

Precision Convergence Webinar Series

Science Gateways – Enabling Seamless Large-Scale Modeling and Data Processing on Supercomputers for Domain Sciences with the Neuroscience Gateway as a Case Study

By Dr. Amit Majumdar

San Diego Supercomputer Center, University of California San Diego

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

Wednesday, September 13, 2023 11:00 AM Montreal to 1 PM EST (2 hours in duration)

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

ABSTRACT: This talk motivates the impact the science gateways are having on science and engineering research fields as they seamlessly enable large scale modeling, data processing and, more recently, AI/ML work on supercomputing resources. The talk will explain why and how science gateways are successful in eliminating and lowering administrative and technological barriers to using supercomputers by domain scientists for their computational work. It will discuss how science gateways are helping with education and training. The Neuroscience Gateway, which has been in operation since 2013, will be used as a case study to describe how it is enabling computational, cognitive and experimental neuroscientists with their research and relate to the US BRAIN Initiative which started in 2013, the European Human Brain Project which also started in 2013, and various such initiatives in brain research in various countries over the last decade.



PRESENTER: Amit Majumdar is the Division Director of the Data Enabled Scientific Computing division at the San Diego Supercomputer Center and Associate Professor in the Department of Radiation Medicine and Applied Sciences at the University of California San Diego. One of his research interests has been to bring cyberinfrastructure to the biomedical research community to enable computational and data focused biomedical research. As a part of this he has collaborated with biomedical researchers such as neuroscientists and radiation oncologists and developed and supported science gateways. Two such science gateway projects are supporting the neuroscience community – the Neuroscience Gateway (NSG) project and the NeuroElectroMagnetic data Archive and tools Resource (NEMAR) project. His other research interests are in high performance computing (HPC), computational science, and cyberinfrastructure. He is PI/Co-PI on multiple research projects related to HPC and AI,

neuroscience cyberinfrastructure, neuromorphic computing and education/outreach and which are funded by NSF, NIH, DOD and industry. He is the PI of the Voyager machine an AI-focused hardware-based supercomputer funded by NSF. He is the SDSC PI of the Intelligent Cyberinfrastructure with Computational Learning in the Environment (ICICLE) AI Institute funded by NSF. He is PI on multiple NIH grants where computing is involved in neuroscience research. He participates actively in training and outreach programs including mentoring students of diverse backgrounds. He is member of IEEE, SIAM, APS, Society for Neuroscience, and Organization for Computational Neuroscience.

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 [PSCA 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 <https://thefutureeconomy.ca/interviews/laurette-dube>



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).

Panelists:



Satra Gosh Satrajit Ghosh is a Principal Research Scientist at the McGovern Institute for Brain Research at MIT and an Assistant Professor of Otolaryngology at Harvard Medical School. He is a computer scientist and computational neuroscientist by training. He directs the Senseable Intelligence Group whose research portfolio comprises projects on spoken communication, brain imaging, and informatics to address gaps in scientific knowledge in three areas: the neural basis and translational applications of human spoken communication, machine learning approaches to precision psychiatry and medicine, and preserving information for reproducible research and knowledge generation. He is a co-PI of the DANDI project, a BRAIN Initiative archive for cellular neurophysiology. He is a member of the scientific steering committees of Neurodata Without Borders, the Allen Institute OpenScope project, and the Healthy Brain and Cognitive Development study. He directs Openmind, the neuroscience computing cluster at MIT that serves about 30 PIs and 600 users. He was one of the lead architects of Nipype, a workflow platform that supports the neuroimaging community.



Tristan Glatard is a Associate Professor at the Department of Computer-Science and Software Engineering, Canada Research Chair (Tier II) on Big Data Infrastructures for Neuroinformatics, head of the Big Data Infrastructures for Neuroinformatics lab, and member of the PERFORM centre and Data Science Research Centre at Concordia University in Montreal. Before, he was Researcher at the French National Center for Scientific Research.

His research goal is to build platforms for the efficient and reproducible processing of Big Data. The main applications of my work are in medical image analysis, in particular neuroimaging.



