Hebbian Mechanisms and Temporal Contiguity for Unsupervised Task-Set Learning

Submission ID 3000072

Submission Type Poster

Topic Neuroscience

Status Submitted

Submitter Flora Bouchacourt

Affiliation Princeton Neuroscience Institute

SUBMISSION DETAILS

Presentation Type Either Poster or Oral Presentation

Presentation Abstract Summary Humans engaged in a given task are capable of learning multiple strategies, or "task-sets". We examine a model for the implementation of concurrent task-sets. A decision network implemented as a fast Hebbian mechanism encodes one task-set at a time. We show that a slower unsupervised Hebbian encoding of the temporal structure of the task in a second network composed of mixed-selective neural populations can account for the implementation of concurrent task-sets. When synaptic patterns are detected in this network, an inference bias to the decision network guides successive behavior. The model reproduces behavioral data from a conditional associative learning experiment. Specifically, the model reproduces humans' ability to retrieve three stimulus-response associations of a previously learned task-set as soon as they run into one of them. The model makes specific behavioral predictions corresponding to positive or negative abrupt effects of previous responses on performance. The predictions are borne out by the behavioral data. Results of the fMRI analysis suggest that activity in dorsomedial and dorsolateral prefrontal nodes may provide the bias to decision circuits when a task-set is retrieved. Hebbian mechanisms in the service of encoding the temporal structure of the environment parsimoniously explain how humans learn complex, rule-based behavior.

Paper Upload (PDF) ccn_latex_FB.pdf

Co-author Information

* Presenting Author

First Name	Last Name	Affiliation	E-mail
Flora *	Bouchacourt *	Princeton Neuroscience Institute	floramb@princeton.edu

Stefano	Palminteri	Laboratoire de Neurosciences Cognitives, Paris, France	stefano.palminteri@gmail.com
Etienne	Koechlin	Laboratoire de Neurosciences Cognitives, Paris, France	etienne.koechlin@upmc.fr
Srdjan	Ostojic	Laboratoire de Neurosciences Cognitives, Paris, France	srdjan.ostojic@ens.fr

Keywords

Keywords
Task-set learning
Hebbian plasticity