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Type: **Invited Talk**

Mean field theory of memristive systems and nanowires

Tuesday, September 26, 2023 9:00 AM (40 minutes)

There has been a lot of interest in nanoscale devices that can mimic some brain functionalities. In this talk, we discuss mean field theoretical techniques that can be used to study nanoscale devices with memory, including recent experiments on self-organizing nanowires. A large body of work has shown that PVP-coated self-organizing Ag nanowires have a dynamic response to an applied voltage that mimics the short-term plasticity of neuronal synapses. However, while every single experiment has a different connectivity pattern, it is observed a conductance response that is not strongly dependent on the details of the nanowire network. In this talk, we use recent results on the study of memristive networks that apply to dynamical systems with constraints, such as Kirchhoff laws, to derive a mean field theory for networks of nanowires. We show how these mean field theories have potential applications that go beyond the specificity of the system, but that can be applied to a larger class of dynamical systems. We also comment on more recent use of Weingarten calculus to derive these mean field theories.

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