Using fMRI to Diagnose Schizophrenia

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Abstract

Diagnosis of schizophrenia is a challenging task that yet to be addressed[2]. Although, in recent years methods which use Functional Magnetic Resonance Imaging (fMRI) for mental disorder diagnosis has become more popular, but in case of schizophrenia it still needs to become more robust and reliable. In similar studies[4][5] have been shown that fMRI can be used in conjunction with Sparse Gaussian Markov Random Field (SGMRF) to produce high accuracy in diagnosis of illness. However having a dataset with homogeneous distribution of illness makes this result less reliable and creates the need for more evidence using heterogeneous dataset in terms of illness. In this work we pursue two path to tackle this problem. First, we evaluate performance of Sparse Gaussian Markov Random Field (SGMRF) on fMRI data obtained through whole brain, and second we work on Regions of Interest (ROI) according to Power et al.[3]. We have used 5 fold cross validation for hyper parameter tuning and 20% holdout set for test. Accuracies that we have obtained through mentioned method are: —— for whole brain features and —- for ROI features. While this result are slightly less than the results obtained by Rish *et al.* it is on par with Rosa *et al.* results.

1 Introduction

Functional Magnetic Resonance Imaging (fMRI) is a tool for recording functional changes caused by neuron activity. When a person is doing a task neuron activity fluctuate and human body in order to provide the energy needed for this activity increases the blood flow to feed the neurons with the needed glucose which is not stored in the brain. More blood flow also brings more oxygen through blood vessels. This change in the level of oxygenated blood known as oxyhemoglobin and deoxyhemoglobin (oxygenated or deoxygenated blood) changes the magnetic susceptibility of blood (BOLD signal) which is the base for detection in MRI machine.

Schizophrenia is a mental disorder that has been shown to affect blood flow in patient's brain[1],and this makes fMRI a perfect match for detecting changes caused by Schizophrenia in the brain. The only down side is the low resolution of fMRI compare to the scale of those changes. However fMRI is still one of the most used and efficient tools in study of psychiatric disorders such as Schizophrenia.
Another advantage of fMRI is that this method is non invasive. This means that unlike some other imaging methods that needs using some types of instruments in patience body this methods operates without the need of that.

2 Background

2.1 Schizophrenia

what is it and why do we care

2.2 ROI and Voxel by Voxel Analysis

2.3 Fourier Transform

What is a FFT and how does it work

2.4 Principal Component Analysis

2.5 Support Vector Machines

What is an SVM and how does it work

2.6 SGMRF

What is a SGMRF and how does it work

3 Methodology

3.1 Data Set

Turn our slide into this section How do we have? Balance? How we create the holdout set?

3.2 Your Approach? Mario

Describe your experiments

3.3 Your Approach? Neil

Describe your experiments

3.4 Your Approach? Farhad

Describe your experiments

4 Results

4.1 Your Approach? Mario

Report your results

4.2 Your Approach? Neil

Report your results

4.3 Your Approach? Farhad

Report your results

5 Conclusions

References

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