ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

Doctoral School in Health & Technology

Scuola di Dottorato in
Scienze e Tecnologie della Salute

Seminar Notice

Specialization of deep learning architectures for modeling brain activity and function

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TEAMS room link

Monday 14 March 2022, at 2.30 pm – classroom 1.3

School of Engineering and Architecture, viale del Risorgimento, 2 – Bologna

ABSTRACT

In the last 5 years, the advent of deep learning (DL) paradigms has revolutionized the field of artificial intelligence (AI). Previously, the contribution of AI across disciplines was confined to applications whose overall complexity is low, and towered by that of human physiology. However, modern DL paradigms offer unprecedented ability to integrate multimodal, multi-domain, and multiscale data with previously unimaginable prediction performance and little or no need for data preprocessing. With advent of 'big', publicly available, and often multidomain data repositories it is now possible to build and validate AI frameworks with a tangible potential to boost neuroscience research, enhance decision-making in disease management algorithm, and enrich next-generation clinical trials. This seminar will focus on the latest developments and deep architectures for modeling and studying biomedical data in general and brain structure and function in particular, as measured through e.g. MEG, EEG, or MRI. Particular emphasis will be given to key architectural developments like e.g. separable convolutions, multi-head attention networks, spiking neural networks graph and contrastive learning. Every example will include a use-case stemming from an ongoing or published study.

AUTHOR BIO

Nicola Toschi is an Associate Professor in Medical Physics at the university of Rome Tor Vergata and Research Staff and Associate Investigator at the A.A. Martinos Center for Biomedical Imaging - Harvard Medical School/MGH. He has an interdisciplinary background in physics, mathematics and neuroscience. His research is focused on the development of mechanistic, statistical and intelligent models for understanding physiological phenomena, advanced image generation and processing, modelling of neuronal activity, nanoparticle physics and bioactivity, and the development of software/hardware interfaces for real-time biomedical data acquisition. He also has a strong focus on MR physics and ultra-high field human MR imaging, and regularly serves as a senior biostatistician, machine learning and parallel computing consultant in fundamental biological/biomarker research (genetic, epigenetic, imaging) as well as an image acquisition and processing. He is the author or co-author of approximately 250 peer-reviewed publications in these fields, which have been cited around 5500 times since year 2000.

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