"RECENT DEVELOPMENT IN THE MEDICAL IMAGE ANALYSIS "

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Healthcare is one of the high-priority sectors where people expect the highest level of care and services. In the healthcare sector, due to technological advancement, disease diagnosis and clinical procedures have become technology-driven. In diagnostic radiology, medical imaging is the fundamental tool for the analysis and interpretation of internal anomalies. Radio imaging gained significant attention due to its non-invasive way to analyse the internal anatomy and anomalies. It allows the expert to reach decisions faster and saves the life of the patient. Apart from disease diagnosis, it is also useful for the treatment planning for particular diseases, surgical planning and post-treatment assessment for analysing the response of the patient to the treatment and recovery rate. Nowadays, clinical activities include image-guided therapy (IGT) and image-guided surgery (IGS), where localization, targeting, monitoring, and control are the main concern for medical practitioners.

The medical experts utilized the different radio imaging modalities based on the nature of symptoms and patient conditions. The commonly used medical imaging modalities are X-Ray, Computer Tomography (CT), Magnetic Resonance Imaging (MRI), Positron Emission Tomography (PET) and Ultrasound. These images are acquired with the help of various medical equipment specially designed to capture the particular modalities. Due to recent advancements in technology the image acquisition protocols have been modified and the data produced by the scanners are in digital form with huge volume and 3D representation. The size of medical data increasing day by day and provides fine details of the internal organs of the object. In routine practice, the medical experts analyse the images and conclude by utilizing their knowledge, experience and skills. However, analysing such huge volumes becoming a tedious and labour-intensive task which lead to the chance of arising errors due to human limitations that become the decision dependant on the operator. To automate the process of analysing medical images many technocrats and researchers proposed engineering

solutions to foster the need of the medical community by developing the semi automated and automated framework without human intervention which provides the second opinion to the radiologist to reach quickly on the correct decision.

Recently the artificial intelligence is utilized in the medical domain to analyse medical images. Machine learning is a part of artificial intelligence. Specifically, deep learning which is a subset of machine learning dominating most of the previously developed algorithms for medical image analysis and shown state-of-the-art performance. The basic building block of deep learning algorithms is artificial neural networks with many hidden layers. However, Deep learning algorithms produce the state-of-the-art results but it needs huge dataset and computational power may limit its development. But due to recent technological development is allowing the researchers to use deep learning algorithms by providing sufficiently computational resources and different techniques to increase the data volume.

Especially, in medical image analysis, there are four key problems: (1) Image Segmentation { dealing with (semi)automated methods that lead to creating patient-specific models of relevant anatomy from images; (2) Image Registration { automated methods that align multiple data sets, eventually coming from different imaging modalities, with each other; (3) Visualization { the technological environment in which image-guided procedures can be displayed; (4) Simulation { software that can be used to rehearse and plan procedures, evaluate access strategies, and simulate planned treatments.

There are several challenges in the medical image analysis which are listed below:

1. Image enhancement and restoration
2. Automated and accurate segmentation of features of interest
3. Automated and accurate registration and fusion of multimodality images
4. Classification of image features, namely characterization and typing of structures
5. Quantitative measurement of image features and an interpretation of the measurements
6. Development of computer-aided diagnostic (CAD) systems for the clinical sector.

In the future artificial intelligence become an integral part of the medical domain and advance routine procedures and could be the third eye of medical experts that will make their life easy. These technological advancements will ensure the quality of medical services to society.