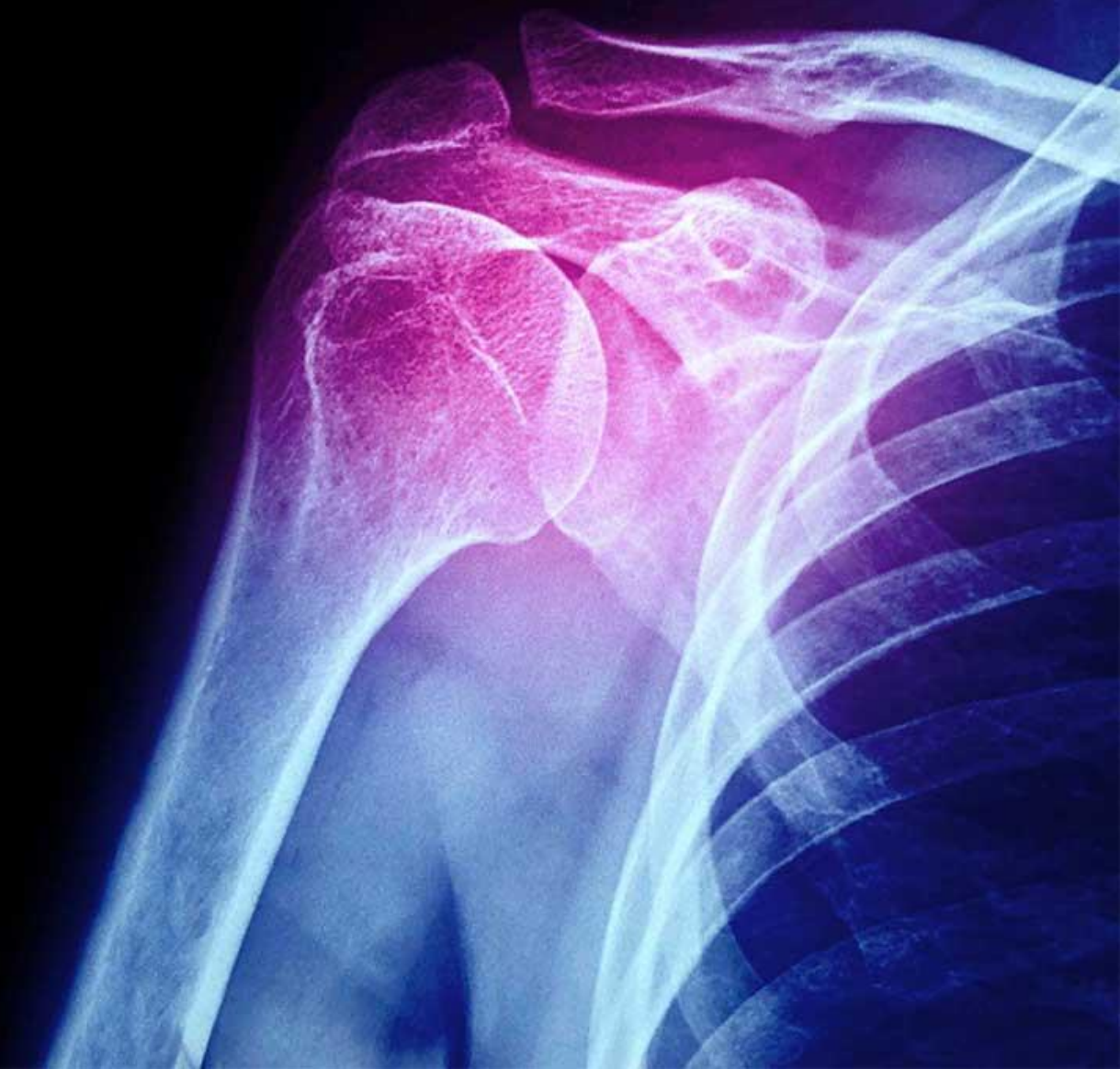
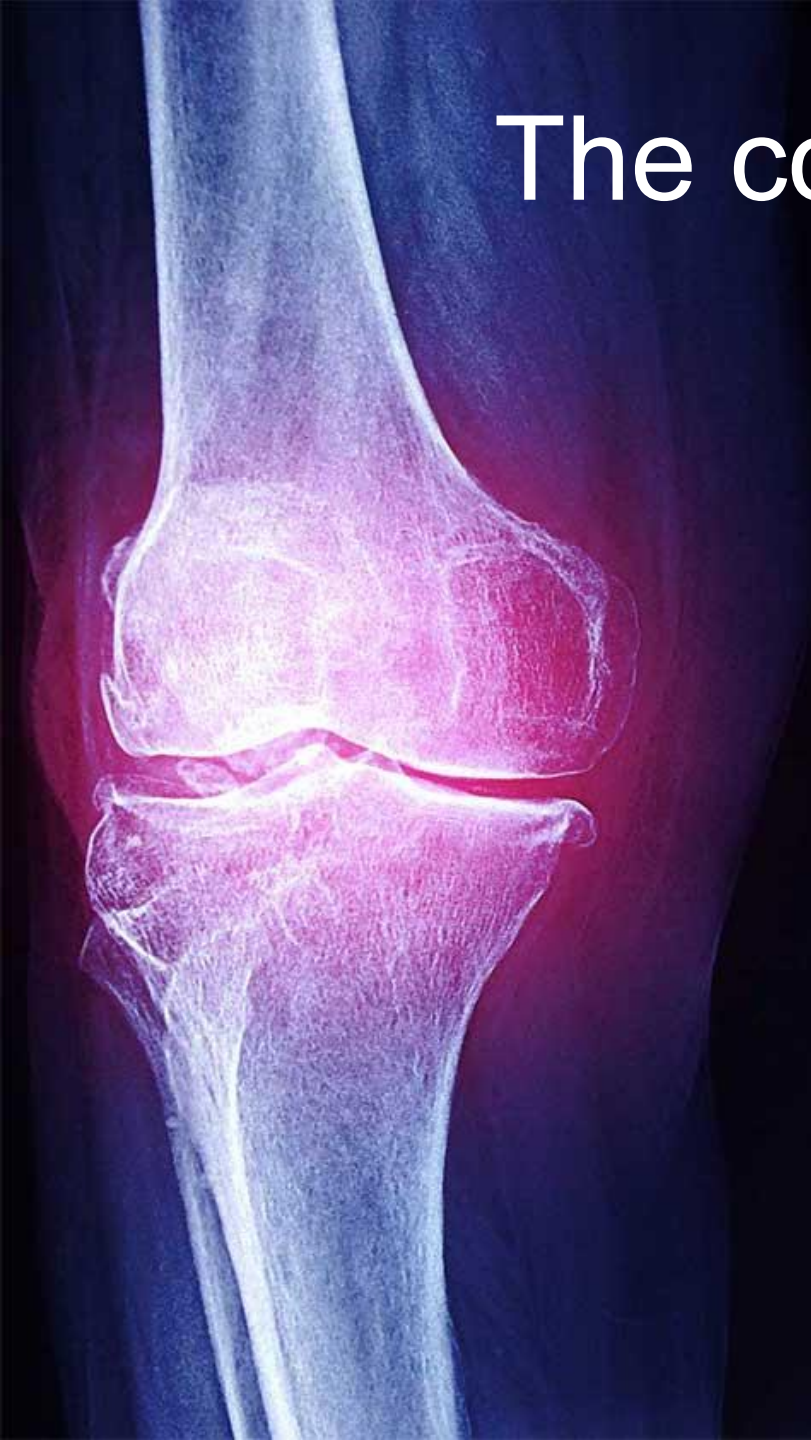
Medical Image Processing

