Graduate Student: **Danelakis Antonios**

Master Thesis Title:

Development of automated diagnostic software for breast MRI examination

Abstract:

Breast diseases, and especially cancer, are very common pathologies for women worldwide. Nonetheless, timely diagnosis allows proper treatment, which is the reason why radiology methods are used. The most established radiology method is the magnetic resonance imaging (MRI), which produces magnetic mammographies. It presents less risk for the patient and at the same time produces high resolution images. MRI operates on a number of breast scans and each scan consists of a number of slices.

Radiologists use the set of the slices, produced by MRI, in order to detect pathological regions within the breasts. To achieve this, they follow three major steps for each MRI slice. First, regions with acute intensity are selected. Then, using appropriate software, they produce an intensity change curve, for each selected region, among all scans, for the current slice. Finally, the same software produces the ascent and descent slope of the intensity change curve color maps. Using the curves and the color maps, radiologists decide whether a region is normal or not. Let us consider that the number of slices of a single scan is *T*, and the number of scans is *S*. Then, the total number of slices that must be processed is *S***T*. As stated, the above procedure should take place for each slice. If we consider that *T* is of the order of hundreds, it is evident that the above procedure is very time consuming and tiring for the radiologists.

The purpose of the software developed within the present master's thesis, is the automation of the above procedure. The input of the software is the set of all scans of the MRI images for a specific slice. The output of the software is the set of the breast regions which are suspect for existence of pathology. In addition, the software produces the intensity change curves of the regions as well as the slope color maps. This makes the job of radiologists easier, faster and more accurate. The results of the software can be used to support medical decisions and not to create them. The software is intended to operate with minimum risk; if a region is marked by the software, it not necessarily abnormal, but if a region is not marked, then it is certainly normal.

The developed software was subjected to initial clinical trials with impressive results. It successfully detected all the medically diagnosed breast regions for the pathological cases.

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