

COVID-19 Detection from Chest CT Images Using a Hybrid CNN–Swin Transformer Network

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Abstract

Early and reliable identification of COVID-19 from chest computed tomography (CT) images can assist healthcare professionals in screening suspected cases and supporting clinical assessment. Deep learning models based on Convolutional Neural Networks (CNNs) have demonstrated strong capability in learning local image patterns, whereas transformer-based models can capture broader relationships between image regions. This paper proposes a hybrid CNN–Swin Transformer network for COVID-19 detection from chest CT images. The proposed approach combines local spatial features extracted by a CNN branch with hierarchical contextual features obtained from a Swin Transformer branch. The two feature representations are fused before classification to obtain a more comprehensive representation of the CT image. The proposed model is evaluated against standalone CNN and Swin Transformer models using accuracy, precision, recall, F1-score, and area under the receiver operating characteristic curve. Training behavior, confusion matrices, and computational characteristics are also considered to examine the practical performance of the models. The study investigates whether combining convolutional and hierarchical transformer features can provide a more balanced and robust approach to automated COVID-19 detection from chest CT images.