Lecturer: Ph.D Bao-Thien Nguyen-Tat
Faculty of Information Science and Engineering
University of Information Technology

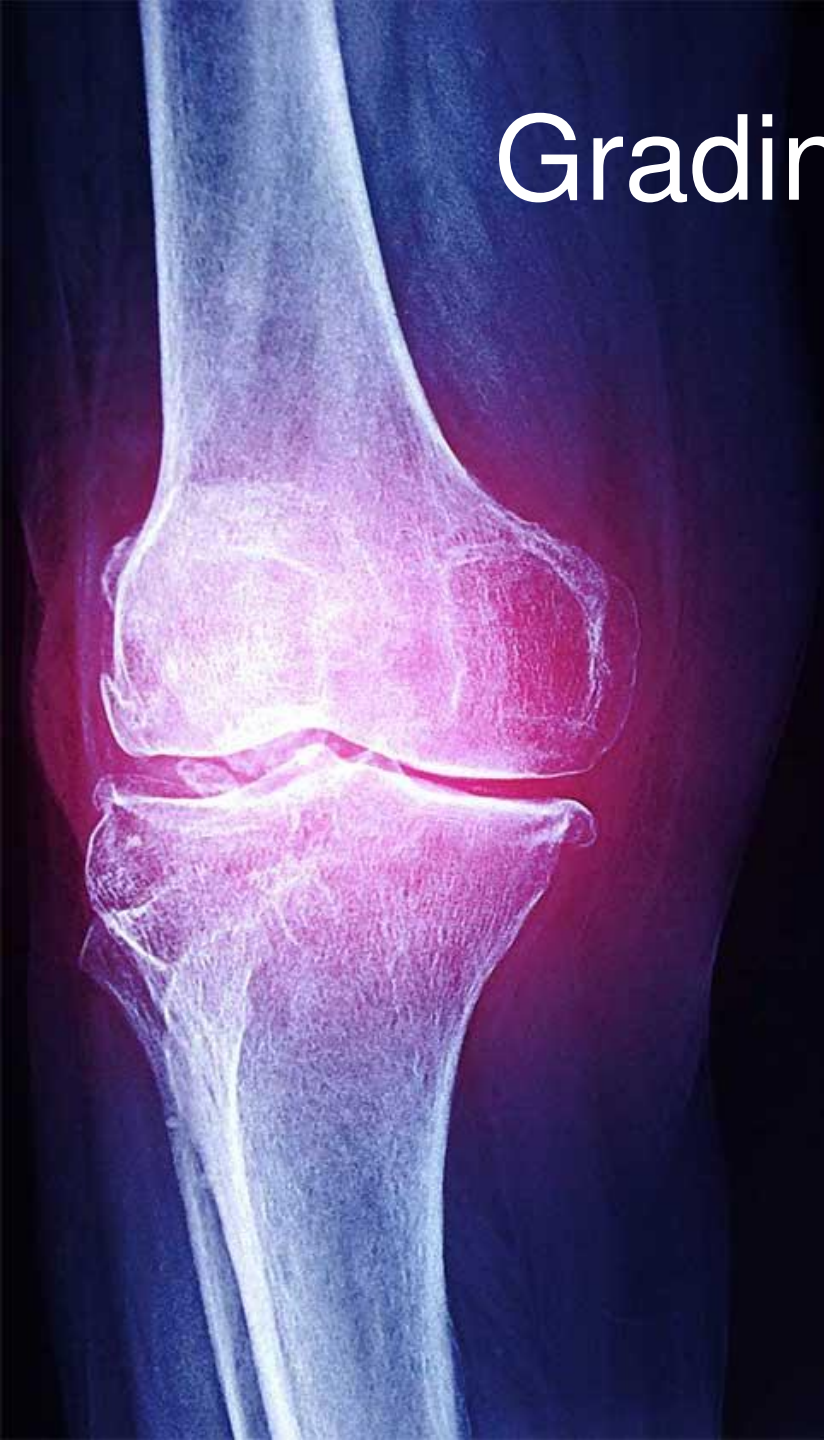


The course’s information

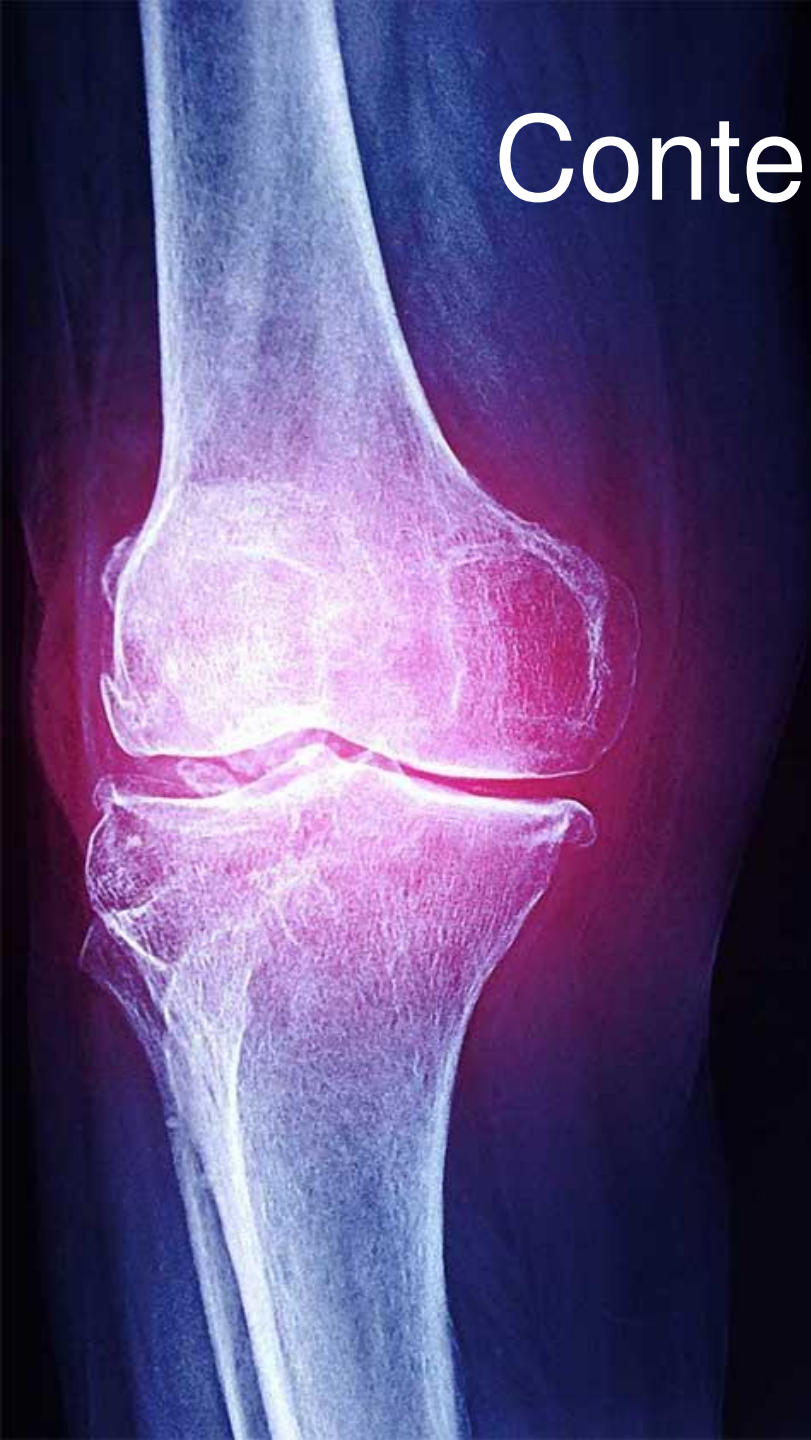


- Value: 03 credits
- Type of course: Elective
- Textbooks:
  1. Nguyen-Tat, B.-T. (2023). "Medical Image Processing" (slides). UIT, HCM.
  2. Dougherty, G. (2009). *Digital Image Processing for Medical Applications*. Cambridge, UK; New York: Cambridge University Press. ISBN: 9780521860857, 0521860857.
  3. Bankman, I. N. (2009). *Handbook of Medical Image Processing and Analysis*, 2nd Edition. CA, USA; San Diego: Academic Press. ISBN: 0123739047.

