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Seminaires du LPTM , Universite de Cergy Pontoise

Jeudi 21 Novembre 2019, 14 :00
LPTM, 4.13 St Martin II
Domaines : qbio.NC

Titre : *Neuronal mathematical models in the study of human brain (pathological) activity*

Orateur : **Thanos Manos (Faculty of Science, UCP, Cergy)**

Résumé : *Mathematical modelling is an important tool in understanding the basic mechanisms of the human brain as well as determining its function and operation. In this talk, I will discuss how such models, based on ordinary differential equations can capture and describe the underlying dynamical evolution at different levels, that is, from individual neuron activity, to interactions between a relatively small number of neurons within some brain area, up to interactions between different brain regions (whole brain dynamics). Several brain diseases are characterized by abnormally strong neuronal synchrony. Mathematical models can help develop therapies to counteract such synchronization with external devices. The first part of the talk focuses on neurons whose firing activity is not static ; it continuously evolves and adapts, i.e. some already existing neural synapses may get stronger or weaker (synaptic plasticity) while new synapses may be created or deleted (structural plasticity) as time evolves. Recently, there is an increasing effort to bring mathematical models closer to neuroimaging data (for example, MRI or EEG). Patient-based data can be used to improve the models to better compare and differentiate pathological from healthy brain behaviour. The second part of the talk is dedicated to models which take into account large amounts of experimental data and then are used as a virtual platform for experimenting and testing brain activity.*

References [1] Manos T., Zeitler M. and Tass P.A. Short-term dosage regimen for stimulation-induced long-lasting desynchronization. Front. Physiol. 9 :376, 2018. [2] Manos T., Zeitler M. and Tass P.A. How stimulation frequency and intensity impact on the long-lasting effects of coordinated reset

stimulation. PloS Comput. Biol. 14 (5), e1006113, 2018. [3] Popovych O.V., Manos T., Hoffstaedter F. and Eickhoff S.B. What Can Simulations Contribute to Neuroimaging Data Analytics ? Front. Syst. Neurosci. 12 :68 2019.