

# Computer-Aided Diagnosis of Digital Mammography

## Motivation

Computer-aided diagnosis (CAD) is defined as a diagnosis made by a radiologist who uses the output of a computer analysis of the images when making his/her interpretation. Conventionally, CAD can be categorized as either Computer-aided detection (CADe) or Computer-aided diagnosis (CADx). In CADe, the goal is to identify and mark suspicious areas in an image with goal to help radiologists avoid missing a cancer in screening radiology. On the other hand, CADx helps radiologists decide if a woman should have a biopsy or not by estimating the likelihood that a lesion is malignant in clinical radiology. Each involves manipulation of digital images using segmentation, feature extraction, feature selection, and classification techniques. In this project, we will build a functional CAD system and test it on a real digital mammography data set and evaluate the performance of the system, using quantitative metrics.

## Research Tasks Involved

- A. Digital mammography data set handling and manipulation.
- B. Design a feature extraction methodology from a region of interest (ROI).
- C. Design a feature selection strategy that identify useful features.
- D. Design a methodology to detect abnormal ROIs (Binary classification - CADe).
- E. Design a methodology to classify ROIs into their correct pathology (CADx).
- F. Design quantitative evaluation criteria to assess the results of different methods.

## Design Input

- MiniMIAS Digital Mammography Database with matlab code to read it.
- Sample reconstructed medical images (CT, ultrasound, and mammography images).

## Design Output

- A lab notebook (preferably in Microsoft OneNote® format) with all the experiments done to address each of research tasks listed above including documented Matlab code for each.

## References

[1] Francesco Sardanelli and Giovanni Di Leo, *Biostatistics for Radiologists, Planning, Performing, and Writing a Radiologic Study*, Springer-Verlag Italia, 2009.