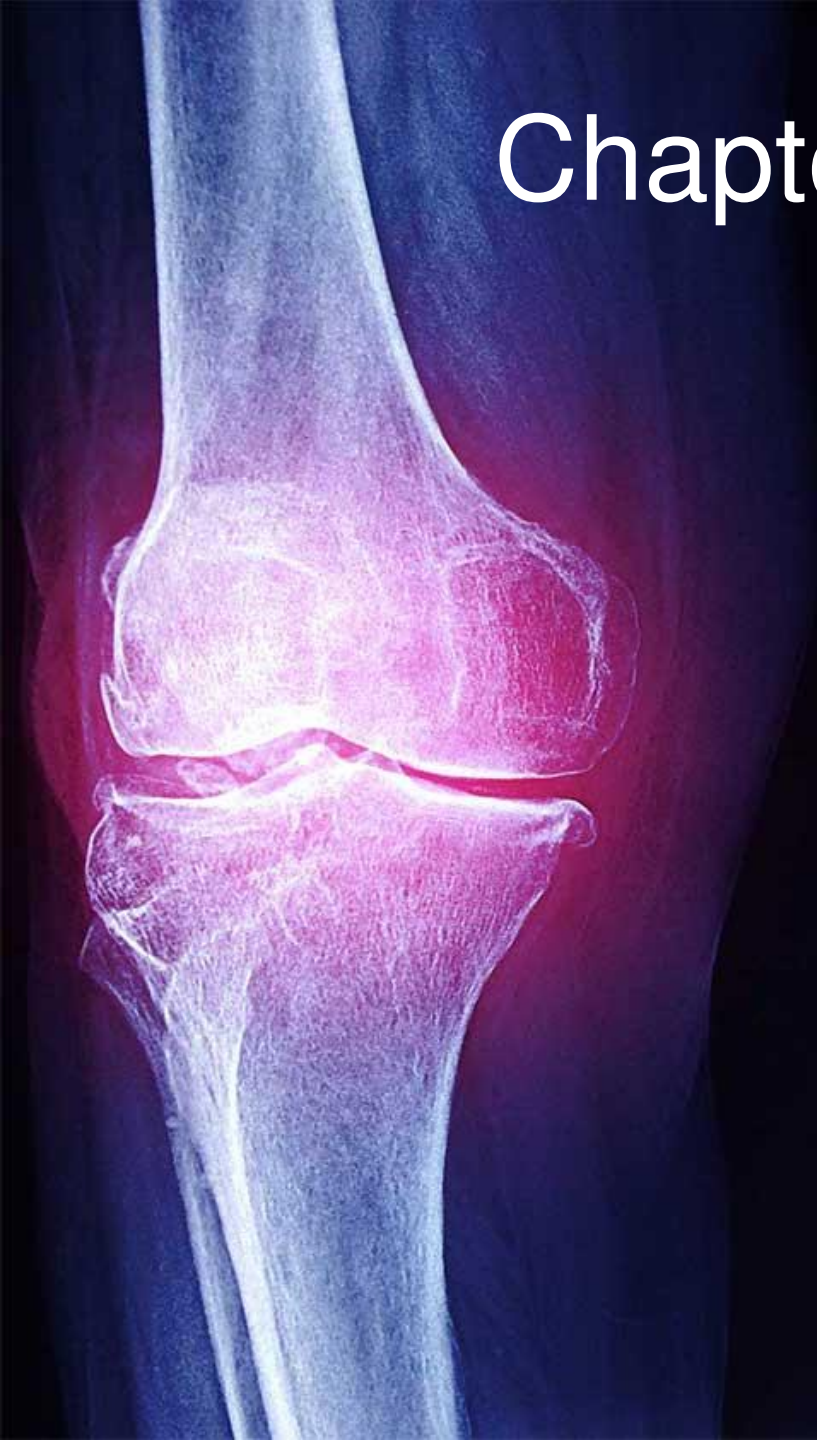
Grading



Method	Percentage
Homework and others (***class attendance***, participation in Q&A, class notes, quizzes, and so on)	30
Lab	0
Mid-term test	0
Final exam	0
Assignment	70



