

Interplay between Multiple Plasticities and Activity Dependent rules: Data, Models and Possible Impact on Learning

Submission ID 3000260
Submission Type Poster
Topic Neuroscience
Status Submitted
Submitter Laurent Venance
Affiliation CNRS UMR 7241 / INSERM U1050

SUBMISSION DETAILS

Presentation Type Either Poster or Oral Presentation

Presentation Abstract Summary Synaptic plasticity, the activity-dependent evolution neuronal connectivity, is admitted to underpin learning and memory. A paradigmatic plasticity depending on the spike timings of cells on both sides of the synapse (STDP), was experimentally evidenced through multiple repetitions of fixed pre- and post-synaptic spike patterns. Theoretical and experimental communities often implicitly admit that plasticity is gradually established as stimulus patterns are presented. Here, we evaluate this hypothesis experimentally and theoretically in the striatum, where (i) synapses may involve multiple pathways, or (ii) synaptic connections with multiple brain area exist. We will present models and experiments leading to reevaluate this hypothesis, showing that (i) multiple pathways may lead to non-monotonic establishments of plasticity where plasticity can be inverted depending on the number of stimulus presentations, and (ii) that multiple connections with in particular thalamus and cortex contribute to shaping their plasticities. We will propose a mathematical model building upon calcium transients to precisely dissect these complex interplays on resulting plasticities and reveal unexpected dependences on variables side variables (e.g. repetitions, frequency, temporal window). These results invite to reevaluate how plasticity is implemented as a global process, and to explore consequences on data processing capability and inspire new artificial intelligence techniques.

Paper Upload (PDF) [ccn_style\[Venance\].pdf](#)

Co-author Information

* Presenting Author

First Name	Last Name	Affiliation	E-mail
Gaetan	Vignoud	College de France	Gaetan Vignogaetan.vignoud@gmail.com

Alexandre	Mendes	College de France	alexandre.mendes@college-de-france.fr
Sylvie	Perez	College de France	sylvie.perez@college-de-france.fr
Jonathan	Touboul	College De France	jonathan.touboul@college-de-france.fr
Laurent *	Venance *	CNRS UMR 7241 / INSERM U1050	laurent.venance@college-de-france.fr

Keywords

Keywords
Spike-Timing-Dependent-Plasticity
Computational Modeling
striatum
neocortex
LTP
electrophysiology
Hebbian plasticity
model of neural networks; dendrite; spiking neuron; Hebbian learning; hierarchical network; generalization; clustering; unsupervised learning; supervised learning; encode; biological plausibility; processing unit; pattern recognition; online learning; error criterion.