# 6 NOVEMBER 2023, 4:30 pm
## SALA SEMINARI VIMM
(Via Giuseppe Orus 2, Padova)

# PNC SEMINARS

**A talk by Loren Koçillari (Istituto Italiano di Tecnologia – IIT, Trento, and Universitätsklinikum Hamburg Eppendorf)**

## MEASURING SYNERGISTIC AND REDUNDANT INTERACTIONS AMONG FUNCTIONALLY CONNECTED NEURONS IN THE MOUSE AUDITORY CORTEX DURING A SOUND DISCRIMINATION TASK

Functional connectivity (FC) plays a crucial role in understanding how correlated activity between brain regions supports neural information processing and communication. Previous research has primarily focused on redundant FC, typically using Pearson correlations to examine the similarity of activity across pairs of regions. However, recent studies have started exploring synergistic FC, which refers to the information that arises when two regions are considered together. In this presentation, I report our work [doi: 10.1007/978-3-031-43075-6_5] focalizes on the interplay between synergy and redundancy at the individual neuron level within the mouse's primary auditory cortex during a sound discrimination task. Using calcium imaging data, we first identified neuron pairs with directed FC through Granger Causality. Subsequently, we used the novel information-theoretic framework of Partial Information Decomposition to quantify the redundant and synergistic information shared by these neurons in relation to the auditory stimulus.

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<u>Biography</u>

Dr. Loren Koçillari is a Postdoctoral Fellow at the Center for Neuroscience and Cognitive Systems CNCS at the Istituto Italiano di Tecnologia (Rovereto, Italy), and a Visiting Scholar at the Excellence Department of Neural Information Processing at University Medical Center Hamburg-Eppendorf (Hamburg, Germany).

Dr. Koçillari is a biophysicist with a background in statistical physics. During his PhD, Dr. Koçillari worked at the Interdisciplinary Physics Laboratory of University of Padua, where, under the supervision of Prof. Amos Maritan, he analyzed data related to plants, human behavior, proteins, and sperms. He gained experience in neuroscience collaborating with the Padua Neuroscience Centre led by Prof. Maurizio Corbetta. He then worked as part of the Computational Neuroscience Group at Universitat Pompeu Fabra (Barcelona, Spain) where, under the supervision of Prof. Gustavo Deco, he specialized on the analysis and modeling of the resting-state whole-brain dynamics of humans affected by stroke.

He is currently conducting research at the interface between computational and experimental neuroscience. Part of his research is in network neuroscience, with a focus on building new models of the whole-brain dynamics to understand how the large-scale functional brain networks unfold from the anatomical networks in healthy and injured (e.g. stroke) neural systems. In conducting his research, he also applies novel methods from Information Theory for the dissection of neural circuits underlying behavior.

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