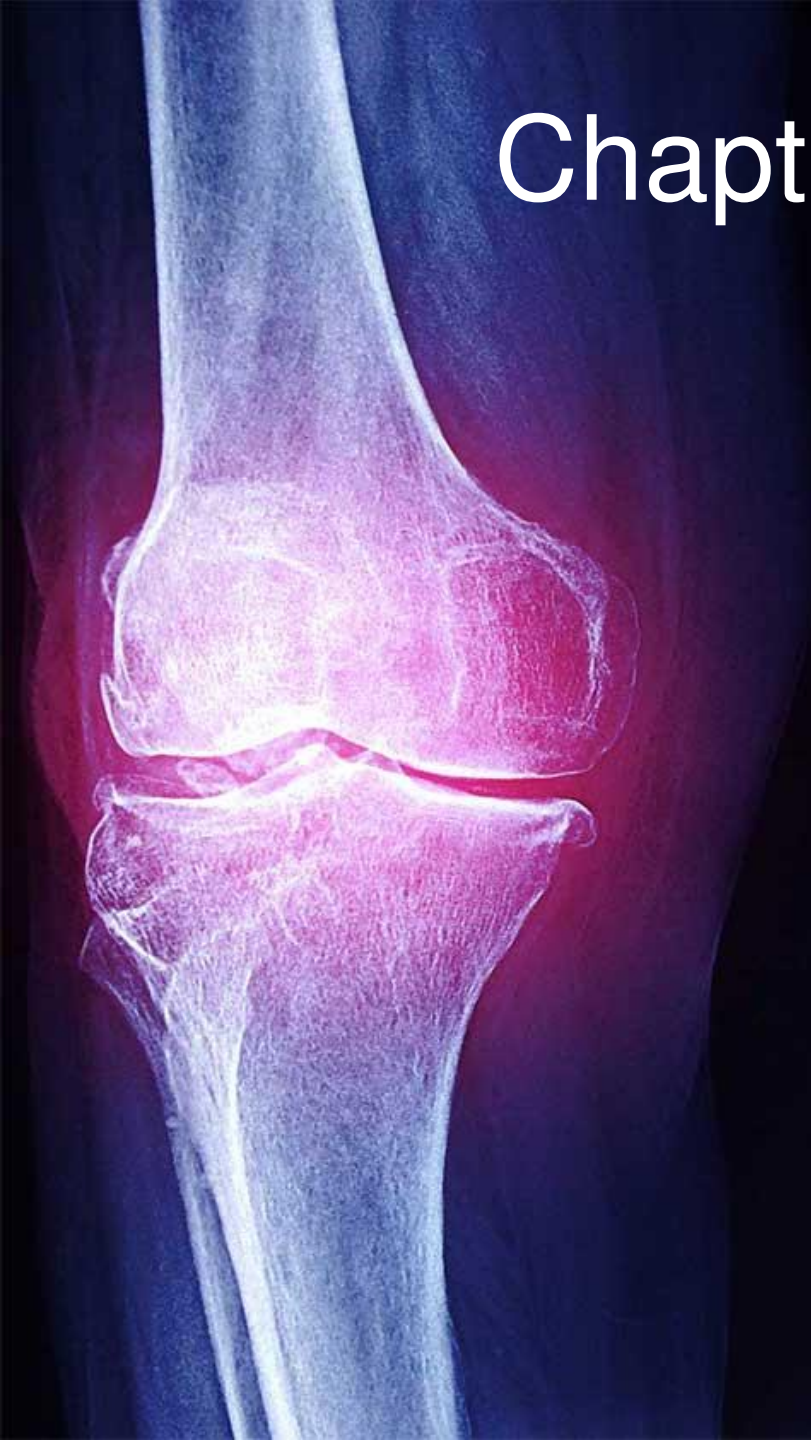
Content



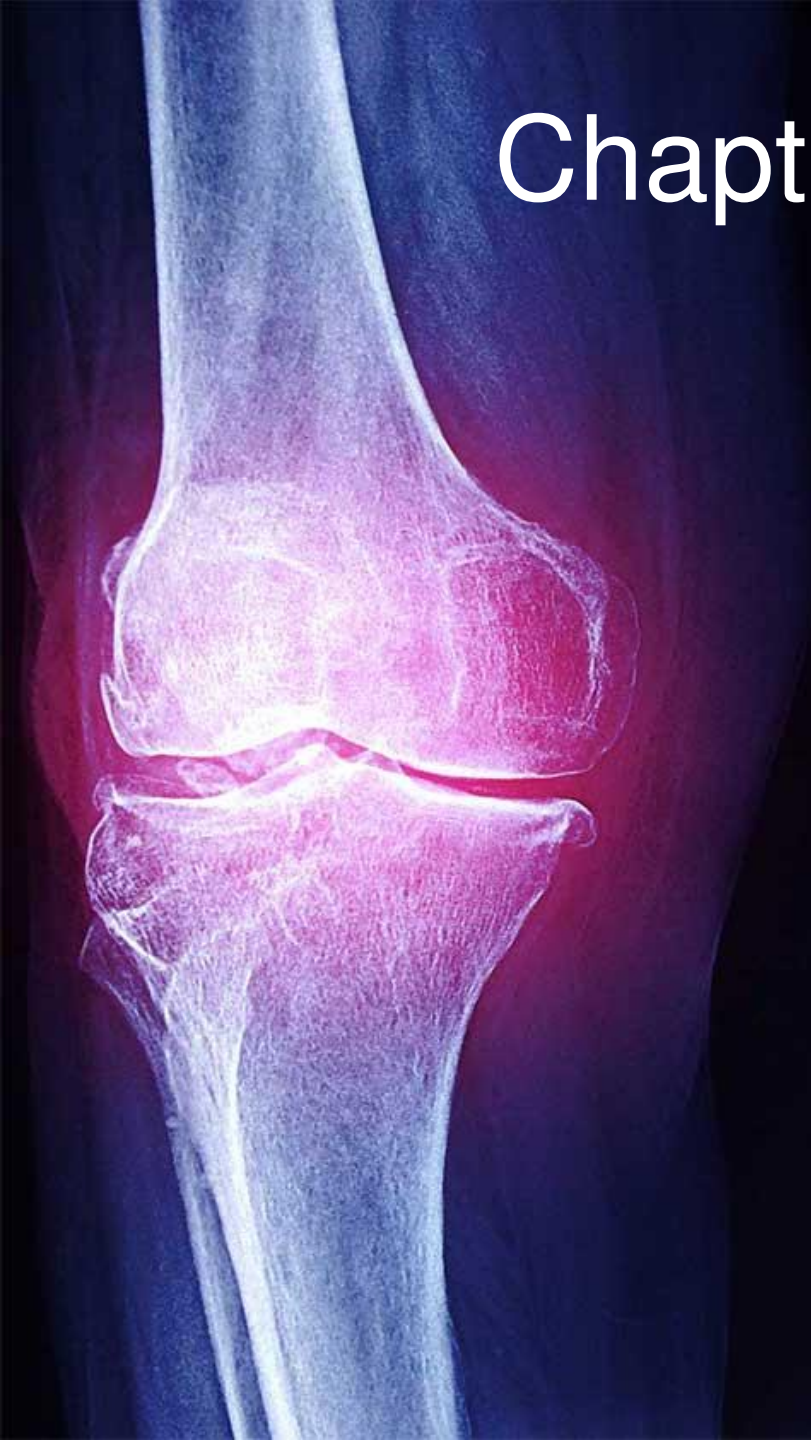
Chapter 1: Introduction

- This chapter presents an overview of disease screening procedures for a chosen disease.
- The invasive and non-invasive image recording procedures existing present in literature and the assessment of the images are discussed briefly along with appropriate examples.

