

Enhanced Chest X-Ray Classification Model for Covid-19 Patients Using HOG and LBP

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Abstract - Several alarming health challenges are urging medical experts and practitioners to research and develop new approaches to diagnose, detect and control the early spread of deadly diseases. One of the most challenging is Coronavirus Infection (Covid-19). Models have been proposed to detect and diagnose early infection of the virus to attain proper precautions against the Covid-19 virus. However, some researchers adopt parameter optimization to attain better accuracy on the Chest X-ray images of covid-19 and other related diseases. Hence, this research work adopts a hybridized cascaded feature extraction technique (Local Binary Pattern LBP and Histogram of Oriented Gradients HOG) and Convolutional Neural Network (CNN) for the deep learning classification model. The merging of LBP and HOG feature extraction significantly improved the performance level of the deep-learning CNN classifier. As a result, 95% accuracy, 92% precision, and 93% recall are attained by the proposed model.

Keywords— *Hybridized, Covid-19, Prediction, Feature Extraction.*

I. INTRODUCTION

The rate of increase in Covid-19 cases being discovered every day is worrisome; this is due to the lack of an accurate detection mechanism. A great number of people in different countries have been affected and killed as a result of the fast spread of the deadly disease. It is identified in the research work of Chen [1] that the deadly virus can easily spread fast and quickly via the airway medium. Hence, this results in inflammation thereby causing an obstacle or blockage of the lungs for the intake of oxygen. According to world statistics, almost all countries around the globe are affected with the Covid-19. The highest number of confirmed cases of Covid-19 case was recorded in India [1]. The emergence of the covid-19 virus was first uncovered in Wuhan China in December 2019. According to the findings of Rahman *et al* [2] over 34.8 million infected people had been identified as of October 4th, 2020 and more than one million people have died as a result of the virus. Intelligent behaviors that are demonstrated by machines are called Artificial intelligence or AI. Terms like Artificial Intelligence (AI), Machine Learning

(ML), Deep Learning (DL), and Data Science (DS) are all correlated words [3].

Furthermore, the technology that mathematically represents how the human brain functions or behaves is termed Artificial Neuron Network (ANN). The ANN is capable of learning or extracting important features from a dataset on its own. In comparison with the traditional approach, deep learning has proven to be better in areas such as text processing, speech recognition, image processing, and recognition [4]. The Convolutional Neural Network (CNN) is a form of artificial neural network which has been developed to solve varieties of issues in the domain of computer vision [5]. The layers in the CNN architecture are made up of a convolutional layer (Performing auto feature extraction), Pooling Layer (Used in dimensionality reduction), and finally the dense layer (containing fully connected neurons) [5].

A better understanding of data or images can be done using feature extraction techniques. This improves machine prediction, accuracy level, and training time and minimizes the cost of computation [7]. Local Binary Pattern (LBP) and Histogram of Oriented Gradient (HOG) are typical examples of feature descriptors. The HOG is a feature descriptor used in the processing of images (mainly object detection), the technique takes the local neighborhood of an image and counts the incidences in the edge direction [8]. The Local Binary Pattern (LBP) is considered an effective operator for texture which is used in labeling the pixels of images by thresholding pixels at the neighborhood and the result is considered as binary pixels [9].

Problems identified in existing designed models for detecting Covid-19 cases are affected by non-substantial amounts of chest X-Ray images, undeployable models to cutting-edge devices, issues of data overfitting, high memory requirement, and finally the computational cost of the models [10]. However, it's essential to improve the classification accuracy of the chest X-Ray images of Covid-19 cases and other diseases capable of affecting the lungs by adopting parameter optimizer [11]. It is identified in the research work of Jumani *et al* [12] that LBP feature extraction alone cannot extract all important features, future work was now suggested by the researchers to adopt the combination of Local Binary