Deep Learning-Based Automated Classification of Lung Cancer Using VGG16 Architecture

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Abstract:

One of the most prevalent and fatal diseases in the world today is lung cancer, and early and accurate detection is essential to better treatment outcomes. A deep learning-based technique for classifying chest CT scan images into four categories—normal tissue, squamous cell carcinoma, big cell carcinoma, and adenocarcinoma—is the aim of this study. In a 70%-20%-10% ratio, the dataset's labelled CT scans are divided into subsets for testing, validation, and training. Utilizing transfer learning, the study employs the pre-trained VGG16 model, first trained on ImageNet, as a feature extractor. The model's classification head was changed in order to address this specific four-class problem. To improve performance, sophisticated optimization methods were applied, including mixed-precision training, adaptive learning rate scheduling, and fine-tuning the final layers of the basic model. The model's generalization across different data samples was enhanced by the use of preprocessing and data augmentation techniques. The model's performance was assessed on both the test and validation sets using metrics such as accuracy and loss. The trained model's high classification accuracy demonstrated its ability to distinguish between healthy tissue and different types of lung cancer. TensorFlow Saved Model, HDF5, and Keras were among the formats in which the model was stored to facilitate integration into deployment procedures. The promise of AI in medical imaging is demonstrated by this study, which offers a reliable tool to assist medical professionals in diagnosing lung cancer.

Keywords:

LC Detection, CNNs, Medical Imaging, VGG16 Architecture, Image Classification, Early Detection, Mixed Precision Training, Data Augmentation, Healthcare AI, Model Optimization, Non-Small Cell Lung Cancer (NSCLC), Image Processing, Diagnostic Automation.