

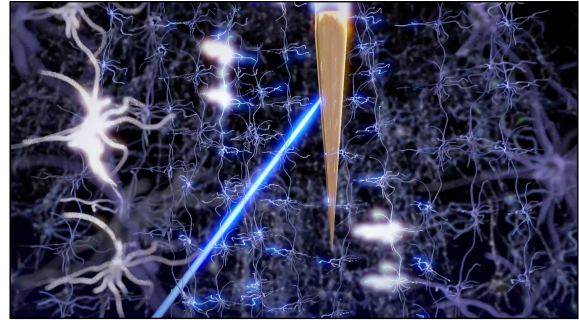
New Methods for Optical Neural Interfaces

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Fondazione Istituto Italiano di Tecnologia
DISTEBA Aula D9 ore 15:00 - 4 Apr 2016



ISTITUTO ITALIANO
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NANOTECHNOLOGIES



Sommario: Nella comunità scientifica vi è un ampio consenso sulla necessità di sviluppare nuovi approcci per comprendere meglio l'incredibile complessità strutturale e funzionale del sistema nervoso centrale. I metodi e le tecnologie ottiche basate sull'utilizzo di indicatori e attuatori di attività neuronale sono considerati una recente rivoluzione per le neuroscienze, poiché permettono di ottenere un'immagine dinamica dei processi di comunicazione interneuronale. Tuttavia, ad oggi risulta ancora estremamente difficile raggiungere le regioni cerebrali più profonde, mentre quelle superficiali sono di più facile accesso.

Dopo aver analizzato lo stato dell'arte, in questo seminario si discuteranno le sfide ancora aperte nel campo e verrà presentato un nuovo approccio tecnologico che permette di accedere contemporaneamente a più regioni cerebrali utilizzando un unico impianto a bassa invasività.

Abstract: There is widespread agreement that innovative new research tools are required to better understand the incredible structural and functional complexity of the brain. To this aim, optical techniques based on genetically encoded neural activity indicators and actuators have represented a revolution for experimental neuroscience, allowing to get a dynamic picture of the brain in action. However, currently available technologies can only reach shallow brain areas, while deep brain regions are very difficult to access.

This seminar will review state-of-the-art approaches for optical neural interfaces, discuss research challenges still open in the field, and describe our approach to interface with multiple regions of the brain by using a single optical waveguide.

Ref.s: Neuron 82, 1245 (2014) Biomedical Optics Express 6, 4014 (2015) Frontiers in Neuroscience 10:70 (2016)

About the speaker: Ferruccio Pisanello received his MS in Telecommunication Engineering from University of Salento (Italy) in July 2008 and the PhD degree in Physics from the University Pierre et Marie Curie in Paris (July 2011). He coordinates the activity on New Technologies for Neuroscience Research at the Center for Biomolecular Nanotechnologies of the Italian Institute of Technology (Lecce, Italy), and his research group aims at exploiting advanced micro- and nano-fabrication techniques to develop new tools for optogenetic applications. In 2015 he was awarded of the ERC Starting Grant MODEM, to develop multifunctional neural interfaces with deep brain regions. He is author and co-author of more than 20 publications on peer-reviewed international journals, more than 20 contributions to international conferences and two international patents.