CMPT 880 - G100 Special Topics in Computing Science

Instructor(s): Ghassan Hamarneh

Calendar Objective/Description:
This course aims to give students experience to emerging important areas of computing science.

Instructor's Objectives:
Medical Imaging Meets Machine Learning. Anatomical and functional medical imaging modalities (such as MRI, X-ray CT, Ultrasound, Positron Emission Tomography, Single Photon Emission Computed Tomography, and Functional Magnetic Resonance Imaging) are allowing us to peer inside the human body and providing scientists and physicians with a wealth of information indispensable for understanding, modelling, diagnosis and treatment of diseases. The number of medical images acquired on a daily basis is growing, finer details are captured and larger image sizes are produced, and the dimensionality of images is increasing from two dimensional scalar images to dynamic 3D multi-valued fields. This is resulting in image data that cannot be effectively and accurately processed with traditional simple visual inspection techniques. The development of computational tools for medical image analysis therefore has tremendous value and is the focus of this course. A specific emphasis will be given to recent machine (deep) learning techniques for medical image analysis. By reading and discussing recent research papers on medical image analysis we will explore topics in medical imaging, image processing/filtering, image segmentation, image registration and shape modeling in the context of different applications such as computer aided diagnosis and statistical shape analysis.

Prerequisites:
instructor discretion.

Topics:
- Medical image processing/filtering
- Medical image segmentation
- Medical image registration
- Machine learning and deep learning
- Deformable shape modeling and analysis
- Clinical applications

Grading:
To be discussed in the first week of classes. Grading will be primarily based on students' active participation in the discussions, paper presentations, assignments, and a project.

Academic Honesty Statement:
Academic honesty plays a key role in our efforts to maintain a high standard of academic excellence and integrity. Students are advised that ALL acts of intellectual dishonesty will be handled in accordance with the SFU Academic Honesty and Student Conduct Policies (http://www.sfu.ca/policies/gazette/student.html).