



Seminari di Dipartimento

Aula 103, Dipartimento di Fisica
Giovedì 5 marzo 2026 - ore 16:00

Computational models of the brain

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Neurotechnologies have recently taken on a profound biomimetic capacity to the point of generating brain digital twins, i.e. digital replicas of the individual's brain capable of simulating its internal dynamics. Digital twins rely on a multiscale modelling strategy going far beyond mapping the properties of cells and tissues as they can simulate brain function using generative models. On the one hand, the rapid progress of computer science and engineering is providing powerful computational tools that make it possible to model the multiscale organisation of the brain. On the other hand, imaging technologies (such as nuclear magnetic resonance imaging, MRI) provide detailed, structural and functional images of the brain. Digital twins of the brain first allow us to decode MRI and EEG signals in terms of neuronal activity and provide physiological insight into the relationship between microscopic and large-scale brain phenomena.

This approach can be applied to investigate cellular and network phenomena as well as resting-state and task-dependent brain activity addressing the relationship between neural functions and behaviour. From an application perspective, digital brain twins are demonstrating the ability to predict neural alterations in various pathologies. Digital twins of the brain are destined to play an increasingly important role in personalised and precision medicine: they can be used to improve diagnosis and predict the evolution of disease and to define the most appropriate pharmacological and interventional approach, supporting clinical decisions and improving patient profiling.

The seminar is in presence up to the maximum occupancy of the lecture hall.