Franco Pestilli, Associate Professor in the Department of Psychology at the University of Texas, Austin. Dr. Pestilli joined the University of Texas in 2020. Prior to that, he was Associate Professor at Indiana University. Dr. Pestilli holds a Ph.D. from New York University and a B.A. from the University of Rome *La Sapienza* and received Postdoctoral Training at Stanford University and Columbia University. Dr. Pestilli is the author of over 60 publications spanning multiple fields of science, such as Cognitive and Computational Neuroscience, Vision, Neuroanatomy, Computer Science, and Neuroinformatics. Dr. Pestilli's scientific projects have been funded by the National Science Foundation, the National Institute of Health, the Department of Defense, the Association for Psychological Science, the Indiana University Emergent Areas of Research, Pervasive Technology Institute, and Microsoft Research. Dr. Pestilli is elected Fellow of the Association for Psychological Science and Psychonomics Society and has received a Microsoft Faculty Fellowship, the Janet Taylor Spence Award for Transformative Early Career Achievements by the Association for Psychological Science as well as the Early Career Travel Award from the Japanese Neuroscience Society. He is an editorial board member for [Scientific Data](#), and [Scientific Reports](#). Dr. Pestilli is director of the [Advanced Computational Neuroscience Network](#) and founder and director of the open science platform [brainlife.io](#).



Liane Gabora is an interdisciplinary cognitive scientist at the University of British Columbia. Her research focuses on how culture evolves, how the creative process works (with an emphasis on concept combination and cross-domain thinking), and how it fuels the evolution of culture, as well as more generally, the different ways in which evolutionary processes could--and do--work. Her Ph.D. thesis was the first publication to introduce a quantum formalism for modeling the contextual nature of concept interactions, and she is the first author (with her Ph.D. supervisor, Diederik Aerts) of the first paper on this topic. She was the first to develop a computational model of cumulative cultural evolution, to develop an autocatalytic framework to explain the integrated nature of human cognition, and to explain creative insight at the level of neural cell assemblies. Over the last two decades, further developments of these ideas, both theoretical and empirical, has led to the Self-Other Reorganization (SOR) theory of cultural evolution, and a theory of creativity--honing theory--that synthesizes research on complex systems, associative memory, and formal models of concept combination. She has over 200 scholarly publications in diverse journals that span psychology (e.g., *Psychonomic Bulletin & Review*), cognitive science (e.g., *Cognitive Science*), biology (e.g., *Journal of Theoretical Biology*), computer science (e.g., *Journal of Experimental and Theoretical Artificial Intelligence*), physics (e.g., *Foundations of Physics*), mathematics (e.g., *Journal of Mathematical Psychology*), anthropology (e.g., *Current Anthropology*), archaeology (e.g., *World Archaeology*), and interdisciplinary research (e.g., *Journal of the Royal Society Interface*), as well as literary journals (e.g., *Fiction*). She has given lectures worldwide. She is a published fiction writer, and composes music. She is writing a nonfiction book titled *Dawn of the Creative Mind* and will eventually return to a novel titled *Quilandria*.



Samer Faraj holds the Canada Research Chair in Technology, Innovation & Organizing at the Desautels Faculty of Management at McGill University. He is head of the research group on Complex Collaboration and was the former Director of the Faculty's PhD program. Previously, he was an Associate Professor at the University of Maryland, College Park. His current research focuses on complex collaboration in settings as diverse as health care organizations, knowledge teams, and online communities. He is also interested in how emergent social technologies are transforming organizations and allowing new forms of coordination and organizing to emerge. He has published over 130 journal articles, refereed proceedings, and book chapters in outlets such as: *Academy of Management Journal*, *Management Science*, *Organization Science*, *MIS Quarterly*, *Information Systems Research*, *Journal of Applied Psychology*, *Business Horizon*, *OMICS*, and *Annals of Emergency Medicine*. He has served as Senior Editor at both *Organization Science* and *Information Systems Research*. He currently serves on the editorial boards of *Organization Science* and *Information and Organization*. He has won multiple best published paper awards; most recently, the AOM OCIS division 2021 *Best Published Paper Award*, the AOM Healthcare division 2018 *Best Theory to Practice paper award*, the 2018 *FNEGE Prix Académique de la Recherche en Management*, the AOM OCIS division 2016 and 2018 *Best Paper Award*; the AIS 2012 *Best Published Paper Award*, as well as the 2013 Desautels best doctoral advisor award. Institutions such as SSHRC, NSF, IBM, the Fulbright foundation, and the Government of Quebec have funded his research. He is currently a Research Fellow at the Cambridge Judge Business school, a Fellow at the Cambridge University Digital Innovation Center and has been a visiting professor at HEC-Paris, VU University (Amsterdam), and a Senior Fulbright Scholar at the American University of Beirut. He is one of the highly cited Management scholars in Canada recognized by 5 ISI Highly Cited Papers awards and more than 7,600 citations in Web of Science and 23,000 Google Scholar citations.