MASTER THESIS

Fluctuations of statistical learning

The ability to detect unexpected environmental events results from a comparison of the actual state of our sensory world with predictions based on immediate and long-term contextual knowledge, showing a prediction error (PE) signal as deviations from these predictions occur. The mismatch negativity (MMN) is considered the classic PE signal elicited during passive listening to deviant sounds interrupting the context provided by a sequence of repeated standard stimuli. To enhance the brain's ability to detect unexpected events neural responses to frequently repeated environmental stimuli are typically suppressed by repetition and hence display experience-dependent dynamics. Predictive coding (PC) interprets neural response dynamics as a constant comparison of new sensory information with stimulus history.

On the other hand recent studies showed that behavioral performance especially in the visual modality fluctuates over time resembling in their dynamics ongoing oscillatory brain activity. Previous behavioral and scalp EEG studies reported periodicities in bottom up perception and top down guided behavior linked to neuronal oscillations the theta/alpha range. This would in part contradict the implicit assumption of a constant comparison of the sensory world with the internal model the brain has acquired. In this project we want to test whether the MMN and repetition suppression are modulated by the phase of underlying low frequency excitability fluctuations of the brain.

In this project the potential candidate is going to carry out a classical auditory oddball paradigm while recording EEG to test whether comparisons with an internal model are constant or fluctuate as a function of ongoing oscillatory activity.

Requirements:

- programming skills, any programming language but Matlab preferred
- interest in statistical learning, signal processing, and neuroscience

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