PMI
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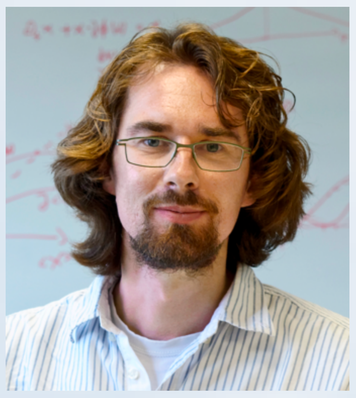
INTheory on-line Seminar Series 02

Statistical physics approach to neuronal dynamics

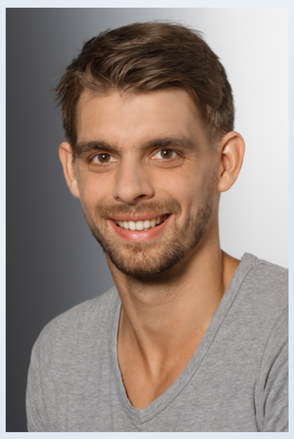


Moritz Helias

Speaker： Moritz Helias & Alexander van Meegen

(Research Centre Jülich)

Host： Haiping Huang



Alexander van Meegen

Abstract：

Networks of neurons presumably form the basis of the impressive cognitive ability of mammals. From a physics point of view, these networks can be modeled as disordered systems with asymmetric interactions. Intriguingly, such disordered systems can be treated using statistical field theory. We start with a brief introduction to the statistical field theory of neuronal networks. Next, we highlight some key insights that we were able to deduce using the field theoretic approach: Chaos in driven networks, optimal memory, and dimensionality expansion of signals. In the second part of the talk, we relate the field-theoretic approach to large-deviation theory. This relation allows us to treat the inverse problem, inferring the network parameters from the dynamics, but also quantifies beyond-mean-field fluctuations of the order parameter.

About speaker：

Prof. Moritz Helias is the group leader of theory of multi-scale neuronal networks in Research Centre Jülich, Germany. He was a postdoctoral researcher at RIKEN Brain Science Institute. He is one of the authors of the book “statistical field theory for neural networks” (Springer, 2020). Alexander van Meegen studied Physics in Heidelberg, Toulouse, and Berlin. In his PhD supervised by Prof. Moritz Helias and Prof. Sacha van Albada in Juelich, he investigates the dynamics of large cortical networks using both theory and simulations.

Time: 15:00-16:30, Oct 22, 2021

Voovmeeting/Tecentmeeting ID： 189 640 115