



Enhanced Brain Structural Connectivity Mapping

Technology No. 20180310

Estimation of complete function specific networks

This technology is a software based model for analyzing whole brain diffusion magnetic resonance imaging (dMRI) and functional magnetic resonance imaging (fMRI) data to estimate function specific brain circuits. The approach reveals detailed anatomical connectivity patterns for each functional module and recovers structural connections that are underestimated by diffusion MRI (dMRI). Using Human Connectome Project (HCP) data, the model successfully identified function specific anatomical circuits, such as the language and resting state networks.

Models interactions between structural and functional connectivity

Traditionally, estimating brain circuits by incorporating information from functional MRI into diffusion MRI is challenging. Seed regions for tractography are selected from fMRI activation maps to extract the white matter pathways of interest. This new method jointly analyzes whole brain dMRI and fMRI data revealing detailed anatomical connectivity patterns for each functional module. This novel framework explicitly models interactions between structural and functional connectivity measures, thereby improving anatomical circuit estimation.

Phase of Development

- Proof of concept. Model demonstrated using Human Connectome Project (HCP) data.

Benefits

- Enhanced structural activity brain mapping
- Discovers function-specific brain circuits

Features

- Analyzes whole brain diffusion MRI (dMRI) and functional MRI (fMRI) data
- Joint structural-functional brain network model
- Reveals detailed anatomical connectivity patterns for each functional module

Applications

- Magnetic resonance imaging (MRI)
- Brain mapping
- Diffusion MRI (dMRI)
- Functional MRI (fMRI)

Researchers

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Publications

[*Function-specific and Enhanced Brain Structural Connectivity Mapping via Joint Modeling of Diffusion and Functional MRI*](#)

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