Evolution of New Era in Medical Imaging and Healthcare Sector Using Machine Learning Concepts

Medical imaging and diagnostic radiology have led to a huge rate of development in the field of computer-aided analysis and assisted clinical assessment [1]. The synergised amalgamation of computer and imaging have led to an incremental rise in the potential deployment of computer-aided decision support in a range of radiographic imaging procedures such as prognosis, risk assessment, therapy response, and disease discovery. Machine learning-based computer vision has evolved as an important asset in the field of medical imaging. Medical imaging is playing a pivotal role in delivering highly sophisticated modern-day healthcare. Technological advancements in signal processing theory continue to obtain a higher level of information from medical images. Machine Learning (ML) has emerged as a major assistive medical diagnostic tool that helps in identify clinical patterns [2, 3]. Usually, there is a large amount of delay in reading radiographs by radiologists due huge bundle and scarcity of medical resource personnel. Artificial intelligence and machine learning can help reduce the incessant amount of delay by speedily scrutinizing abnormal medical scans. This issue entails various implications and aspects involved in medical imaging and their applications in the field of medical imaging, tumor diagnosis, and breast cancer detection. At each and every level, images acquired from multi-modal sensors require pre-processing and enhancement for undeterred subsequent image analysis and application in decision support. It is also evidently witnessed that how deep learning technology has enrooted the field of radiology in an indispensable manner. In order for deep learning methods and techniques to perform well, a large set of well-annotated data is required to cater to complex hardware and computer software, which are constantly evolving, making the perception of subtle differences amongst disease patterns a little cumbersome [4, 5]. Various applications will include image denoising, image super resolution, image fusion, image registration, image segmentation, image super-resolution, abnormality detection, image synthesis, etc. As a form of decision support, machine learning algorithms in medical imaging have a substantial impact. The clinical examination is frequently supported with highly sophisticated imaging examinations which are available in abundance due to rapid progress in signal processing tools and theory. The term “decision support” stands for the fact that computers will augment or assist medical image interpretation, thereby making it more reliable and precise. This assistive diagnostic technology capacitates the radiologists with the ability to integrate their knowledge with CAD analysis and establish precise medicine. In order to obtain a high rate of specificity and accuracy in automated computer diagnosis, it is imperative to have efficient computer-based image processing algorithms like image enhancement, segmentation, fusion, and denoising algorithms. Therefore, the development of computer algorithms is significant for CAD analysis. The greater performance of the computer algorithm, the better is the overall analysis. In this issue, authors have briefly laid out an insight into various advancements in the field of computer-aided analysis based on medical imaging for tumor detection as well as other forms of cancer. A detailed analysis of subsequent advancements in the field of MRI-CT image fusion has also been listed [6, 7]. Specifically, in cases where radiologists are under-confident or the case under study is cumbersome, decisions are highly supported with the help of computer output. One thing is carefully pointed out that these CAD analysis tools do not have to equate or supersede the radiologist’s diagnosis. The key advantage of large-scale applicability is due to the synergistic effect resulting from computerized algorithms and clinical competence. Despite the fact that machine learning has taken the medical research field by storm, it can be misapplied too. For instance, machine learning requires to recognise or extract some significant or important features from the input data set whose attributes are trained or fed to the algorithm.

Any ML algorithm requires a huge range of data for its validation and training, which subsequently bring into the picture the consequences, such as data sharing, privacy concerns, and computerised trust. On top of it, ML algorithms tend to work well if extensive training is carried out; however in the case of independent validation and data processing, it fails drastically.

The features extracted are required to be uniquely defined in order to have a predefined set of features for an elevated level of system performance. Therefore, it is actually challenging to choose an adequate number of features and data to model the given research issue. Besides this, the ML algorithm needs large-scale data training and manifolds of online iterations along with expanded memory requirements. For that matter, if the data are readily available and pertinent to use, extremely high computational burden and costs are involved [8-10]. Therefore, in order to usher in the era of ML, one has to be mindful of the weighing limitations of this technology as well.

REFERENCES


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