



Thesis Project Form

Title (tentative): Biomedical imaging and data analysis for the validation of a new diagnostic technique for the study of the hepatic fibrosis

Thesis advisor(s): Dellepiane Silvana, Marco Trombini (DITEN); Paolo Borro (Policlinico San Martino)

E-mail: Silvana.Dellepiane@unige.it

Address: Via all'Opera Pia 11 (ex-CNR) - 16145 Genova, Italy

Phone: (+39) 010 33 52754

Description

Motivation and application domain

In the past a widely spread approach to the study of liver diseases consisted of a laparoscopy in the abdominal region, aimed at visualizing the surface of the Glisson's capsule. This technique was deeply invasive as also currently used ones such as biopsy. Other techniques can have different problems e.g. user-dependance for the shear-wave analysis. Diagnostic imaging represents an alternative to standard approaches but it still requires to be validated via an appropriate study on its efficacy.

General objectives and main activities

The starting point for the proposed work is the study of liver diseases based on laparoscopy. The surface of the Glisson's capsule is notable also in ultrasound liver images, in the shape of a line that known as Glissonian line. Image processing techniques can be used to identify it and study its geometric properties, in order to extract features that will be analyzed via a machine learning approach. For instance, a continuous line is symptomatic of a healthy liver, hence continuity is a feature that can be analyzed to discern people suffering from hepatic disease from people in good health. Since ultrasound imaging is a completely non-invasive diagnostic technique, an ultrasound-based diagnostic method can be a relevant innovation in the framework of hepatic diseases study. The scope of this work is the validation of the new diagnostic method, aiming at obtaining a supervised classification of ultrasound images whose accuracy is comparable to the outcomes of standard techniques.

Training Objectives (technical/analytical tools, experimental methodologies)

- _ Creation of a supervised database of liver images collecting medical classification and outcomes of the standard diagnostic techniques (in collaboration with Ospedale Policlinico San Martino, Clinica Gastroenterologica).
- _ Extraction of features from ultrasound images of the liver.
- _ Development of machine learning algorithm for classification and evaluation of its performance.

Place(s) where the thesis work will be carried out: DITEN

Additional information

Pre-requisite abilities/skills: Knowledge of basics image processing techniques and of pattern recognition and machine learning algorithms, good programming skills (MatLab/Python preferred).

Maximum number of students: 1