Johns Hopkins Institute for Assured Autonomy and the Department of Computer Science

Present

Lifelong Learning

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ABSTRACT

Lifelong Learning is at the cutting edge of artificial intelligence, encompassing computational methods that allow systems to learn in runtime and incorporate learning for application in new, unanticipated situations. Until recently, this sort of computation has been found exclusively in nature; thus, Lifelong Learning looks to nature for its underlying principles and mechanisms and transfers them to this new technology. These include, among others, the creation and representation of abstraction [Nature Reports 2015, ICML 2020] and the mechanism of rehearsal [Nature Communication 2020]. Whereas lifelong learning machines are studied to reach next-wave AI capabilities, they are difficult to predict externally, and could thus constitute a virus-like target when under attack.

BIO

Dr. Siegelmann is a Professor of Computer Science, Core Member of the Neuroscience and Behavior Program, and director of the Biologically Inspired Neural and Dynamical Systems (BINDS) Laboratory at UMass Amherst. Siegelmann recently completed her term as a DARPA PM: L2M, one of her key initiatives, inaugurated "third-wave AI," pushing major design innovation and a dramatic increase in AI capability. Her program GARD is leading to advancements in assuring AI robustness against attack. Similarly, CSL introduces powerful methods of combined learning and information sharing on AI platforms without revealing private data, and RED reverse engineers attacks to reveal their sources. Other programs include advanced biomedical applications.

Siegelmann conducts interdisciplinary research in both next generation machine learning and computational neuroscience, with a variety of applications spanning government and biomedicine. She is a leader in increasing awareness of ethical AI including via the IEEE and INNS. She was the recipient of the Alon Fellowship of Excellence, the NSF-NIH Obama Presidential BRAIN Initiative award, the Donald O. Hebb Award of the International Neural Network Society for "contribution to biological learning"; she was named IEEE fellow and Distinguished Lecturer of the IEEE Computational Intelligence Society. Recently she received the DARPA's Meritorious Public Service award (2020).

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