I. INTRODUCTION

In 2019, COVID-19 start its infection into the world, including Indonesia. With one COVID-19 inhalation that is invisible to the naked eye, humans who do not have a strong immunity will be infected. If a person is infected, then the result from it can go up to even the worst-case scenario, which is an inevitable death. Therefore, people began to create a solution that can help others to fend off the virus. One of the alternatives that is used is a face mask. However, some of the people tend to neglect using mask within crowded places. Thus, many researches creating a face mask detection system that uses many models such as Convolutional Neural Network (CNN).

Face Mask Detection methods are spreading widely on the internet within time. The pandemic gains a curiosity towards researchers which they improve classification and performance of the face mask detection system, thus the results are getting better and better. For example, in 2017, Preeti Nagrath *et al.* [1] conduct research with the title "SSDMNV2: A real time DNN-based face mask detection system using single shot multibox detector and MobileNetV2" which uses deep learning, TensorFlow, Keras, and OpenCV to detect face mask. The approach for this paper is by a Single Shot Multibox Detector as a face detector and MobileNetV2 architecture as a framework for the classifier. The results are obtained throughout this research with an accuracy score of 0.9264 and an F1 score of 0.93. Another example such as in 2020, Arjya Das, Mohammad Wasif Ansari, and Rohini Basak [2] which they conducted research with the title "Covid-19 Face Mask Detection Using TensorFlow, Keras, and OpenCV" that can also detect a face in motion. The result for the research attains an accuracy for up to 95.77% and 94.58% which uses Sequential Convolutional Neural Network Model to detect the mask without overfitting. In 2020, Shilpa Sethi, Mamta Kathuria, and Trilok Kaushik conduct research with the title "Face mask detection using deep learning: An approach to reduce risk of Coronavirus spread" [3] which contains ResNet50, AlexNet, and MobileNet as a baseline models followed by an ensemble of a one-stage and two-stage detectors to achieve low inference time and high accuracy. This paper also proposed a bounding box transformation to improve localization performance during mask detection. The results from the ResNet50 model achieve high accuracy of 98.2%.

From the research that is studied about the face mask detection, one of the downsides is that most of the paper does not focus on low light condition. The case for this is that studying the face mask detection under night light is a difficult problem because there are internal and external factor that the system features needed for the mask detection, especially under low light. For example, the brightness of an image that is captured under low light conditions tend to be very low and the contrast will be severely reduced [4]. Humans can easily detect the use of the face mask under low light conditions. But it is difficult for a machine to detect the use of face mask under low light conditions. One of the other problems is that an image that is acquired using computer vision system under low light conditions tends to contain multiple characteristic such as high noise, lousy illumination, reflectance and bad contrast which makes object detection more difficult [5]. Thus, A face mask detection system needs a special approach to overcome low light conditions. Using some low-illumination tools to help identify the mask, but using these tools is not easily implemented because of its high cost. One of the most popular approaches of face recognition research is created through deep learning, which is data preparation dependent as to performance and accuracy. We can use deep learning method to create a face mask detection system.

Thus, this paper proposed an approach on face mask detection under low light condition which is efficient and can be accurate in terms of detection under low illumination images, and can be implemented in real-time. Using pre-trained model is achievable, but this paper's intention is to create a light-weight CNN model so that the people can use this method. This paper focuses on face mask detection system that can detect face mask under low light conditions and the approach for this study gains an accuracy that is comparable to the existing face mask detection method. To do this, we collect a public face mask dataset combined with our own. CNN architecture is used to train the model to detect the face mask along with some Machine Learning (ML) packages such as TensorFlow, Keras, and OpenCV along with Python Imaging Library (PIL) for the low light manipulation. This approach has its pros which is easy to implement with a low cost and is able to achieved a promising result.

The contributions that can be considered in this study is that this approach is one of the alternatives to achieve a face mask detection system under a low light condition. Using PIL as a low light manipulation for the dataset can give a resemblance of a real low light image that can be used in many cases which includes a low light image detection.

The organization for the rest of this paper is as followed. Section 2 reviews the related previous work. Section 3 explain about the approach for the face mask detection. Section 4 evaluate and analyze results. Section 5 conclusion and future work.