Building the Human Brain: The State of the Art of Neural Simulators

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Traditional neuroscience experiments have primarily been performed using either in vivo or in vitro methods. But, these methods are known to be physically-invasive and costly, as well as do not scale well to larger experiments across networks of neurons. To address this issue, neuroscientists turned to in-silico or computer simulation approaches that allow for experimentation of large-scale neural networks. Building these computational neural models requires a neural simulator. Neural simulator is a useful research tool to model brain functions computationally, which can help us explore the parameters much easier than the real brain. Several neural simulators are currently available, each with a different set of features and limitations.

In this talk Dr. Nam will present the state of the art of neural simulators to build the human brain simulations. He will also present the three main principles of the neural engineering framework (NEF) that can be applied to computationally build the human brain, along with examples and demonstrations. Finally, Dr. Nam will open the floor for questions from the audience on any aspects of his research in the areas of social cognitive, affective and computational neuroscience.

Dr. Chang S. Nam is currently professor of Edward P. Fitts Industrial and Systems Engineering at North Carolina State University, USA. He is also an associated professor of the UNC/NCSU Joint Department of Biomedical Engineering as well as Department of Psychology. He received a PhD from the Grado Department of Industrial and Systems Engineering at Virginia Tech in 2003. His research interests center around brain-computer interfaces, social cognitive and affective neuroscience, computational neuroscience, and trust in human-robot interaction. His research has been supported by federal agencies including National Science Foundation (NSF), Air Force Research Laboratory (AFRL) and National Security Agency (NSA). Dr. Nam has received the NSF CAREER Award (2010), Outstanding Researcher Award (2010-2011), and Best Teacher Award (2010-2011). He is the main editor of "*Brain–Computer Interfaces Handbook: Technological and Theoretical Advances*" (CRC Press), *"Neuroergonomics: Principles and Practice"* (Springer), and *"Trust in Human-Robot Interaction: Research and Applications"* (Elsevier). He is a recipient of the US Air Force Summer Faculty Fellowship Program Award in 2018. Currently, Nam serves as the Editor-in-Chief of the journal Brain-Computer Interfaces.