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Cancer Diagnosis Optimization Using Deep Learning and Medical Image-Based Bioinformatics Techniques

Nader Behdad, Lima Hongou, Sofia Arkhstan

1. Electrical and Computer Engineering, The Polytechnic University of the Philippines, Manila, 1016, Philippines
2. Faculty of Engineering, Computer Technology, UCSI University, Kuala Lumpur 56000, Malaysia
3. Department of Computer System, South Ural State University, 454080 Chelyabinsk, Russia

Abstract:

Accurate and early diagnosis of cancer is crucial for improving patient outcomes and guiding effective treatment strategies. This study presents an integrated framework that combines deep learning with medical image-based bioinformatics techniques to optimize cancer detection and classification. High-resolution imaging modalities such as MRI, CT, and histopathological slides are processed using convolutional neural networks (CNNs) and autoencoders to extract significant features and reduce noise. These features are then integrated with genomic and proteomic data through bioinformatics pipelines to enhance diagnostic accuracy and biological interpretability. The proposed hybrid model enables precise tumor localization, subtype differentiation, and risk stratification with high sensitivity and specificity. Experimental results demonstrate improved performance over conventional diagnostic systems, supporting the advancement of personalized and data-driven cancer diagnostics.

Keywords:

Cancer diagnosis, deep learning, medical imaging, bioinformatics, feature extraction, personalized medicine.

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