Chapter 2: Image Examination



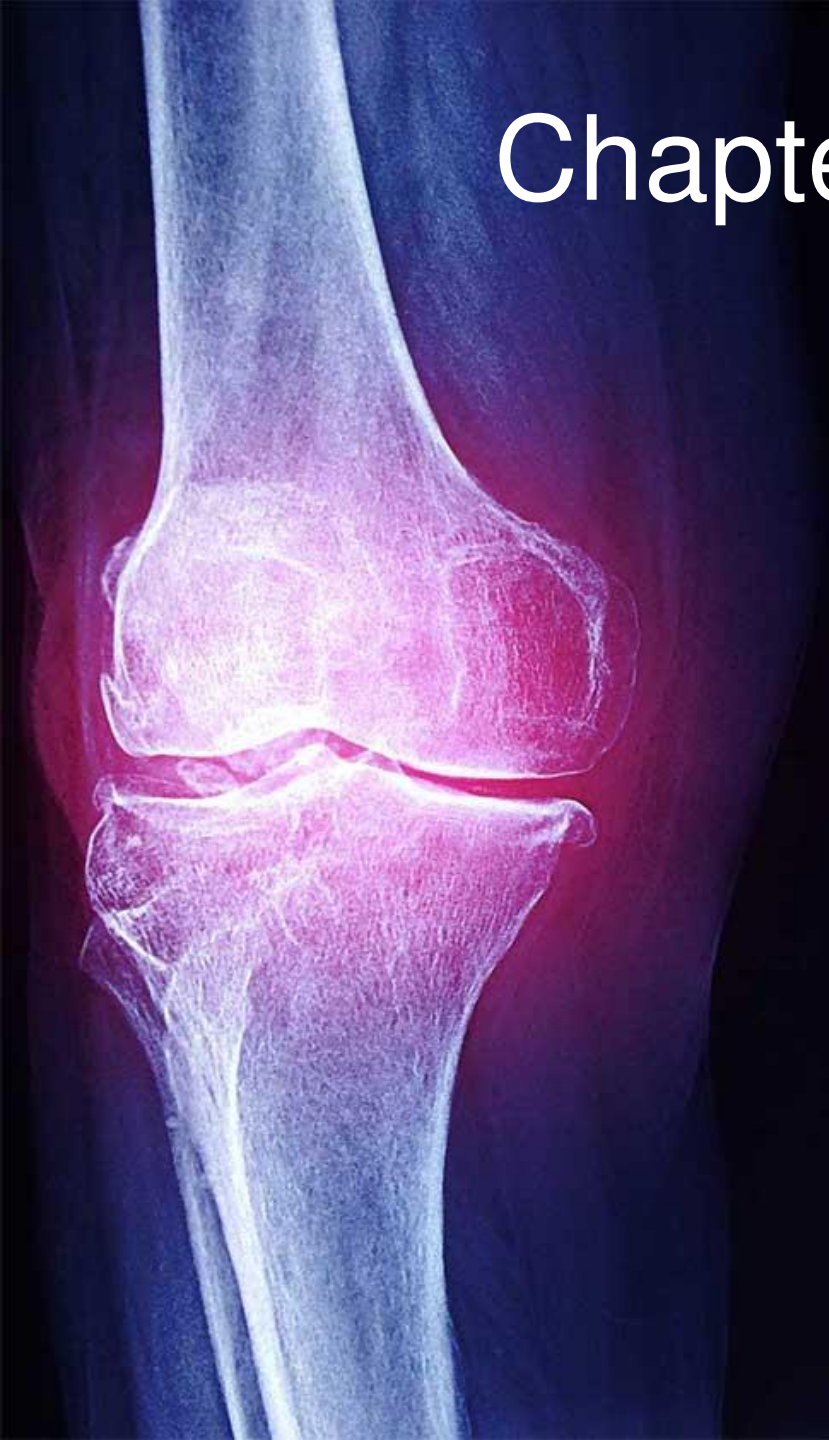
- The preliminary level, which intends to reveal the body function with imaging, is known as the raw or unprocessed image. These images are contaminated with artifacts, along with the normal segment to be examined.
- To eliminate the artifact and to enhance the image segment, it is important to implement an image pre-processing technique which improves the condition of the image. This section discusses primarily used image enrichment techniques to pre-process the raw recorded image.



