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Abstract for an Invited Paper
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**Detection of phase and lag synchrony as an adaptive measure of asymmetric neuronal interactions**

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Asymmetric temporal interdependencies between individual neurons and their populations are though to underlie learning and memory formation and can provide information about direction of information transfer in neural systems. We have developed an adaptive measure that detects asymmetries in phase and lag synchrony between activities of individual neurons of synchronized networks. In the first part of the talk I will discuss the properties of the measure on network models of coupled non-linear oscillators and show progression of rapid transitions in temporal patterning in such networks as a function of their topology. In the second part of the talk I will present its application in analysis of normal and pathological neural activity: detection of evolving asymmetry in interactions of hippocampal neurons in freely behaving rats, and characterization of dynamical progression of synchronous seizure-like activity recorded from intact rat hippocampus.