

The University of Queensland - IIT Delhi Academy of Research Joint PhD Project

PROJECT TITLE	ACCURATE LOCALIZATION OF FUNCTIONAL BRAIN AREAS IN EPILEPSY PATIENTS AND HEALTHY INDIVIDUALS USING NATURALISTIC FUNCTIONAL MRI PARADIGMS
PROJECT CODE	UQIDAR 00198
PROJECT DESCRIPTION	For drug resistant Epilepsy, surgical resection of epileptogenic tissue is the most effective treatment for improving the quality of life of the patient. For pre-surgical planning, localization of normal healthy functional areas in the vicinity of epileptogenic tissue is one of the key components determining the suitability and outcomes of surgical intervention. For temporal lobe epilepsy, identification of lateralization of speech and localization of different aspects of language processing and episodic memory is very important in order to minimize the risks of creating new deficits. Currently, the localization inferred from task-based fMRI is not adequate because areas that do not seem to be activated might be necessary for a function whereas the areas that are found to be activated might not be crucial for that function. Moreover, the current task-based fMRI paradigms are difficult to administer for a variety of patients. The evolution of naturalistic audio-visual paradigms such as those used in study of Neurocinematics (Hasson et al., 2004; Hasson et al., 2008; Kauttonen et al. 2014; Wilson et al., 2020), auditory story telling (Stephens et al., 2010; Hasson et al., 2012) along with the suitable inter-subject correlation analysis techniques (Kuppi et al., 2010; Pajula et al., 2012; Kauppi et al., 2014) are promising for accurate localization of function in a naturalistic setting. The Garg labs at IIT Delhi has designed advanced fMRI analysis techniques to localize activity in such naturalistic paradigms which will be easy to administer to such patients. This project aims to develop and validate fMRI paradigms and statistical and corresponding machine learning based analysis techniques to localize epileptogenic as well as normal functional brain regions in healthy individuals as well as in epilepsy patients using functional neuroimaging.
PROJECT OUTCOMES	This proposal has the potential to influence the pre-surgical planning protocols for epilepsy patients. The proposed research may lead to newer fMRI paradigms that are easier to administer to epilepsy patients and corresponding analysis methods that will be used to localize healthy brain areas related to language, memory, sensory and motor processing.
ADVISORY TEAM	Professor David Reutens Centre for Advanced Imaging, UQ https://cai.centre.uq.edu.au/profile/102/david-reutens Professor Rahul Garg Computer Science & Engineering, IITD http://www.cse.iitd.ernet.in/~rahulgarg/
TYPE OF STUDENT	Applications are open to i or q students who meet eligibility criteria.
DISCIPLINE BACKGROUND OF STUDENT	Ideally, this project requires students with a background in: Student should be good at programming and have interest in Neurosciences or Neuroimaging. The students preferably be Bachelor/Master/MPhil in a relevant field of Science, Engineering, Biology, or Medicine.
IDEAL CANDIDATE	Essential capabilities: Data analytical skills, Expertise in a programming language (eg, C/C++ or Matlab)

APPLICATION
PROCESS

Desirable capabilities:An understanding of epilepsyExpertise in machine learning / artificial intelligence methods

Expected qualifications (courses, degrees, etc): Bachelor/Master/MPhil in a relevant field of Science, Engineering, Biology, or Medicine.

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