



Contribution ID: 2

Type: **Talk**

Lattice Field Theory for a Network of Real Neurons

Friday 7 November 2025 15:50 (20 minutes)

In a recent paper [1], we introduced a simplified Lattice Field Theory framework that allows experimental observations from major Brain-Computer Interfaces (BCI) to be interpreted in a simple and physically grounded way. From a neuroscience point of view, our method modifies the Maximum Entropy Model for Neural Networks so that also the time evolution of the system is taken into account, and it can be interpreted as another version of the Free Energy principle. The framework is naturally tailored to interpret data from chronic multi-site BCI, especially spike rasters from measurements of single neurons activity.

[1] Neural Activity in Quarks Language: Lattice Field Theory for a Network of Real Neurons. Bardella, G.; Franchini, S.; Pan, L.; Balzan, R.; Ramawat, S.; Brunamonti, E.; Pani, P.; Ferraina, S., *Entropy* 26(6), 495 (2024). <https://doi.org/10.3390/e26060495>

Parallel Session (for talks only)

Theoretical developments and applications beyond Standard Model

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Session Classification: Theoretical developments and applications beyond Standard Model