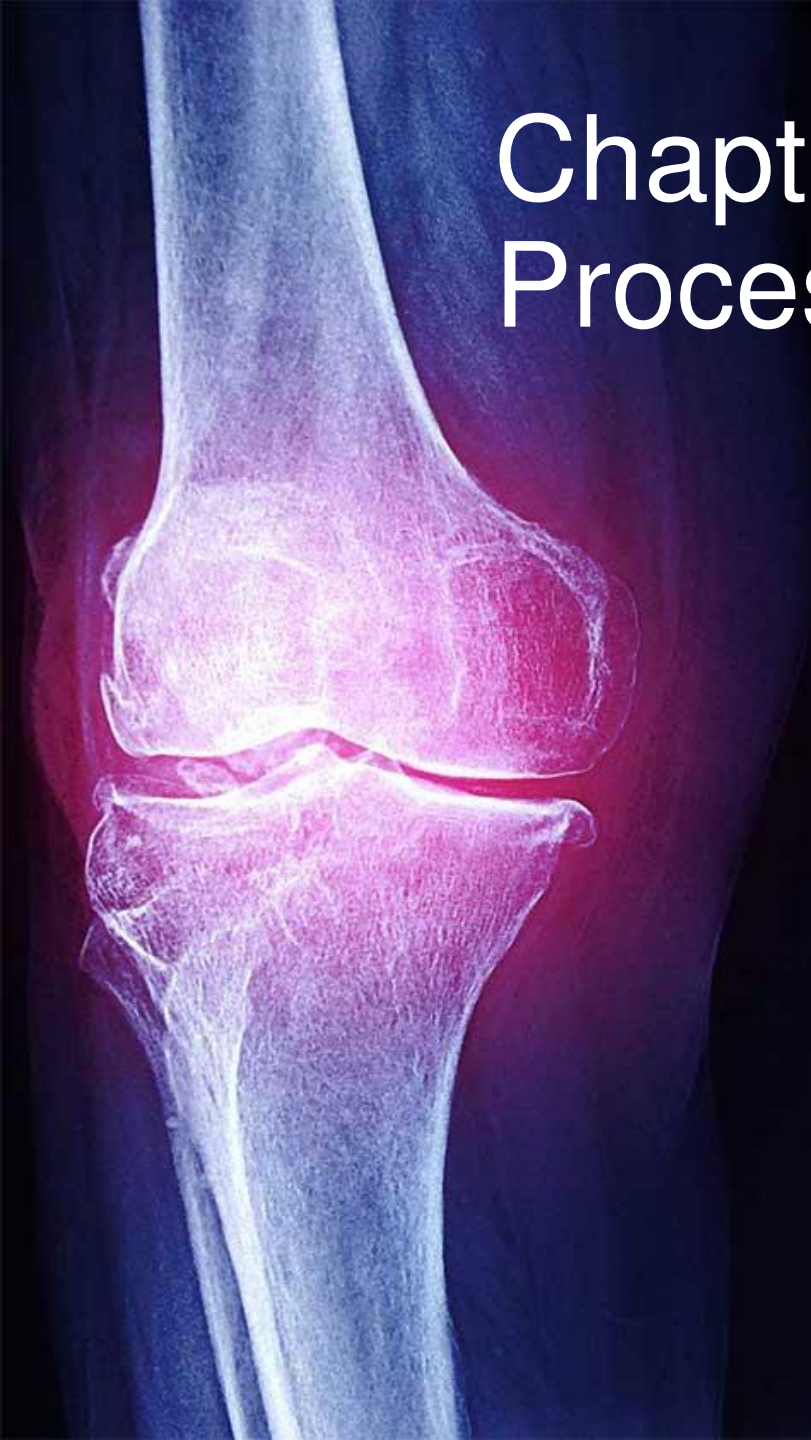
Chapter 3: Image Thresholding

- The implemented image processing schemes improve the condition of the unprocessed image using a variety of methodologies such as edge-detection, noise-removal, contrast enrichment, and thresholding.
- Due to its reputation and practical significance, a variety of gray/RGB-scale image threshold selection methods are implemented by the researchers to process the digital photographs recorded through varied modalities.
- A preferred thresholding practice improves the visibility of a section by grouping related pixels according to the selected threshold value.

