1116-55-1344 **Martina Scolamiero*** (martina.scolamiero@epfl.ch), EPFL SV BMI UPHESS MA B3 495, 1015 Lausanne, Switzerland. *Combinatorial invariants for directed graphs with applications to neuroscience.*

Directed graphs offer a simple but efficient formalism to model relational information between agents. For example, in neuroscience, they are used to study structural and functional connectivity between neurons or brain regions.

In this talk I will review some well known topological invariants and introduce new ones which allow to identify patterns and densely connected regions in a directed graph. Robust connections between pairs of vertices will be ensured by the so called highways, and local cohesiveness within a graph measured by the clustering polynomial.

I will then present applications of such invariants to study brain connectivity at the micro-scale. The focus will be on understanding the neural spiking activity generated by different stimuli on the Blue Brain model: a simulation of the neocortical columns of a fourteen days old rat built within the Blue Brain Project.

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