Project 1: sub-sampling of functional MRI data and prediction of cognitive ability based on full ve sub-sampling data

Background:
Blood oxygenation level dependent Functional Magnetic Resonance Imaging (BOLD-MRI) is a data acquisition technique that tracks the changes in blood flow in task-related regions. Due to the low data acquisition fMRI sample rate, a relatively larger number of volumes should be acquired in order to receive a meaningful signal. One way to achieve this larger number of volumes is by increasing the scanning time, which, in children, can be very problematic due to their inability to stay still and avoid motion throughout the scan.

Definition:
The goal of this project is to examine the possibility of using a shorter question time to achieve the same BOLD signal and functional connectivity (i.e. canonical correlation analysis) in children. We will achieve this goal by adapting an existing technique used in structural MRI data acquisition also in functional MRI (down sampling). We will use functional MRI data of 3-5 years old children listening to stories and will compare the original BOLD signal and functional connectivity results from the entire dataset to that achieved following the volumes down sampling. We will validate the effectivity of the sub-sampled data by examining if we can predict cognitive abilities of these children based on the shortened compared to the longer dataset using machine learning tools. This technique will allow physicians and researchers who work with pediatric population to significantly shorten their fMRI protocols which will then minimize artifacts resulting from motion. It may also assist in avoiding the use of Anastasia during clinical scans, when possible, due to the short question time.
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