UCL Institute of Neurology

Wellcome Trust Centre for Neuroimaging

PhD studentship: A framework for tracking changes in MRI data of the spinal cord and brain.

Applications are invited for a PhD studentship at the Wellcome Trust Centre for Neuroimaging (WTCN) under the supervision of Prof. John Ashburner and in collaboration with the Spinal Cord Injury Center, University of Zurich. Closing Date: 24th Nov, 2013

The anticipated start date is 1st Nov, 2013.

Project
The work will involve developing computing frameworks to address both of the following challenges:

Atlas of the head and neck. Develop a framework for learning tissue probability atlases from large datasets of MRI scans. The primary aim will be to extend our existing brain image segmentation approach [1] (released with our Statistical Parametric Mapping software – SPM -http://www.fil.ion.ucl.ac.uk/spm) to use atlas data from both head and neck. This would allow clinicians to more easily analyse MRI data of patients with neurological diseases involving the spinal cord. The framework should generalise to MRI scans of all body parts, both human and non-human. The project may require some parts of a relatively small number of scans to be manually segmented, with the aim of generalising these segmentations to other scans.

Longitudinal change modelling. Anatomical MRI scans of the head and neck, collected at a number of time points following a spinal incidence such as trauma, allow atrophy rates to be determined via longitudinal image registration procedures. Image registration essentially forms a generative model of the underlying atrophy [2], described by a set of differential equations. The project will involve developing a more realistic longitudinal model of atrophy (and possible recovery) for data containing data from more than two time points. This may involve parameterising longitudinal changes in terms of both rates of change (ie velocity) and its acceleration or deceleration.

[1] Ashburner, J & KJ Friston (2005). Unified segmentation. NeuroImage 26(3):839–851.
[2] Ashburner J & GR Ridgway (2013). Symmetric diffeomorphic modeling of longitudinal structural MRI. Frontiers in neuroscience 6.
Environment
The student will be tightly integrated in our world-leading lab at UCL, primarily supervised by Prof. Ashburner. The student will have the opportunity to attend UCL courses in relevant subject areas, as well as to interact with students and postdoctoral researchers from other departments.
Funding
The studentship is funded for 3 years (1st Nov, 2013 – 31st Oct, 2016) and will cover UK/EU university tuition fees and an annual stipend of £18,000 (tax free). Note that overseas candidates (i.e., non EU/UK) can only be considered if they provide formal proof, at the time of application, of a scholarship which funds the additional overseas tuition fees.
Person specification
• A good degree in a mathematical or engineering subject (or equivalent EU/overseas degree), but ideally an MSc in a related area.
• Strong analytical/mathematical skills, preferably with some knowledge of Bayesian modelling approaches.
• Programming experience, preferably proficiency in MATLAB and C/C++.

- An interest in medical image processing, and a desire to learn more.
- Good communication skills - especially in written English.
- A strong work ethic, with the ability to think creatively and work independently.

Duties and Responsibilities

- Develop models for MR images under the direction of Prof. Ashburner.
- Implement and maintain the software arising from the PhD work.
- Work in collaboration with clinical researchers and MR physicists, who will help guide the project and who may need some training in making use of the PhD work.
- Prepare progress reports on research as required.
- Prepare manuscripts for submission to peer-reviewed journals.
- Prepare presentations, including text and images, for delivery by self and others.
- Travel for training, collaboration and other meetings or conferences.
- Contribute to the overall activities of the research team and department as required.
- Maintain an awareness and observation of Fire and Health and Safety Regulations at UCL and other facilities to be visited. Actively follow UCL policies including Equal Opportunities and Race Equality policies.

Informal enquiries

Please email Prof. John Ashburner for further information about the project (j.ashburner@ucl.ac.uk).

Application procedures

Application is by CV and covering letter (including motivation for applying) emailed to ion.educationunit@ucl.ac.uk. Candidates short-listed for interview will be required to give a short research presentation. Please put "WTCN Spine Studentship" in the subject line.