**INTRODUCTION**

Optical Coherence Tomography is a relatively new imaging modality that is able to penetrate the tissue and visualize the underlying structure in very high resolution. Recently, commercial systems have become available for OCT imaging of the esophagus. This has enabled gastroenterologists to inspect the underlying tissue layers of a possibly malignant lesion. Since early cancerous tissue exhibits distinct patterns in the submucosal layers, this technique opens the door to in-vivo pathology in the esophagus.

In short: with OCT imaging, it is possible to see if a patient is developing esophageal cancer by inspecting the tissue beneath the surface. Furthermore, the physician can see if the cancerous lesion has grown through several tissue layers, and determine the best treatment. In many cases, the early lesion still resides in the upper layers of the esophagus, and it is possible to surgically remove the cancerous tissue. In this case, the disease is tackled in the earliest stage, and the patient is cured before he even noticed that he was ill.

**PROBLEM DESCRIPTION**

Since OCT has become available only recently, and the submucosal patterns associated with cancer are hard to detect, physicians cannot yet exploit its power to the full extent. Therefore, supportive image analysis algorithms can be of great help with OCT imaging. By analyzing the tissue layers in OCT images, a computer algorithm can support the physician in his decision. Figure 1 shows a simple algorithm that expose irregular tissue layers of a cancerous lesion, in contrast to the more regular layers in normal tissue.

**ASSIGNMENT**

The VCA research group (EE) offers a nine-month graduation project, in which the feasibility of a supportive image analysis algorithm for OCT images of the inner esophagus is investigated. Traditional image processing methods and more complex machine learning-based methods are explored. As an example, Figure 1 shows that relatively simple methods already yield some promising results. The algorithm will be clinically evaluated with 60 real OCT images of esophageal tissue (30 cancer / 30 no cancer).

This project is carried out in collaboration with the Academic Medical Center (AMC) in Amsterdam and the Catharina Hospital in Eindhoven. During the graduation project, the student will spent the majority of the time at the VCA research group of Eindhoven University of Technology. However, for consult with the involved clinical partners, the student will eventually visit both hospitals.

**STUDENT PROFILE**

We are looking for a highly motivated student with a background in signal processing and experience with MATLAB. Knowledge of machine learning and image processing is a plus. Since this project is at the frontline of research, the results of this project will be published in a scientific paper, which will be (co-)authored by the student.

If you are interested in this Master graduation project, please contact:

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