LUDMER CENTRE FOR
NEUROINFORMATICS & MENTAL HEALTH

Yasser Iturria-Medina, PhD

Dr Yasser Iturria-Medina is an **Assistant Professor** in the Department of Neurology and Neurosurgery, Faculty of Medicine, McGill University (effective August 2018). He leads the **Neuroinformatics for Personalized Medicine** (NeuroPM) lab at the **Montreal Neurological Institute & Hospital** (the Neuro) and is a **Primary Investigator** at the **Ludmer Centre for Neuroinformatics & Mental Health**, a multicenter big-data approach to research in normal brain development and disorders.

One of McGill's most promising transdisciplinary researchers, Dr Iturria-Medina integrates neuroscience with computer sciences in research that encompasses multi-modal neuroimaging (MRI, fMRI, PET), diffusion-tensor imaging (an MRI technique employing anisotropic diffusion to estimate the brain's white matter organization), effective connectivity (the causal influences that neural units exert over another) using functional data, and multifactorial causal analysis (how different biological factors interact directly, from the molecular to the macroscopic scale).

In 2003, he pioneered initial attempts to characterize whole brain connectivity patterns using diffusion tractography. His current goal is to improve the characterization and prediction of normal and abnormal brain states, including both neurodegenerative and cognitive disorders. He believes most disorders result from dynamic interactions between multiple factors rather than specific triggers or genes. Thus, his research aims to develop integrative multifactorial mathematical models and algorithms to help elucidate both the causes and progression of brain diseases.

Demonstrative of the power of this approach, through a series of studies, Dr Iturria-Medina developed a mathematical model that explains how the brain pathology of Alzheimer's disease (AD) propagates through white matter pathways and demonstrated that the buildup of toxic amyloid protein resulted from inadequate clearance, rather than overproduction. He then extended this model to analyze data in a large public AD databank, demonstrating that the earliest elements in AD progression involve damage to cerebral blood vessels—not only Aβ lesions, as previously believed. These findings have major implications for the design of interventions to prevent the spread of AD, effectively moving the goalpost for AD research and early identification. The January 2017 edition of **Discover Magazine ranked Dr Iturria-Medina's research as 12th among the top 100 scientific discovers of 2016**.

Dr Iturria-Medina continues to expand on these mathematical approaches in the search for early biomarkers of AD and other dementias. He also believes the same methods could be adapted to research in other disorders, such as, Parkinson, Autism, schizophrenia, etc.

Before moving into brain research, Dr Iturria-Medina obtained a B.Sc. (2004) Summa Cum Laude in Nuclear Engineering at the Higher Institute for Nuclear Sciences & Technology in Cuba. He then completed an M.Sc. (2006) in Neurophysics and Neuro-engineering at the Cuban Neuroscience Center (CNEURO), and a Ph.D. (2013) in Health Sciences at the University of Medical Sciences of Havana, Cuba. He was a visiting scientist in China (2012) at the University of Electronic Science & Technology of China and in Spain (2011) at both the Biomedical Investigation Center for Mental Health and the Benito Menni Complex Assistencial de Salut Mental, where he refined his knowledge of neuroimaging of the white matter connecting pathways in the brain. In 2013, he moved to the Montreal Neurological Institute to work with Dr Alan Evans and, among other awards, received the prestigious Banting Postdoctoral Fellowship (2016-18) and the CIBC Post-Doctoral Fellowship in Brain Imaging (2016-17).

McGill

Contact: Stéphane Achim | Associate Director
Ludmer Centre for Neuroinformatics and Mental Health
Phone: +1 514 265 3408 | Email: stephane.achim@mcgill.ca