APPLICATION OF IMAGE PROCESSING TECHNIQUES TO BONE RADIOGRAPH IMAGES FOR OSTEOPOROSIS DIAGNOSIS

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DESCRIPTION OF THE PROBLEM:

Osteoporosis is a disease characterized by low bone mass and loss of bone tissue that may lead to weak and fragile bones. It is often called a “silent disease” because it usually progresses without any symptoms until a fracture occurs. About 54 million Americans have low bone mass, placing them at increased risk for osteoporosis [1]. A low bone mineral density (BMD) is presently regarded as the most important risk factor for the development of osteoporosis. However, BMD can represent only 60% fraction prediction rate [3], estimated by the dual-energy X-ray absorptiometry. Bone structure can be examined by analysing the 2D texture of conventional radiographs. The evaluation of osteoporosis from bone radiograph images presents a major challenge for medical image processing. There arises difficulty in classifying textured images from the bone structure of osteoporotic and healthy subjects because of the high degree of similarity [3].

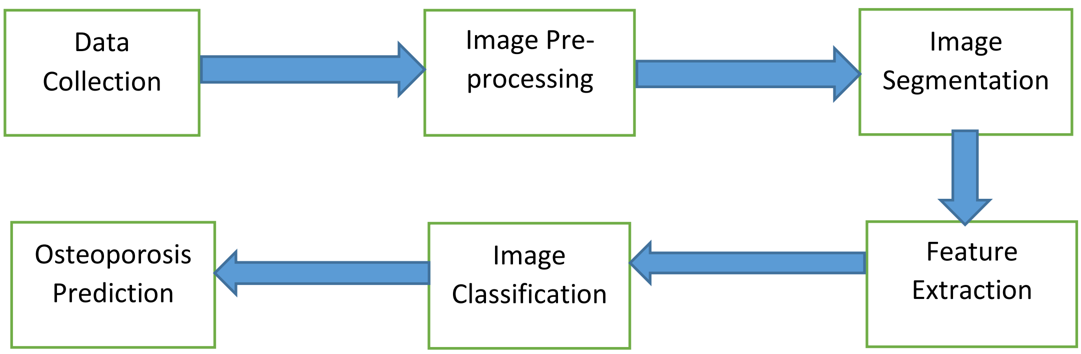
OBJECTIVES:

In this project, we plan to use image processing as a tool for 2D texture analysis of bone radiograph images. We aim to improve and execute existing ideas in the feature extraction/selection process. Finally, we plan to use machine learning techniques on the extracted feature data to identify osteoporotic subjects from healthy subjects.

LITERATURE REVIEW:

This project is an extension of the IEEE-ISBI bone texture characterization challenge[1]. De-noising an image involves preprocessing techniques. Efficient preprocessing can be done by filtering, followed by enhancement [4]. A brief study of texture analysis techniques have been discussed in [2], [3], [5]. The papers present a view of popular techniques such as the first order and the second order methods, model based approaches, filter banks based methods, fractal dimensions and edge histogram methods, etc. Novel feature selection techniques described in [4], [3] has been proved to increase the efficiency of osteoporosis diagnosis. The performance metrics calculated suggests that Bayes Network classifier is the most efficient ML technique.

WORK PLAN OF THE PROJECT:



The detailed work plan for each team member is shown in the Gantt chart.

[1] http://www.univ-orleans.fr/i3mto/challenge-ieee-isbi-bone-texture-characterization

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- [5] Brodatz, Phil. *Textures: a photographic album for artists and designers*. Dover Pubns, 1966.