

## Group 1 Project Proposal:

Schizophrenia is a common brain disease. Researchers have focused on the relationship between schizophrenia and the brain. They want to know its nature and its existence. Such research has made substantial progress with the help of MRI technology. Studies have shown that schizophrenia is associated with enlarged ventricles and decreased brain size. The researchers used magnetic resonance imaging to compare the brain structure of family members with and without schizophrenia. Their report found that the ventricles of schizophrenia patients were larger than those of their uninfected siblings and larger than normal person.

We want to explore the functional magnetic resonance(fMRI) data collected in studies from OPENfMRI conducted by Csernansky JG, Repovs G and Barch DM. Our goal is to better understand the difference on how the working memory between healthy people and schizophrenic patients varies. For that we make use of a set of different exploratory techniques and linear regression. The dataset consists of 99 subjects, which is very large compared to other fMRI datasets. Because of that we will have to possibility to filter out subjects and reduce the dataset size to the most representative ones.

Advances in computer technology have allowed detailed investigation of human body. Magnetic resonance imaging (MRI), as a common image inspection method, is particularly useful for showing soft tissue structure especially for brain. MRI can provide information about how the blood moves through certain organs and blood vessels, which is the reflection of neuronal activation of the brain. While psychiatric disorders have been diagnosed based on clinical symptoms, the results are relatively ambiguous compared to the diagnostic procedures for physical disorders, since no objective methods of examination have been available on which to base the diagnosis. Studies have shown that qualitative evaluation of MRI images allows identification of structural brain abnormalities of certain degrees in schizophrenia.

Magnetic resonance imaging uses strong magnetic fields to create images of biological tissue. The strength of the static magnetic field created by an MRI scanner is expressed in units of Tesla. Scanners used for fMRI are typically at least 1.5 Tesla (1.5 T). For comparison, the Earth's magnetic field is approximately 0.00005 Tesla. To create images, the scanner uses a series of changing magnetic gradients and oscillating electromagnetic fields, known as a pulse sequence. Depending on the frequency of the electromagnetic fields, energy may be absorbed by atomic nuclei. For MRI, scanners are tuned to the frequency of hydrogen nuclei, which are the most common in the human body due to their prevalence in water molecules. After it is absorbed, the electromagnetic energy is later emitted by the nuclei, and the amount of emitted energy depends on the numbers and types of nuclei present. Depending on the pulse sequence used, the MRI scanner can detect different tissue properties and distinguish between tissue types.