Chapter 4: Image Segmentation

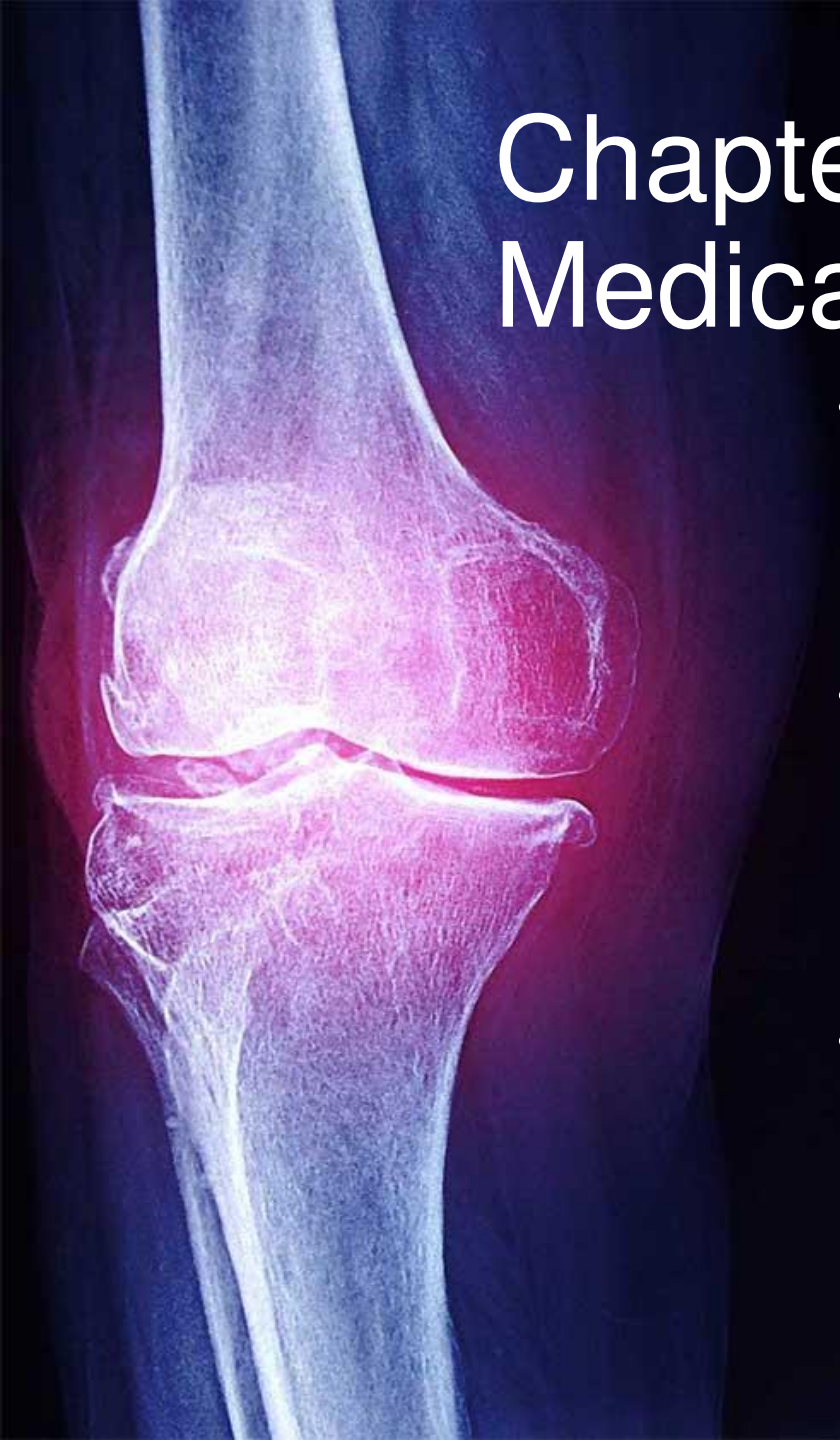


- Segmentation is one of the important image processing techniques implemented to extract a particular section of the image.
- A considerable number of the SOI extraction techniques are available in the literature. Based on the implementation, it can be classified as (i) automated segmentation and (ii) semi-automated segmentation techniques.
- The choice of which depends on the expertise of the operator and the complexity of the test image to be examined.



