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The Performance Evaluation of Transfer Learning VGG16 Algorithm on Various Chest X-ray Imaging Datasets for COVID-19 Classification

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Abstract

Early detection of the coronavirus (COVID-19) disease is essential in order to contain the spread of the virus and provide effective treatment. Chest X-rays could be used to detect COVID-19 at an early stage. However, the pathological features of COVID-19 on chest X-rays closely resemble those caused by other viruses. The visual geometry group-16 (VGG16) deep learning algorithm based on convolutional neural network (CNN) architecture is commonly used to detect various pathologies on medical images automatically and may have a role in the detection of COVID-19 on chest X-rays. Therefore, this research is aimed to determine the robustness of the VGG16 architecture on several chest X-ray databases that vary in terms of size and the number of class labels. Nine publicly available chest X-ray datasets were used to train and test the algorithm. Each dataset had a different number of images, class compositions, and interclass proportions. The performance of the architecture was tested using several scenarios, including datasets above and below 5,000 samples, label class variation, and interclass ratio. This study confirmed that the VGG16 delivers robust performance on various datasets, achieving an accuracy of up to 97.99%. However, our findings also suggest that the accuracy of the VGG16 algorithm drops drastically in highly imbalanced datasets

Author keywords

Chest x-ray; Cnn; Covid-19; Transfer learning; Vgg-16

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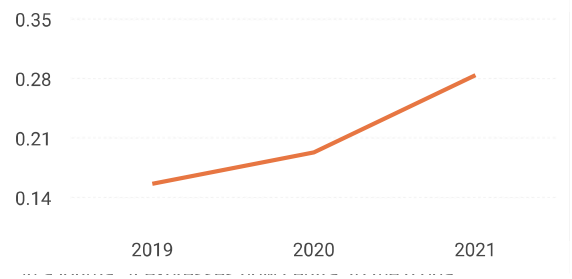

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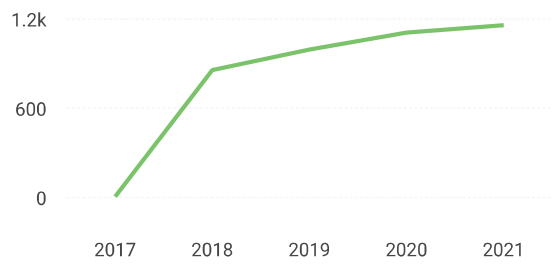

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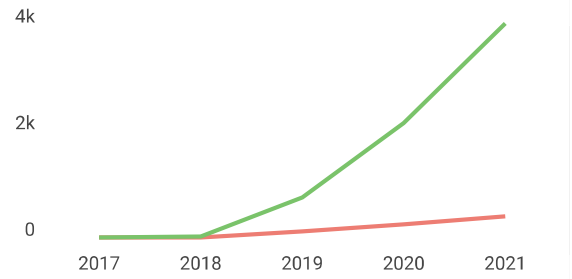

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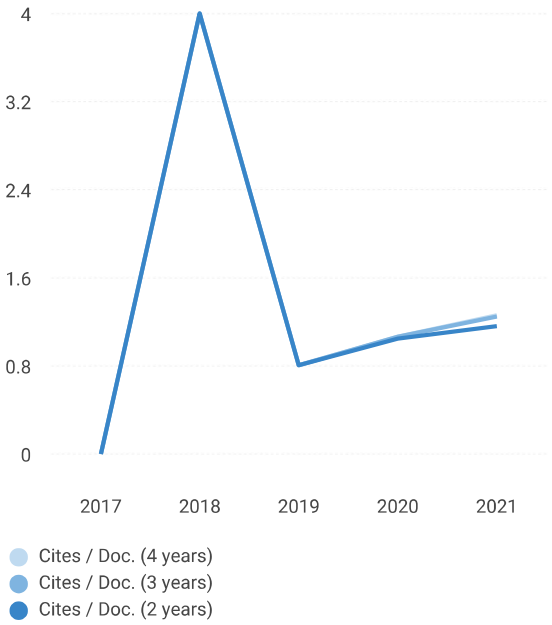

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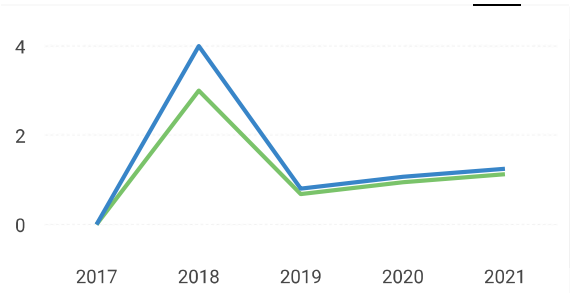

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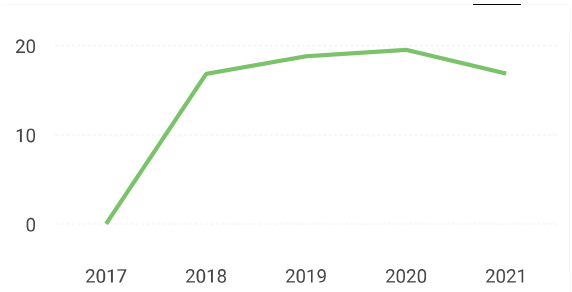

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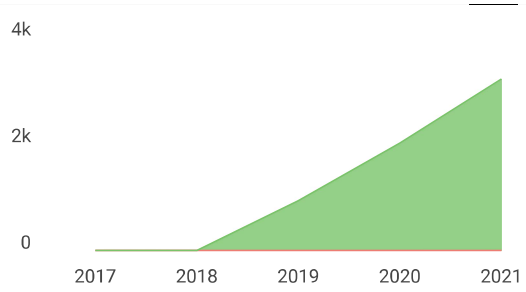

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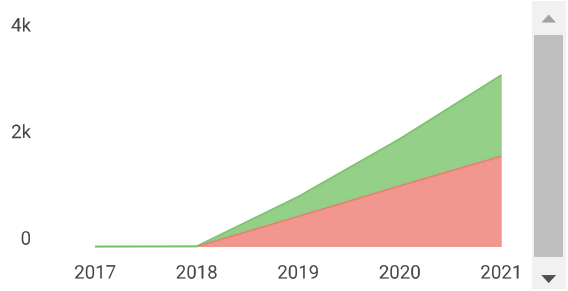

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