

# iHealthtech Seminar

**6 AUG, TUE, 10 AM – 11 AM**

NUS, College of Design and Engineering, Building E7, Level 3, Seminar Room 4



## Professor Francesca Santoro

**Institute of Biological Information Processing IBI-3,  
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## Neurohybrid Materials for Bioelectronics



In organic neuroelectronics, organic polymers offer promising biocompatibility and mixed ionic and electrical conduction for biological interfaces. These devices emulate synaptic plasticity and respond to neurotransmitters but lack the 2.5D/3D features of neuronal cells. Addressing this topographical challenge, we have identified dendritic spine-like and neuronal morphology structures using two-photon polymerization and PEDOT-based blends. Our studies show these shapes significantly impact neural network remodeling, particularly during the growth cone phase, shifting from pausing to resting states and affecting the growth cone rate based on pitch configurations. Further research reveals that biomimetic topographical cues enhance the efficiency of membrane adhesion proteins, as demonstrated through 3D reconstruction integrated into an electrical model.

In this talk, I will discuss recent developments in organic semiconductors for neuromorphic and neurohybrid devices, including the interfacing of neuromorphic OECTs with living neurons to establish biohybrid synapses. Additionally, I will delve into how conjugated polymers combined with opto-sensitive azopolymers exhibit diverse optoelectronic plasticity.

### Speaker biography:

Francesca Santoro received her Bachelor's and Master's degrees in Biomedical Engineering at the 'Federico II' University of Naples (Italy) with specialization in biomaterials. She received a PhD in 2014 in Electrical Engineering and Information Technology in a joint partnership between the RWTH Aachen and the Forschungszentrum Juelich (Germany) with a scholarship by the International Helmholtz Research School in Biophysics and Soft Matter (IHRS BioSoft). In October 2014, she joined the Chemistry Department at Stanford University (USA) and received a research fellowship in 2016 by the Heart Rhythm Society. She joined IIT in July 2017 as Principal Investigator of the 'Tissue Electronics' lab at CABHC-Naples. In 2018 she has been awarded the MIT Technology Review Under 35 Innovator ITALIA and EUROPE. She has been awarded an ERC Starting Grant in 2020. She is among the Inspiring Fifty Italy and is also the winner of the Falling Walls Science Breakthrough of the Year in Engineering and Technology in 2021. Since January 2022, she is Professor in Neuroelectronic Interfaces at RWTH Aachen and Forschungszentrum Juelich.

[https://www.fz-juelich.de/profile/santoro\\_f](https://www.fz-juelich.de/profile/santoro_f)

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