Editorial

Radiomics: A Powerful Tool

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The Artificial Intelligence based technique of radiomics is an evolving modality that employs data characterization algorithms to extract a variety of useful features from medical images [1]. Tumoral patterns are revealed that cannot be appreciated by the naked eye [2]. This can aid in assessing prognosis and gauging the response of tumor cells to therapy [3].

Various imaging modalities like CT, PET MR provide essential raw data. Extraction tools then use the raw data volumes to analyze pixel/voxel characteristics. Using these images, "volumes of interest" can be generated since such segmentation entails handling and processing of large image data; automatic and semiautomatic segmentation algorithms are employed enabling automation [4]. However, thorough testing and quality assurance are vital to ensure that the algorithm used is not only accurate, consistent, and reproducible but also time-efficient [5].

Reliable segmentation enables the extraction of various useful features [6]. Relevant features are selected, and data are analyzed. Relevant clinical and genetic information may also be incorporated. Moreover, data is analyzed using supervised or unsupervised methods, with graphic representations [7].

The relevance and utility of Radiomics are maximum in the field of Oncology. The first large-scale Radiomics studies were conducted by Aerts *et al*. [8] on lung and head-and-neck patients. Radiomics features extracted from CT images were used to assess the potential of gauging prognosis using texture, shape, and characteristics based on intensity. Tumor volumes were derived either employing a semi-automatic segmentation methods or drawn out by experienced radiation oncologists [9]. Further subset of Radiomics features were distilled that seemed valid to comment on prognosis, patient survival, and intratumoral heterogeneity. Analysis of serial imaging provide delta-radiomics features or DRFs which, coupled with biomarker data, had the potential to predict treatment response in some cancers like that of the pancreas [10]. Algorithms derived from Radiomics features, employing tumor size quantification coupled with tracer uptake estimated on PET studies, have the potential to predict treatment response to chemotherapy and immunotherapy [11]. This opens up the realm of personalized and tailored therapies. Similarly, Radiomics features have the potential to predict probabilities of the occurrence of distant metastases [12].

Radiomics has been a boon to the field of Radiation Therapy, enabling the development of Image-Guided Radiotherapy, Image-Modulated Radiotherapy, Stereotactic Radiotherapy, dose escalation, etc. [13].

Radio genomics, or imaging genomics, helps assess the genomics of cancer without biopsy. MRI Spectroscopy aids in diagnosing brain tumors like glioblastoma, assess the aggressiveness of liver, prostate, breast, and lung cancers, and also aids in gauging the efficacy of therapy and prognosis [14].

A further development has been Multiparametric Radiomics (MPRAD) which has been helpful in differentiating between benign and malignant breast lesions with good sensitivity and specificity. It is also useful in precisely analyzing the perfusion-diffusion mismatch in brain stoke cases [15].

Radiomics applications are multifarious, and it's evolving as a potent tool in many disciplines, especially oncology. It requires a coordinated effort by experts in imaging, data managing, and analysis. The need for standardization, validation, and quality assurance cannot be underemphasized.

CONFLICT OF INTEREST

Declared none.

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