

The Future of the Brain and Beyond

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Abstract

In order to study brain function, some researchers have attempted to reverse-engineer neuronal networks and even the brain itself. This approach was based on the assumption that neurons in-vivo acted just like simple transistors in-silico. Unfortunately, both network and whole-brain modeling based on this premise have led to very little insight into actual brain function. The evidence for this claim is two-fold. First, the amount of energy needed to operate computing machinery that isn't anywhere near as complex as the human brain still requires much more energy than the latter. Second, because transistor-based computing reacts to static events whilst neurons can react to processes, properties inherent to computing architectures hardware prevent the true level of complexity and connectivity achieved in the human brain from being realized in-silico. In contrast to transistors, neurons can establish and change their connections and vary their signaling properties according to a variety of rules, allowing them to adapt to circumstances, self-assemble, auto-calibrate and store information by changing their properties according to experience (Laughlin & Sejnowski, 2003). In this speech, we elaborate on this evidence, and argue that there is a need to re-think the way we approach brain computation. In particular, we argue for a detailed understanding of neuronal function and network organization is required prior to neuronal network modeling attempt.

About the Keynote Speaker



Prof. Newton Howard is an inventor and scientist. Has over 30 years of experience developing technology and bringing it to life including products now owned by Boeing, Intel, Google and Microsoft with the development of emergent technologies and IP. Dr. Howard has over 200 publications, and has generated over 85 patents in the fields of AI and neuroscience. Dr. Newton Howard is a Professor of Computational Neuroscience and Functional Neurosurgery at the University of Oxford, where he also serves as Director of the Computational Neuroscience Lab. At MIT, Professor Howard was the Director of the Synthetic Intelligence Laboratory and the former founder Director of the MIT Mind Machine Project. Professor Howard is an active member of several research laboratories worldwide. He is also the Founder and Chairman of the Brain Sciences Foundation. Dr. Howard has been involved in a wide range of research, spanning academic, military and commercial domains and has resulted in several significant theories, including Intention Awareness (IA), the Fundamental Code Unit (FCU) and the Brain Code (BC). His work at Oxford has been focused on understanding how the most fundamental processes within the human brain produce thought and consciousness. He seeks to understand the language of the brain, for the purposes of providing advanced methods of detection and treatment for many neurological disorders such as Alzheimer's Disease (AD), Parkinson's Disease (PD), Post Traumatic Stress Disorder (PTSD), depression, epilepsy and diabetes.