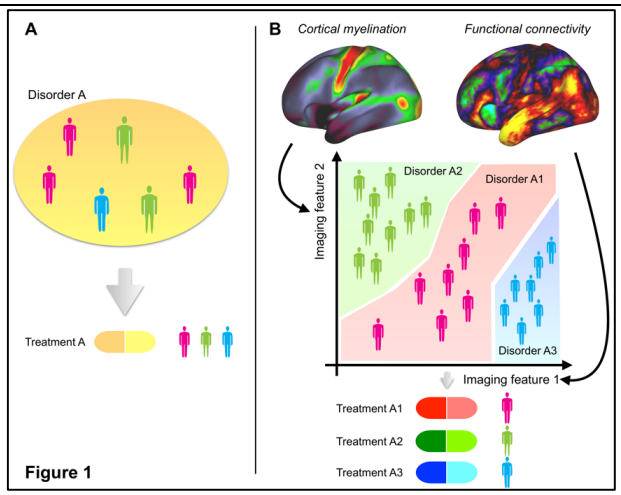
University of Nottingham
UK | CHINA | MALAYSIA

Precision Imaging Beacon of Excellence

Studentship Form

The Precision Imaging Beacon wishes to promote cross-disciplinary interaction between Schools, with an expectation of at least two supervisors.

First Supervisors name	Dr Matteo Bastiani	School Addresses	Sir Peter Mansfield Imaging Centre, School of Medicine
Co Supervisors name	Dr Maddie Groom	School Addresses	Institute of Mental Health, School of Medicine
Co Supervisors name	Prof Chris Hollis	School Addresses	Division of Psychiatry, School of Medicine
Start date	Sept 2019	Duration	3.5 years
Student	TBC following selection process		
Project Title	Imaging-based neurophenotypes to model developmental mental health disorders		
Project Abstract	Mental health disorders such as attention deficit hyperactivity disorder (ADHD) and autism spectrum disorders (ASD) arise during early development [1], even though they might be diagnosed only later in life when treatment becomes less effective. Neuroimaging offers the unique capability of providing connectivity profiles non-invasively and *in vivo*, potentially for large numbers of subjects of any age. Therefore, extracting and selecting clinically-relevant features from neuroimaging data using machine learning represents a necessary step for probing the aetiology, differentiating the sub-type and designing the best treatment for several developmental mental disorders. This project aims to develop and use multi-modal (i.e., structural and functional) neuroimaging methods to extract accurate markers [2] for improving personalised diagnosis and predicting treatment outcome in patients with developmental mental health disorders, such as ADHD and ASD. The student will apply and expand state-of-the-art analysis methods to extract the maximum information from the available multicentre big cohort imaging studies that include clinical information [3, 4]. The analysis pipelines will need to be highly optimised and run on high performance computing (HPC) solutions. Moreover, linking abnormal brain development and clinical outcomes is a challenging task. Generalizability of the discovered imaging-based neurophenotypes will need to be assessed using the available big datasets and sophisticated cross-validation/replication frameworks. The analysis of such datasets will require the development of data reduction, data-driven exploratory and statistical approaches to define biologically relevant and interpretable imaging-derived-phenotypes.		

	The student will take advantage of the world-class interdisciplinary research environment at the Sir Peter Mansfield Imaging Centre, University of Nottingham. The project fits well with the research strategy of the University of Nottingham and its Beacon of Excellence in precision imaging. Its aims are well embedded within the Beacon's strategic plan and will strengthen its internationally leading position in biomedical imaging research. Being at the interface between biomedical engineering research and clinical applications, the project will greatly benefit from the interdisciplinary expertise available in Nottingham, including membership of the Institute of Mental Health, a collaboration between the University of Nottingham and Nottinghamshire Healthcare NHS Trust. Moreover, the Nottingham Biomedical Research Centre has a theme on mental health, allowing evaluation of efficacy of the proposed technology to available clinical cohorts, opening the path for clinical translation. References 1. Marin, O., *Developmental timing and critical windows for the treatment of psychiatric disorders.* Nat Med, 2016. **22**(11): p. 1229-1238. 2. Drysdale, A.T., et al., *Resting-state connectivity biomarkers define neurophysiological subtypes of depression.* Nat Med, 2017. **23**(1): p. 28-38. 3. Consortium, H.D., *The ADHD-200 Consortium: A Model to Advance the Translational Potential of Neuroimaging in Clinical Neuroscience.* Front Syst Neurosci, 2012. **6**: p. 62. 4. Di Martino, A., et al., *Enhancing studies of the connectome in autism using the autism brain imaging data exchange II.* Sci Data, 2017. **4**: p. 170010.
Graphic for Advertising (Must be high resolution)	 **Figure 1**