

Abstract: Radiomics, defined as the high-throughput extraction of quantitative features from medical images, represents a paradigm shift in diagnostic and prognostic medicine by enabling the discovery of imaging biomarkers beyond human perception. This review synthesizes existing literature on the integration of advanced image processing techniques with machine learning (ML) and deep learning (DL) methods in radiomics. It outlines the standard workflow—including image acquisition, segmentation, feature extraction, feature selection, and model development—while examining both its potential and technical challenges. Applications across pulmonary disease analysis, oncology, and cardiac risk prediction highlight the state-of-the-art. Key issues such as feature reproducibility, model interpretability, data heterogeneity, and the need for robust validation are critically discussed. The paper concludes by identifying future directions, including standardized protocols, explainable AI, multimodal data fusion, and the ethical deployment of radiomics in clinical practice.

Keywords: Radiomics, Machine Learning, Deep Learning, Image Processing, Feature Extraction, Predictive Modeling, Quantitative Imaging, Medical Imaging Analytics.