A Neurological Subtype Classification of ASD and an fMRI-Powered Therapy Prediction Model

Majumdar, Stavan (School: Blue Valley Northwest High School)

It is well known that autism is a spectrum of various disorders rather than a single, discrete disorder. This makes it incredibly difficult to study since there appears to be a gradient in behavioral trends where everyone's issues differ to varying degrees. A computational analysis of neurological data, such as functional MRI (fMRI), may reveal a better understanding of the subject as it relies on the more quantitative measure of brain activity rather than the qualitative observation of behavior. Directly analyzing neuroimaging data is a step closer to understanding the autism spectrum disorder (ASD) at a deeper level. This research aims to engineer an fMRI brain-data-powered therapy recommendation system that reports why an individual exhibits certain behaviors, what functional network connectivities are deficient in their brain, what constraints they will face in life, and what therapies / training will help them improve. Additionally this project aims to create a subtype classification of autism based on neurological data. An effort to classify ASD in buckets is significant as it helps streamline autism therapies. This subtype classification is incorporated into the main therapy prediction pipeline as it helps clinicians better understand their patients. The primary methods used in this paper include forming normalized connectivity matrices from fMRI data and creating neurological vectors for each individual to implement the machine learning algorithm, k-means clustering. This project uses the ABIDE dataset for neurotypical and neurodivergent region of interest (ROI) time series data from fMRI. My research aims to make autism therapies more personalized, robust, and evidence-based. This model can be used to enhance early intervention evaluations too.

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