Bocconi

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Bocconi University
Room 3.E4.SR03
Via Röntgen 1 Milano (3rd floor)

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

Speaker

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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 neuroscientists 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.

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