Graph models of cortical plasticity in temporal brain networks

Résumé du projet de recherche (Langue 1)
The emerging area of complex networks has led to a paradigm shift in the neuroscience, though many issues remain unaddressed 1. Perhaps the most critical limitation is assuming that the way different brain regions (i.e. nodes) are functionally connected is implicitly constant (stationarity hypothesis). As a consequence, complex networks theory has been mainly applied to cross-sectional studies referring to a single point in time and the resulting characterization ultimately represented an average across spatiotemporal neural phenomena. However, recent evidence suggests that brain functional connectivity (FC) is highly variable across multiple time scales and that this non-stationarity influences the emergence of global network properties and complex brain behavior 2. In particular cortical plasticity - the ability of the human brain to adapt to new stimuli (i.e. learning) or to restore functions after damages (i.e. brain lesions) - is probably one of the most fascinating, yet unknown, processes characterized by a temporally dynamic reorganization.

Résumé du projet de recherche (Langue 2)
The purpose of the PhD thesis is to go beyond the stationarity hypothesis and develop a coherent framework to properly characterize dynamic brain networks. Specifically, the PhD project aims to i) develop statistical methods to model temporal brain networks, ii) quantify network variability and isolate persistent network properties in normal brain, and iii) model spatio-temporal network changes underlying cortical plasticity after brain lesions.