Precision Convergence Webinar Series

Putting brain data and cloud technology to good use

*By **Franco Pestilli***
The University of Texas at Austin
High-Level Panel of Leaders in Science, Technology, On-the-Ground Action, and Policy

September 11, 2024, Wednesday | 11 AM to 1 PM EST (2 hours in duration)

For Remote Participation, please register HERE

ABSTRACT: Neuroscience research has expanded dramatically over the past 30 years by advancing standardization and tool development to support rigor and transparency. Consequently, the complexity of the data pipeline has also increased, hindering access to FAIR (Findable, Accessible, Interoperabile, and Reusable) data analysis to portions of the worldwide research community. I will present, brainlife.io the platform was developed to reduce these burdens and democratize modern neuroscience research across institutions and career levels. Using community software and hardware infrastructure, the platform provides open-source data standardization, management, visualization, and processing and simplifies the data pipeline. brainlife.io automatically tracks the provenance history of thousands of data objects, supporting simplicity, efficiency, and transparency in neuroscience research. Here this http brainlife.io's technology and data services are described and evaluated for validity, reliability, reproducibility, replicability, and scientific utility. Using data from 4 modalities and 3,200 participants, we demonstrate that this http brainlife.io's services produce outputs that adhere to best practices in modern neuroscience research.

PRESENTER: Franco Pestilli, an Associate Professor of Psychology at the University of Texas at Austin, holds a Ph.D. from New York University and a B.A. from the University of Rome La Sapienza. He previously held positions as a Postdoctoral Researcher at Columbia University, Research Associate at Stanford University, and Faculty at Indiana University. Franco's research spans psychology, computer science, engineering, and neuroscience. At UT Austin, he teaches Neuroscience and Data Science and is affiliated with the Center For Perceptual Systems and Center on Aging and Population Sciences. He serves on the Executive Board of The Center for Theoretical and Computational Neuroscience. Franco is a Fellow of the Association for Psychological Science and the Psychonomics Society and is on the editorial boards of Springer Nature's Scientific Data and Scientific Reports. He has received several awards, including the Microsoft Investigator Fellowship and the APS Janet Taylor Spence Award. He chairs the International Brain Initiative Data Governance and Sharing Working Group and directs the Advanced Computational Neuroscience Network and brainlife.io. His research has enhanced understanding of brain development in children, brain aging, visual impairment effects, and concussion recovery. He received major awards from the Kavli Foundation and the Wellcome Trust for his work on neuroscience and mental health data.

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: 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: 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:

Philip Blood: As PSC's Scientific Director, Philip 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.

Jean-Baptiste Poline: Dr. Poline received his PhD in 1993 in the field of medical imaging analysis. Since 1990, Dr Poline has worked on the development of methods for the analysis of functional imaging data (mostly fMRI), and more specifically in the statistical modeling and inference aspects. In the years 2000, Dr Poline activities turned into neuroinformatics as a fundamental part of neuroimaging, and he chairs the neuroimaging data sharing task force of the International Neuroinformatics Coordinating Facility. He has recently been elected the chair of the INCF Council for Training Science and Infrastructure. He joined the University of California Berkeley in 2012, developing methods for resting-state fMRI and imaging genetic data using clustering techniques, teaching neuroimaging data analysis in Python, and working to better understand and propose solutions to the neuroimaging reproducibility issues. Dr Poline joined the Montreal Neurological Institute at McGill University as an associate professor in 2017 to work on neuroinformatics, open science and brain imaging or imaging genetic methods. He is currently the co-chair of the Canadian Open Neuroscience Platform Technical Steering committee and the co-lead of NeuroHub, the neuroinformatics infrastructure of the McGill Healthy Brains for Healthy Lives initiative, and the co-director for the Brain Imaging Centre Neuroinformatics. In 2020, he was elected chair of the Council for Training, Science and Infrastructure of the International Neuroinformatics Coordinating Facility. A full professor in the Department of Neurology and Neurosurgery at McGill.

Shawn Brown: Dr. Brown is Senior Director of Engineering at Hewlett-Packard Enterprise where he leads a large team of engineers building high-performance computing cloud services. He was formerly the Director of the Pittsburgh Supercomputing Center and Vice Chancellor of Research Computing at the University of Pittsburgh. 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.

Satrajit 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.

Barend Mons: Barend Mons (born 1957, The Hague) is a molecular biologist by training and a leading FAIR data specialist. The first decade of his scientific career he spent on fundamental research on malaria parasites and later on translational research for malaria vaccines. In the year 2000 he switched to advanced data stewardship and (biological) systems analytics. He is currently a professor in Leiden and most known for innovations in scholarly collaboration, especially nanopublications, knowledge graph based discovery and most recently the FAIR data initiative and GO FAIR. Since 2012 he is Professor in biosemantics in the Department of Human Genetics at the Leiden University Medical Center (LUMC) in The Netherlands. In 2015 Barend was appointed chair of the High Level Expert Group on the European Open Science Cloud. In 2017 Barend started the International Support and Coordination office of the GO FAIR initiative. He is also the elected president of CODATA, the standing committee on research data related issues of the International Science Council. Since 2021, Barend is the Scientific Director of the GO FAIR Foundation. Barend is a member of the Netherlands Academy of Technology and Innovation (ACTI). He is also the European representative in the Board on research Data and Information (BRDI) of the National Academies of Science, Engineering and Medicine in the USA. Barend is a frequent keynote speaker about FAIR and open science around the world, and participates in various scientific advisory boards of international research projects.

Raghu Machiraju: 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.