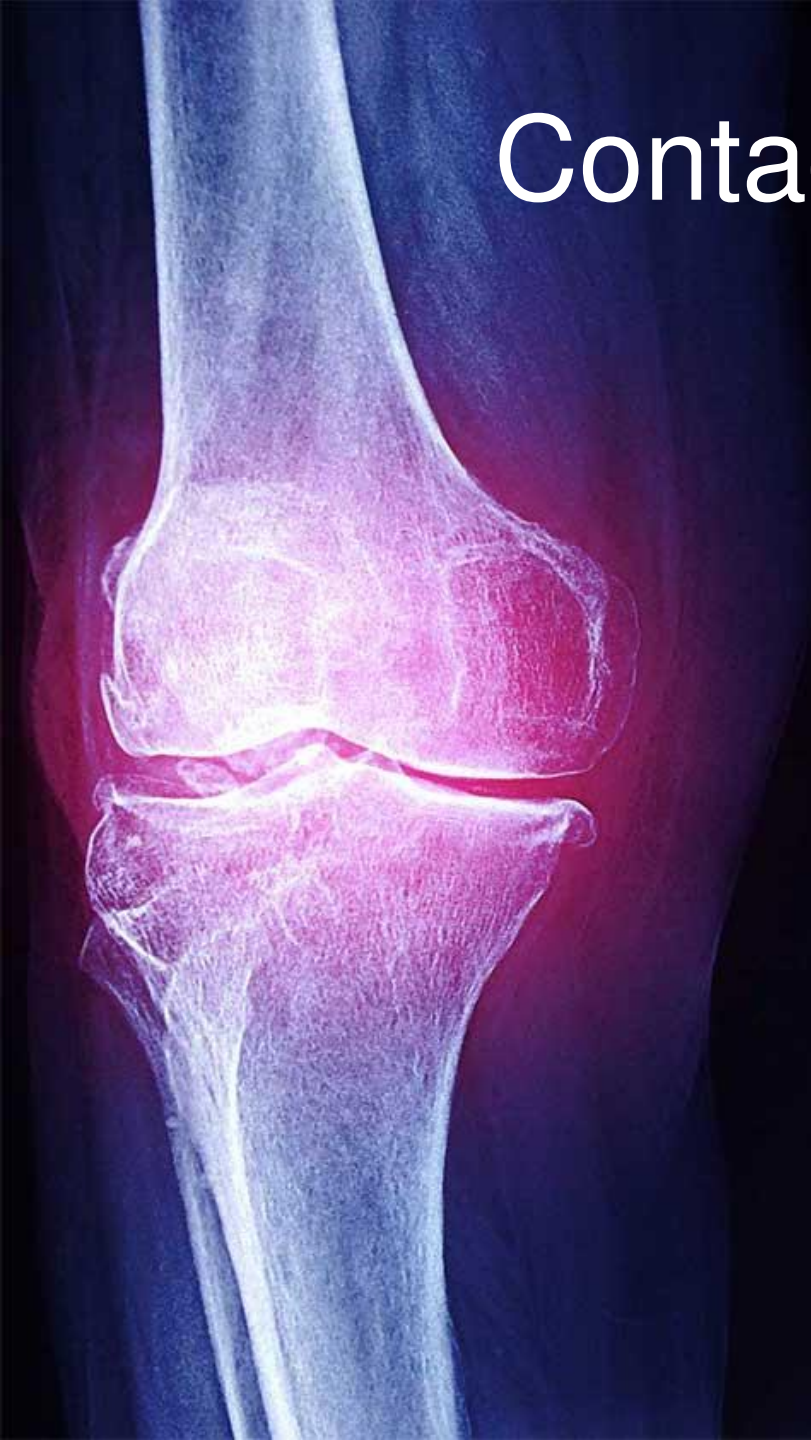
Chapter 5: Medical Image Processing with Hybrid Methods

- The use of ML systems has considerably increased due to its simplicity and detection accuracy. Earlier research work confirms that the ML-based disease detection plays a vital role in detecting a variety of diseases with higher accuracy.
- The choice and implementation of a chosen ML technique depends on the availability of the computer software and the expertise of the scientist who developed the software.
- The ultimate aim of the ML scheme is to provide improved disease detection accuracy and to adapt for use on images recorded with varied modalities.



Chapter 6: : Deep Learning for Medical Image Processing

- The availability of high-end computing facilities and the necessary software allows the implementation of Deep-Learning Architectures (DLA) for the automated detection of diseases with higher accuracy which is supported by the literature using examples of traditional and customary DLA.
- The main advantage of the DLA is it is designed to examine RGB-scale images while also working well on a class of greyscale images. The main limitation of the DLA, on the other hand, is that before executing the detection process, the images to be examined requires resizing into recommended dimensions, such as 227 × 227 × 3 or 224 × 224 × 3.
- Traditional DLAs, such as AlexNet, Visual Geometry Group-16 (VGG-16), VGG-19, Residual Network (ResNet) with various layer sizes such as 18, 34, 50, 101 and 152, and other traditional or customary architectures are chiefly considered to examine medical-grade images to support the automated disease detection process.



Contact information

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