The human brain is a highly complex dynamical system that operates across multiple spatiotemporal scales. It is an intricate network of many interconnected neurons, and its functionality emerges from the collective behavior of these complex interactions. Statistical physics provides a powerful framework to comprehend the emergent properties of large-scale brain networks, bridging the gap between microscopic neuronal dynamics and macroscopic brain function. In this seminar, we delve into various aspects of brain networks, from the construction of structural and functional connectivity networks to the investigation of their collective dynamical regimes. We explore how statistical physics methods can be leveraged to uncover principles governing brain organization and dynamics, and to improve the design and performance of artificial neural networks.