



SFB 1315

Mechanisms and Disturbances in Memory Consolidation:
From synapses to systems

Tuesday

FEB 25, 2025

4:00 pm

Paul-Ehrlich Hörsaal

Virchowweg 4

10117 Berlin

Meeting-ID: 775 491 0236

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SFB 1315 LECTURE SERIES 2025

DENTRITIC MODULATION BALANCES STABILITY AND PLASTICITY

WILLEM WYBO

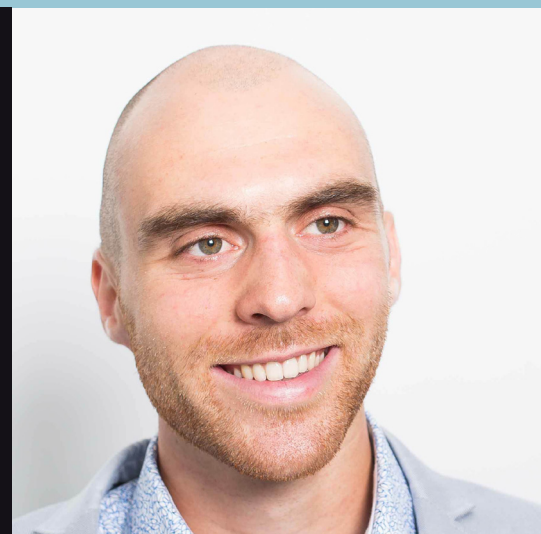
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Neuromorphic Software Ecosystems (PGI-15)

Jülich Germany



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To thrive in continuously evolving environments, animals need to assimilate new sensory information while maintaining stable representations for previously acquired information. This interplay between plasticity and stability lies at the core of lifelong learning, although its underlying neural mechanisms remain poorly understood.

I propose that biological learners primarily attempt to modulate neural activities when facing new challenges, through the activation of context-specific, top-down afferents targeting distal dendritic compartments (stability). Learning of feedforward weights (plasticity) then proceeds on a slower time-scale and only when necessary. I will demonstrate, through biophysical modelling, that dendritic processes constitute a plausible and highly suitable substrate to implement contextual adaptation of feedforward processing.

In a machine learning model and under the broad assumption that plasticity in cortex performs a form of predictive coding, I will then show that these dendritic modulations constitute a memory trace that (i) sharpens representations of new sensory percepts in an unsupervised manner and (ii) stabilises the network

to minimise forgetting of previously learned information.

Together, these findings indicate that the architecture of cortex may be optimised to balance stability and plasticity, through the spatial segregation of feedforward and top-down information streams on individual neurons.

Willem Wybo's talk is hosted by SFB1315 Speaker Matthew Larkum (Sub-projects A04, A10 and Z)

Certificate of attendance:

Please contact team assistant serenella.brinati.1@hu-berlin.de



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