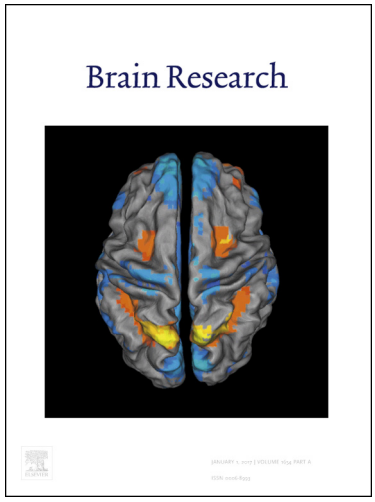

Research report

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Elucidating Functional Differences between Cortical Gyri and Sulci via Sparse Representation HCP Grayordinate fMRI Data

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Abstract

The highly convoluted cerebral cortex is characterized by two different topographic structures: convex gyri and concave sulci. Increasing studies have demonstrated that cortical gyri and sulci exhibit different structural connectivity patterns. Inspired by the intrinsic structural differences between gyri and sulci, in this paper, we present a data-driven framework based on sparse representation of fMRI data for functional network inferences, then examine the interactions within and across gyral and sulcal functional networks and finally elucidate possible functional differences using graph theory based properties. We apply the proposed framework to the high-resolution Human Connectome Project (HCP) grayordinate fMRI data. Extensive experimental results on both resting state fMRI data and task-based fMRI data consistently suggested that gyri are more functionally integrated, while sulci are more functionally segregated in the organizational architecture of cerebral cortex, offering novel understanding of the byzantine cerebral cortex.

Keywords: gyri, sulci, sparse representation, functional networks, grayordinate fMRI