard Enterprise (HPE) where he leads the team that is developing the software platform for exascale high-performance computing and data science. Previously, Dr. Brown was the Director of the Pittsburgh Supercomputing Center in 2019. He has over 25 years of experience in developing software to support the use of high-performance computing for research in areas such as chemistry, bioinformatics, and public health. His research interests are: (1) How agent-based modeling and other computational techniques can be used to provide decision support in public health and chronic disease; (2) Building of highly convergent collaborative neuroinformatics platforms for open data sharing and computation; (3) Synthetic Ecosystems for representing cohort and cross-sectional data for modeling and open data sharing.