

Computer Systems for Brain Sciences

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Abstract

Computer systems are vital to advancing our understanding of the brain. From embedded chips in brain implants, to server systems used for large-scale brain modeling frameworks, computer systems help shed light on all aspects of brain biology, behavior, and cognition. This talk will show the challenges facing such computer systems. We will discuss the extreme energy needs of hardware used in brain implants, and the challenges posed by the computational and data requirements of large-scale brain modeling software. To address these problems, we will discuss recent results from my lab on attacking these problems. For example, we will show that perceptron-based hardware branch predictors can be co-opted to predict neuronal spiking activity and can guide power management on brain implants. Further, we will show that the virtual memory layer is a performance bottleneck in server systems for brain modeling software, but that intelligent coordination with the OS layer can counteract many of the memory management problems faced by these systems. Overall, this talk offers techniques that can continue to aid the development of neuroscientific tools.

Bio

Abhishek Bhattacharjee is an Associate Professor of Computer Science at Rutgers University. He is also a 2017 CV Starr Fellow at the Princeton Neuroscience Institute. His research interests are at the hardware/software interface. Some of the research results from his lab are in commercial use and are implemented in AMD's latest line of processors and the Linux OS.

Faculty Host: Thu Nguyen