ISTITUTO
DI BIOROBOTICA

Sant'Anna
Scuola Universitaria Superiore Pisa

Seminar

From synapse to network: Models of information storage and retrieval in brain networks

Seminar with Nicolas Brunel, full professor at Duke University and Bocconi University

Date
13/05/2024
Time
14.00
Where
Aula Magna Storica, Scuola Superiore Sant'Anna

Abstract

Brains have a remarkable ability to store information about the external world, on time scales that range from seconds to the lifetime of an animal. What are the mechanisms by which information is stored in the brain, and how is stored information retrieved from memory? One of the central hypothesis of neuroscience is that information is stored through synaptic plasticity - modifications of synaptic connectivity between neurons. Theoretical models have explored the impact of such synaptic plasticity mechanisms on network dynamics. One scenario, in which synaptic changes are predominantly temporally symmetric, leads to the creation of fixed point attractor states of the dynamics of the network, one for each item stored in memory. Another scenario, in which changes have a strong temporally asymmetric component, leads to the creation of sequences of network activity. In this talk, I will present recent instantiations of these models, that are both simple enough to enable mean-field calculations, but also detailed enough to enable detailed comparisons with experimental data. I will also show how heterogeneities in synaptic plasticity can allow networks to flexibly switch from the fixed point attractor regime to the sequence regime, and to vary the speed at which sequences are retrieved.

The seminar is organized by Eleonora Russo and Alberto Mazzoni, assistant professors at The BioRobotics Institute, Sant'Anna School

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