Madalena Chaves (GT Bioss) – INRIA, Sophia Antipolis

Titre: Coupling and synchronization dynamics among biological oscillators

Résumé: Biological oscillators often involve a complex network of interactions, such as in the case of circadian rhythms or cell cycle. Mathematical modeling and especially model reduction help to understand the main mechanisms behind oscillatory behavior. In this context, we first study a two-gene oscillator using piecewise linear approximations to improve the performance and robustness of the oscillatory dynamics. Next, motivated by the synchronization of biological rhythms in a group of cells, and to gain insight into the effects of network architecture on the system's behavior, we then study a network of identical oscillators under diffusive coupling, interconnected according to different topologies. The piecewise linear formalism enables us to characterize the emergent dynamics of the network and show that a number of new steady states is generated in the network of oscillators.