

Abstract of the talk:

Theme: Application of digital image processing, computer vision, pattern recognition, content-based retrieval, data mining, and indexed atlas techniques to analyze mammograms for computer-aided diagnosis of breast cancer.

Breast cancer and mammography: Mammograms are difficult images to interpret, especially in the screening context. Objective methods for the analysis of mammographic features are needed for the development of computer-aided methods to assist radiologists in the evaluation of ambiguous features. This seminar will present an overview of several image processing techniques that we have developed over the past 20 years for the following applications:

- Contrast enhancement
- Detection of calcifications
- Analysis of calcifications
- Detection of masses and tumors
- Shape analysis of tumors
- Texture flow-field analysis of masses
- Texture analysis of tumors
- Detection of the skin-air boundary, pectoral muscle, and the fibro-glandular disc
- Analysis of bilateral asymmetry
- Detection of architectural distortion
- Pattern classification and computer-aided diagnosis.

Objective analysis of mammograms: The representation of signs of breast cancer in mammograms for computer-aided analysis requires the design of a number of descriptors to represent the features of diagnostic value with minimal loss of information. We have developed techniques to extract the following features from mammograms:

Calcifications: contours, shape factors, spatial distribution parameters.
Masses: contours, shape factors, texture and gradient measures, size, location. Bilateral asymmetry: statistics of the directional distribution of tissue in the fibro-glandular disc, spatial-geometric moments of the fibro-glandular disc. Architectural distortion: geometric parameters of the distorted area, location.

The seminar will present general descriptions and examples of the techniques listed above. Our latest work on the application of Gabor filters, phase portraits, and oriented texture analysis for the detection of architectural distortion will be described in detail.