PhD Student Position at the University of Edinburgh in Machine learning for multimodality image segmentation

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Medical imaging is routinely used in clinical practice for evaluating and diagnosing disease. Typically, particularly with MRI, several different looking images are obtained (known as modalities), since each one of them portrays different information about the underlying anatomy and pathology. As a result, the amount of available medical imaging data collected is increasing, with several experts now agreeing that we can use machine learning to create artificial intelligence systems that can help the clinicians in their work. To train these systems we require significant amount of annotated images and in the context of many modalities, annotations for the same subject (patient) in all available modalities (a complete set).

However, this is not what is currently practiced by clinicians, since typically they ascertain the presence and extent of disease taking into account all of this information in a qualitative fashion. Then when quantitative measurements are necessary for diagnosis, they usually manually annotate (for example outlining the anatomy and pathology) a few out of all those images. While they primarily do this to save time, it really complicates the training of classical machine learning algorithms because we lack annotated datasets that are complete.

This project will investigate and develop machine learning algorithms that can deal with the above problem. Specifically, we will base our solutions drawing inspiration from areas of machine learning such as weakly supervised, semi-supervised, multiple instance, and transfer learning. These areas all come into play to aggregate information across the variety of imaging data and annotations available, since both qualitative (e.g., presence of disease) and quantitative information (e.g., annotations of a pathology) can be available but not for all datasets. Furthermore, since images of different modalities are available, to represent this information in a manner suitable for the machine learning algorithm, proper features have to be extracted. Thus, this project will also emphasize on how to best learn features relying on techniques stemming from the field of representation learning.

To achieve this, we are looking for an enthusiastic and strongly motivated student to join our group. He/she will have the opportunity to collaborate with our partners (in Edinburgh and USA) and participate in exciting projects particularly in cardiac imaging were medical image computing helps us understand physiology and provide solutions that aid diagnosis.

This position is fully funded for 42 months (3.5 years) and is open to all students with a preference for UK/EU nationals.

The University of Edinburgh is considered one of the top universities in the world according to recent rankings. The Institute of Digital Communications, in the School of Engineering, focuses on theory

and applications of signal processing in healthcare and communications, such as compressive sensing in MRI, large inverse problems in imaging, and medical image computing. In addition, we are in close proximity to excellent imaging facilities which include preclinical and clinical scanners as well as state-of-the-art dual modality scanners (e.g., PET/MR) and collaborate with several clinicians.

Edinburgh, the capital of Scotland, offers a vibrant professional life, excellent career opportunities and a high quality of life. It has a beautiful old part, has an abundance of café's, restaurants and bars, and yearly hosts the Festival and the Fringe, which is the largest arts gathering in the world.

Further Information:
For additional information on the research please see: http://tsaftaris.com
Information inquiries on the research can be addressed to Dr Tsaftaris: S.Tsaftaris@ed.ac.uk

To apply and for eligibility see here (applications accepted till position is filled):
http://www.eng.ed.ac.uk/postgraduate/research/projects/machine-learning-multimodality-image-segmentation
Helpful information on how to apply: http://tsaftaris.com/Instructions_on_how_to_apply.pdf