Chapter 16
Image Processing Including Medical Liver Imaging:
Medical Image Processing from Big Data Perspective, Ultrasound Liver Images, Challenges

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ABSTRACT

Medical diagnosis has been gaining importance in everyday life. The diseases and their symptoms are highly varying and there is always a need for a continuous update of knowledge needed for the doctors. The diseases fall into different categories and a small variation of symptoms may leave to different categories of diseases. This is further supplemented by the medical analysts for a continuous treatment process. The treatment generally starts with a diagnosis and further goes through a set of procedures including X-ray, CT-scans, ultrasound imaging for qualitative analysis and diagnosis by doctors. A small level of error in disease identification introduces overhead in diagnosis and difficult in treatment. In such cases, an automated system that could retrieve medical images based on user's interest. This chapter deals with various techniques, methodologies that correspond to the classification problem in data analysis process and its methodological impacts to big data.

INTRODUCTION

Fast development in the field of medical and healthcare sector is focused on the diagnosis, prevention and treatment of illness directly related to every citizen's quality of life. Medical imaging is a key tool in clinical practice, where generalized analysis methods such as image pre-processing, feature extraction, segmentation, registration and classification are applied. A huge number of varied radiological and patho-

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logical illustrations in digital format are generated by hospitals and medical centers with sophisticated image acquisition devices. Anatomical imaging techniques such as Ultrasound, Computed Tomography and Magnetic Resonance Imaging are used daily over the world for non-invasive human examinations.

All the above imaging techniques are of intense significance in several domains such as computer-aided diagnosis, pathology follow-up, treatment planning and therapy modification. The information extracted from images may include functional descriptions, geometric models of anatomical structures, and diagnostic assessment. Different solutions such as Picture Archive and Communication Systems (PACS) and specialized systems for image databases address the problem of archiving those medical image collections. The obtained classification results can serve further for several clinical applications such as growth monitoring of diseases and therapy. The main contribution of this research is to address the accuracy of ultrasound liver image classification & retrieval by machine learning algorithms. Among all medical imaging modalities, ultrasound imaging still remains one of the most popular techniques due to its non-ionizing and low cost characteristics (Nicolas Dobigeon, Adrian Basarab, Denis Kouame, & Jean-Yves Tourneret 2012)

The image processing plays an important role in the medical field that comprises of image pre-processing, feature extraction, image segmentation, image classification & retrieval. Medical diagnosis is often a categorization (classification) of medical images according to the nature of a specific object namely pathology bearing region or entire region. The primary motivation behind this book is to develop an image retrieval framework focused on image classification according to the nature of the PBR. The PBR helps to classify the liver diseases based on gray texture. The diseases and their symptoms are drastically changing and there is always a need for a continuous update of knowledge for the doctors and the medical analyst. In such cases, an automated learning that could enhance retrieval of medical images based on the physician's and the radiologist's interest of making a final decision about the diseases is needed. This type of learning could be a semi supervised or unsupervised learning process. The learning mechanism has to be properly developed, since an improper design will result in large amount of misclassifications. This provides motivation on improving the learning capabilities of the model considering the fuzzy nature of the dataset.

This chapter deals with various types of liver images, challenges in medical imaging, pre-processing, registration, feature extraction and classification of liver images based on the diagnosis using different machine learning methodologies that correspond to the classification problem in data analysis process and its methodological impacts to big data (Lee, Yuan-Chang Chen & Kai-Sheng Hsieh 2003).

Medical Image Processing from Big Data Perspective

Medical imaging offers important information on anatomy and organ function besides detecting diseases states. Moreover, it is utilized for identifying tumors in liver, disease diagnosis, cancer detection and so forth. In these applications, image processing techniques such as registration, segmentation, and speckle reduction in addition to machine learning methods are employed. As the size and dimensionality of data increase drastically, understanding the dependencies among the data and designing efficient, accurate, and computationally effective methods demand new computer-aided techniques and platforms. The rapid growth in the number of healthcare sectors as well as the number of patients has resulted in the greater use of medical investigative and recommender support systems in clinical domain. Many areas in health care such as diagnosis, registration, and screening can be improved by utilizing computational intelligence. The integration of computer analysis with appropriate care has potential to help physicians