

Chapter 3

Medical Image Analysis With Intelligent Techniques

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ABSTRACT

Medical imaging is an integral part of radiology. This technology has its significance in assisting physicians in clinical procedures. Artificial intelligence and machine learning was recently established in diagnosis of lesions using medical imaging modalities in radiology for various medical diagnoses such as tumor in oral cavities, lungs, using histopathology images. The objective of this chapter is to present the workflow of computer-aided medical diagnosis involved in various imaging modalities with case study on ophthalmology and oral cancer. Towards the end, the machine learning workflow is summarized with directions for future research. Towards the end, summary on research challenges in digital pathology is presented. Finally, the chapter concludes with future research directions.

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INTRODUCTION

The documentation used by doctors to confirm medically the existence of glaucoma, a condition that over time results in visual loss, is fundus pictures. Preferably, a diagnostic tool for automated glaucoma detection would help doctors screen for and further diagnose visual loss (Mursch-Edlmayr et al, 2020). Therefore, it is crucial to use the cup disc ratio(CDR) to determine the stages in glaucoma and medically validate them. In this modern era, computer aided differentiation of normal and cancer cells helps in assisting oral pathologists for diagnosis of oral cancers (Najafabadi et al, 2015). The most common modality in diagnosis of oral cancer is histopathology. This chapter presents the data engineering tasks involved in diagnosis of anomalous tissues. The advent of modern tools and techniques used for feature selection and extraction using microscopic images of the tissues will be explained. Deep learning workflow for the well differentiation of squamous carcinoma cells using histopathology images is illustrated with implementation using deep learning modules and technologies. This study outlines the evolution of a deep learning framework for glaucoma diagnosis which tries to detect the disease. Furthermore, the effectiveness of deep learning frameworks is examined and compared. The following section explains the various modalities used in different medical diagnosis.

Imaging Modalities

Pathology is the medical investigation on diagnosing the disease, its cause and effects especially after the examination of biological samples of body tissues, the biopsies (Daisuke Komura et al.,2018). The role of a histopathologist is remarkable when biopsy of body tissue need to be examined for closer and detailed investigation of a medical condition. Tissue collection, annotation, differentiation of cell types and segmentation of nucleus are the requirements of computer aided diagnosis to ease the laborious job of pathologist in a clinical investigation. Recent approaches adopted in the development of diagnostic tools in digital pathology have highly motivated the author to present the workflow of systematic computational steps involved in the diagnosis of oral cancer. The following section presents the recent research findings in differential diagnosis of Oral Squamous Carcinoma Cell (OSCC). Oral pathology is a branch of study in dentistry, a specialization of pathology that deals with screening, detection, identification and diagnosis of diseases affecting the oral regions of humans such as mouth cavity and teeth. Squamous cells are formed on the surfaces of skins. These cells are formed on outer portion, the upper part of epidermis. OSCC is a cancerous tissue with multiple overlapping cells that can occur anywhere in oral cavity. It is a medical condition that causes malignant tumors. This kind of oral cancer is diagnosed using Whole Slide Image (WSI) acquired by

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