Deep Learning Analysis of 3D Ultrasound Images

PROJECT DESCRIPTION

Deep learning is being actively investigated in many areas of medical imaging, such as mammography and chest computed tomography, where computer-aided diagnosis using deep learning algorithms is gaining in acceptance for screening for breast cancer and lung cancer. Artificial neural networks generated by deep learning analysis have been added to computer workstations or ultrasound machines for internal post-processing.

The project aims at developing deep learning techniques for automatic processing of 3D ultrasound images, particularly the generation of 3D shape models via segmentation, and diagnostic image classification. Multiple use cases are possible; we currently focus on 3D ultrasound of infant hips, where the clinical task is to detect hip dysplasia, which leads to disability and premature osteoarthritis if untreated. An overview of the approach is shown in Figure 1. Ultrasound scans of infant hip are recorded in DICOM format and are used as input to deep learning networks which contain several hidden layers. Once the network is trained over a large number of ultrasound recordings it generates the desired output as a 3D shape model or as an image classification.

The student task will be to assist in developing the architecture for deep learning, including working with the team to optimize neural network design, preparing training and test set data from our approximately 2,000 patient multi-centre database, and performing the main analysis and sensitivity analyses for a variety of input indices. Since the database already exists and is waiting to be analyzed, a 12 week project is sufficient for a motivated student to generate a deep-learning network. Our team includes several members with expertise in deep learning, from Edmonton and Stanford, and the student will gain valuable practical experience in this increasingly popular computing task.

FACULTY-DEPARTMENT

Medicine- Radiology

DESIRED FIELD OF (STUDENT) STUDY

Computer Science or Engineering

INTERNSHIP LOCATION

University of Alberta Main Campus - Edmonton

NUMBER OF INTERNSHIP POSITIONS

1

INTERNSHIP START DATE

July 4

INTERNSHIP END DATE

3 months after start date

ARE THE DATES FLEXIBLE?

Yes, I am flexible regarding the internship dates. Selected students can contact me to request a date change.