

Exploring the Latent Structure of Consciousness

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Severe traumatic brain injury (TBI) normally results in temporary or permanent loss of consciousness. Return of consciousness following TBI is gradual and uncertain and treatment for restoring consciousness is limited due to lack of knowledge regarding the underlying mechanisms that support consciousness. At Stony Brook, we have gathered an interdisciplinary team consisting of a system/computational neuroscientist (Dr. Mofakham), a functional neurosurgeon (Dr. Mikell) and an electrical engineer with expertise in machine learning (Dr. Djuric) to investigate and reveal the underlying mechanisms that support consciousness. The plan is to use the findings about the mechanisms toward the development of neuromodulatory approaches that predict and facilitate the return of consciousness after severe TBI. Our team is uniquely positioned to take advantage of recent advances in functional neurosurgery to directly record and stimulate depth cortical regions associated with arousal and to exploit modern machine learning methods based on probabilistic modeling of acquired measurements. The seed grant will be essential to develop the computational framework for uncovering the dynamical system supporting consciousness and to demonstrate feasibility for developing novel neuromodulatory therapies that will facilitate return of consciousness. The findings from the seed grant and the newly acquired data will be used to strengthen our R21 and R01 NIH proposal, which is planned for submission in February and October of 2020.