

# Precision Convergence Webinar Series

## Leveraging brain research to change scientific culture, education, and infrastructure

By Dr. Satrajit Ghosh

Massachusetts Institute of Technology

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

Tuesday, May 24, 2022 | 11 AM to 1 PM EST (2 hours in duration)

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

**ABSTRACT:** The advent and pervasive use of smartphones, wearables, and connected devices together with significant advances in neurotechnology and computation offer a unique opportunity to understand phenotypic variation in a large population. We can track individuals longitudinally, relate these data to life and clinical outcomes, and potentially intervene or nudge. Actualizing this vision and painting a comprehensive picture of an individual requires solving problems in dealing with data integration, improving neuroscientific understanding, developing new algorithms and models, and reasoning with information. In this talk, I will use several ongoing projects from our group to illustrate progress towards this complex system that will cover translational applications of human communication, machine learning technologies for precision psychiatry and medicine, and infrastructure solutions to preserve information and accelerate collaboration for knowledge generation. Doing this work has come with the significant acknowledgment of the gaps in our individual training and how to overcome these deficits and increase our knowledge through communities of practice, through shared data and resources, and through better research infra-



**PRESENTER: 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.

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



**Shawn Brown, PhD** is the Vice Chancellor for Research Computing at the University of Pittsburgh and the Director of Pittsburgh Supercomputing Center at the Carnegie Mellon University & University of Pittsburgh. Prior to his appointment, Dr. Brown served as the Associate Director of Research Software Development at the McGill Centre of Integrative Neuroscience at the McGill Neurological Institute. Dr. Brown is an expert on high-performance computing and computational simulation. 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 also focused on how agent-based modeling and other computational techniques can be used to provide decision support in public health and chronic disease.

## Panelists:



**Dr. Lesley Fellows** is a neurologist specializing in disorders of cognition. She has a particular interest in the functions of the frontal lobes. Her research programme focuses on the brain basis of decision making in humans, using the tools of cognitive neuroscience. She studies how focal brain damage or neurochemical dysfunction affects all aspects of decision making, how options are generated and organized, how they are valued and compared, and how choices are made. She is also interested in more general questions about the roles of the frontal lobes in the regulation of emotion, the expression of personality traits, and the representation of past and future information. This work has relevance for understanding impaired executive function following frontal lobe injury from aneurysm rupture, stroke, or tumour growth, as well as in degenerative conditions such as Parkinson's Disease and some forms of dementia. It also provides insights into how the component processes that underly decision making are carried out in the intact brain.



**Philip Blood** is the As PSC's Scientific Director, Phil directs PSC's research and research support teams, including Biomedical Applications, AI & Big Data, and User Support for Scientific Applications. In his work, Phil is focused on architecting, building, and supporting cutting-edge research resources that provide the means to overcome difficult scientific problems. Current projects include building and supporting the flexible hybrid cloud microservices architecture supporting the NIH Human Biomolecular Atlas Program (HuBMAP) and Cellular Senescence Network (SenNet) Program and integrating these resources with the NIH Common Fund Data Ecosystem (CFDE). Phil also leads the NIH Anton project at PSC, in collaboration with D. E. Shaw Research, and serves as co-PI of the NSF XSEDE project. In these roles, Phil works closely with PSC's leadership team to accomplish our mission to apply advanced computing to enable discoveries that benefit the world.



**Dr. 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 scientific lead of the brain simulation platform The Virtual Brain ([www.thevirtualbrain.org](http://www.thevirtualbrain.org)) 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.



**Celia Greenwood** has a PhD in Biostatistics from the University of Toronto, and has been involved in research in statistical genetics and methods for analysis of high dimensional genomic data for almost 25 years. Her publications include a mixture of theoretical developments and applied collaborations and have been cited over 16,000 times; all have some relationship to human health or disease. At the Lady Davis Institute for Medical Research ([www.ladydavis.ca](http://www.ladydavis.ca)), she is a Senior Investigator supervising a mix of students and staff. At McGill University, she is James McGill Professor, co-Director of the Ludmer Centre for Neuroinformatics and Mental Health ([ludmercentre.ca](http://ludmercentre.ca)), and the inaugural and current Graduate Program Director of the interdisciplinary PhD in Quantitative Life Sciences ([www.mcgill.ca/qjs](http://www.mcgill.ca/qjs)). She is also a former president of the International Genetic Epidemiology Society ([www.geneticpepi.org](http://www.geneticpepi.org)).



**Andrew Park** is the Assistant Professor of Information Systems at the Peter B. Gustavson School of Business, University of Victoria. He has founded and sold a successful health technology venture based in Seattle, Washington. He then returned to academia, where he is currently investigating how Open Innovation mechanisms impact value creation of firms within the emerging Personalized Medicine innovation ecosystem. His work has been accepted in interdisciplinary journals such as Research-Technology Management, The Journal of Medicine & Philosophy and The Journal of Engineering & Technology Management, spanning the diverse fields of medicine, biotechnology and digital innovation. Andrew is also part of a national network of innovation scholars (4POINT0) evaluating ecosystem models that accelerate the trajectory of Science & Technology innovations to foster strong economic development in Canada.