Titolo (provvisorio): Neurite Orientation Dispersion and Density Imaging (NODDI) in pediatric data

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Motivazione e campo di applicazione

Diffusion-weighted magnetic resonance (DW-MR) imaging is an important tool to investigate the structure of brain tissue in vivo and noninvasively. This kind of imaging analyzes white matter fiber pathways in the brain by mapping the motion of water molecules along the fibers. Several techniques exist in order to derive different kinds of information from this analysis: it is possible to study white matter integrity, structure, connectivity between brain regions in healthy or pathological subjects.

Obiettivi generali e principali attività

An important analysis for this kind of images is the determination of white matter microstructure, at the level of dendrites and axons. NODDI is a technique that allows to obtain maps of several neurite indices, such as orientation dispersion of dendrites and axon density, for microstructural analysis of the brain in health and pathology. This kind of analysis is difficult to apply on data from children and neonates, because of the undermyelination of the developing brain and the suboptimal acquisition sequences used on this kind of subject.

Obiettivi
- study different tools and methods of applying NODDI analysis on DW-MR images
- select best tool for NODDI analysis and test feasibility on images of children and neonates
- develop processing pipeline comprising preprocessing steps, selection of best parameters and postprocessing steps for NODDI analysis in pediatric data

Obiettivi di apprendimento (strumenti tecnici e analitici, metodologie sperimentali)

- learn to integrate image analysis software (FSL, Mrtrix, FreeSurfer) to create a processing pipeline
- develop processing pipeline in Python/bash scripting
- learn to analyze DW-MR images

Luogo/i in cui si svolgerà il lavoro: Biolab - Gaslini

Abilità e capacità richieste: Programming in Python/bash scripting; […]

Numero massimo di studenti: 1