Faculté des sciences médicales et paramédicales
Aix+Marseille Université

AVIS DE PRESENTATION ORALE DES TRAVAUX

M. ANDREA BROVELLI présente ses travaux en soutenance le :

Mardi 21 janvier 2020 de 14h30 à 16h30

Salle de thèse n°2
1er étage – aile bleue
Faculté des Sciences Médicales et Paramédicales
Campus Santé - Timone
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27 Boulevard Jean Moulin
13385 MARSEILLE Cedex 05

en vue de l'obtention du diplôme : **Habilitation à Diriger des Recherches en Médecine**

La soutenance est publique.

Section CNU : 6900 - Neurosciences

Unité de recherche : Institut de Neurosciences de la Timone

Membres du jury

Nom	Qualité	Etablissement	Rôle
M. BORIS BURLE	DIRECTEUR DE RECHERCHE	UNIVERSITE D'AIX-MARSEILLE	Rapporteur du jury
M. MATHIAS PESSIGLIONE	DIRECTEUR DE RECHERCHE	UNIVERSITE PARIS 6	Rapporteur du jury
M. EMMANUEL PROCYK	DIRECTEUR DE RECHERCHE	UNIVERSITE LYON	Rapporteur du jury
M. DEMIAN BATTAGLIA	CHARGE DE RECHERCHE	UNIVERSITE D'AIX-MARSEILLE	Membre du jury
Mme MATHILDE BONNEFOND	CHARGE DE RECHERCHE	UNIVERSITE LYON	Membre du jury
M. JEAN-LOUIS MEGE	PROFESSEUR DES UNIVERSITES	UNIVERSITE D'AIX-MARSEILLE	Tuteur

Le Doyen

Georges LEONETTI

Faculté des sciences médicales et paramédicales AMU

Learning Brain Networks

Habilitation à Diriger des Recherches

21 Jan 2020

Andrea Brovelli
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Learning represents a cornerstone of cognition, because it supports behavioural flexibility and automaticity. Behavioural flexibility allows us and other animals to rapidly learn the consequence of our actions and to select behaviours according to our goals and motivational state (also known as *goal-directed* learning). Automaticity assures the consolidation of goal-directed actions into stable habitual responses and motor routines (*habit learning*). Learning abilities grant successful adaptation when context changes and, in general, they generate more opportunities to engage in meaningful life and social interactions. Indeed, most of our everyday activities result from a dynamic interplay of motor routines and voluntary goal-directed behaviours.

Converging evidence suggest that reward-based learning emerges from the dynamic coordination of distributed neural ensembles and brain networks, composed of the sensorimotor (habit formation), associative (goal-directed learning) and limbic (reward-processing) fronto-striatal circuits. What is unclear, however, is how the different areas and networks coordinate to support learning. My research projects aim to better characterise the dynamic neural interactions between cortico-cortical and cortico-striatal regions and networks during learning. Our approach tries to pinpoint the principles of human learning both at the computational, algorithmic and neural implementation level. At the computational and algorithmic level, my projects try to confront leading learning theories, such as Bayesian Inference and Reinforcement Learning. The aim is to formalise human learning by means of computational models to reproduce and better predict the behavioral patterns, learning strategies and subjective judgements typical of humans. At the neural implementation level, the different projects test whether and how the predicted learning-related computations emerge from the dynamic coordination of multiple brain regions and networks. The long-term objective of my research is to set the bases for a neural theory of learning: a mathematical framework describing the computations and neural processes supporting human learning.