NEST Conference 2024



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A bottom-up, mesoscale approach for the study of the claustrum function

Monday 17 June 2024 10:00 (20 minutes)

The claustrum, a structure having extensive connectivity with the rest of the brain and being involved in many high-cognitive processes, is still one of the least understood parts of the mammalian nervous system. One of the reasons is its complex location and geometry: a folded, thin layer of neurons, sandwiched between other cellular groups and white matter tracts, which creates specific challenges for experimentation. However, in recent years the claustrum has been studied intensely in mice, revealing many details about its cellular composition and dynamics, but still without a satisfactory mechanistic explanation of its function.

This work investigates through computational simulations the dynamics of the interaction between the claustrum and the cortex. To this end, we built a bottom-up, mesoscale in-silico model of the mouse claustrum that we reciprocally connected with a simplified model of the cortex. Specifically, we used NEST and NESTML to create AEIF neurons (Brette and Gerstner, 2005) for the claustrum and Wang-Buzsaki cortical neurons with difference-of-exponentials time-course synaptic conductances (Wang and Buzsaki, 1996; Palmigiano et al, 2017). From this work in progress we will present how we reached with NEST to the sets of parameters that replicate the responses of claustrum neurons in vitro, their arrangement in space and their measured connectivity (Kim et al, 2016; White and Mathur 2018; Graf et al, 2020). The replication of the Palmigiano et al. 2017 network allowed the production of a complex, cortical-like signal. Furthermore, we will present preliminary results of the interaction between the claustrum and the cortex.

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Preferred form of presentation

Talk (& optional poster)

Keywords

claustrum cortex AEIF Wang-Buzsaki NEST NESTML

Topic area

Models and applications

Speaker time zone

UTC+9

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