Title: Modeling interactional neurophysiological activity using latent variables

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Abstract: Being able to automatically analyze, model and predict social signals and social behaviors is one of the major challenges of the social signal processing and affective computing communities. Up-to-date, these research communities focused on non-verbal behaviors such as facial expressions or gesture and very few has been done on analyzing physiological signals of interactive people (imitation, synchrony). In the same time, investigations in neuroscience and psychology have moved from the analysis of isolated individuals to the study of interactive contexts. This paradigm-shift is the basis of the “two-body neuroscience” approach that has already highlighted interesting phenomena, such as strong inter-brain synchrony during behavior imitation.

This thesis is concerned with the development of new computational models for modeling such a phenomena. It is built on the idea that hidden variables characterize inter-brain synchrony. We propose to analyze and model them through latent variable techniques. Non-negative Matrix Factorization (NMF) will be employed and we will focus on models that explicitly take into account social interaction. In addition, the models should be able to deal with temporal dynamics. While the first phase of the thesis is concerned by EEG signals, multimodal extensions will be also investigated.