The Neural Engineering Group within the Trinity Centre for Bioengineering invites applications for a Senior Researcher with specific experience in the design and analysis of neuroimaging to join a multidisciplinary team studying the cause of adult onset primary torsion dystonia (AOPTD).

The multidisciplinary team investigating AOPTD is led by Professor Michael Hutchison at St Vincent’s University Hospital and funded by the Health Research Board from 2013-2018. Focus of this research is to underlying cause of the movement disorder dystonia; a disorder characterized by an excess of unneeded involuntary movement, which occurs at rest and when attempting to make a normal movement. The excessive unwanted movements cause clumsiness, pain, distress, disability and social embarrassment. Structurally MR imaging of dystonic brain shows no abnormality and the condition is not progressive. The abnormal movements start usually after the age of 30 years and remain for the rest of life. Most patients have no other affected relative; rare families have multiple individuals with AOPTD. There is increasing evidence that the cause of this form of dystonia is genetic.

Although applied mainly in psychiatric research, the concept of the endophenotype, a sub-clinical quantitative marker of gene expression, is relevant to poorly penetrant forms of dystonia, in particular AOPTD. A number of putative endophenotypes have been identified for AOPTD. We have examined the utility of the temporal discrimination threshold (TDT) as a valid endophenotype in both familial and sporadic AOPTD.

A TDT test involves the ability to perceive two stimuli (flashing visual stimuli, brief auditory tones, somatosensory etc.) as separated in time is abnormal in the majority of people with this AOPTD and in half of their unaffected siblings and offspring. With new powerful genetic methods, called exome sequencing and the TDT we hope to discover genes that cause this disorder. By finding new genes we will be able to understand the mechanisms of this form of dystonia and thus eventually new treatments. Only a few individuals with the abnormal gene develop the disorder and some effect of the environment must play a part; we will investigate this also. We also are neuroimaging (EEG and fMRI) in AOPTD to localize and explore the functional interactions between specific area of the basal ganglia.

The Senior Researcher and Program Manager will be required to:

- Operate independently with the ability to manage a large research project, playing a leading role in a multidisciplinary team of neurologists, geneticists, neural engineers and neuropsychologists
- Develop and evaluate new and improved neuroimaging methods to fully understand the aetiology of dystonia.
- Develop novel theoretical ideas for analysis of neuroimaging data, particularly EEG and fMRI data for the detection, analysis and classification of sensory discrimination in the domain of dystonia
- Develop dynamic causal models of functional connectivity during a temporal discrimination test in relatives with normal and abnormal TDTs
- Develop in new and improved linear and non-linear analysis methods for EEG based neuroimaging of sensory discrimination tests (DCMs etc).
- Assess relationships MRI/EEG biomarkers with genetic information
- Applying machine learning methods to a unique multimodal data of AOPTD (MRI, EEG, genetics).
- Write journal papers for publication, research and development grants on innovative methods and approaches for neuroimaging in dystonia.
- Prepare progress and technical reports on the research project.
- Represent the Neural Engineering Group in outside discussions (technical and scientific fora) including collaborations with faculty, researchers and clinicians.
- Work closely with internal Trinity Centre for Bioengineering research staff to develop and validate complete acoustic signal acquisition and processing subsystems and to integrate these subsystems into a complete neuroimaging system.
- Act as a technical resource for research staff involved in the study of dystonia and assist in the technical investigation and resolution of mathematical signal processing issues.
Primary Function:

50%: Carry out experimental neuroimaging studies. Analyse real experimental data (neuroimaging, behavioural, genetic). Help develop new and improved neuroimaging algorithms. Help provide the technical focus and direction for the signal processing development effort required.

30%: Project manage progress and results with the funding agencies. Identify funding opportunities for development of this research activity.

20%: Research on design, development, analysis and validation of multimodal neuroimaging analysis methods.

The candidate must have a PhD in neuroscience or neural engineering, have journal publications in the field of neuroimaging (EEG and fMRI) and experience of project management.

- Experience with Signal Processing tools and Languages (Matlab, C++, etc)
- Experience with statistical analysis of experimental data
- Experience with EEG data acquisition and analysis
- Experience with fMRI data acquisition and analysis
- Experience with machine learning method applied to multimodal data
- Familiarity with interpreting genetics information
- Able to work autonomously, managing and reporting on the project to the multidisciplinary tram

Salary is very competitive.

The position is for 3 years with the possibility of extension.

More information can be obtained from

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