

Sistem Peringatan Dini untuk Deteksi *Physical Distancing* dalam Pencegahan Penyebaran *COVID-19*

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Abstrak

Penyebaran virus *COVID-19* telah menjadi ancaman bagi kesehatan manusia. Salah satu cara untuk mencegah penyebaran virus adalah dengan prosedur *physical distancing*. Namun, masyarakat sering mengabaikan prosedur *physical distancing* dan tidak ada pengawas yang ketat untuk memantau dan memberi peringatan agar *physical distancing* terlaksanakan. Sudah terdapat yang memberikan solusi terhadap masalah ini, solusi dengan sistem berbasis pembelajaran mesin dengan kamera yang mendeteksi *physical distancing*. Namun, beberapa solusi yang ditawarkan hanya berfokus pada akurasi dan tidak melihat dari segi mobilitas perangkat, yang dibutuhkan untuk deteksi *physical distancing*. Oleh karena itu, penelitian ini mengusulkan sistem peringatan dini terhadap *physical distancing* pada komputer dengan sumber daya terbatas. Sistem dibangun pada komputer dengan sumber daya terbatas dan kamera yang memiliki mobilitas tinggi. Sistem menggunakan *Tensorflow Lite* untuk melakukan proses pembelajaran mesin dan model *pre-train SSD MobileNet* untuk melakukan klasifikasi manusia. Skenario pengujian yang dilakukan adalah perhitungan akurasi jarak dan akurasi deteksi *physical distancing*. Sistem memiliki akurasi dalam mendeteksi kelalaian jarak fisik dengan akurasi 86% dan F-1 Score 87%. Sistem yang dibangun dapat berjalan pada komputer yang terbatas dengan menggunakan 4.59 MB memori yaitu 0.001% dari total memori, dan pemanfaatan kumulatif dari empat core adalah 139%. Sistem ini memiliki akurasi 10% lebih baik daripada pekerjaan terkait yang serupa.

Kata kunci: *Covid-19*, *physical distancing*, sistem peringatan dini, *Tensorflow Lite*, pembelajaran mesin, komputer sumber daya terbatas

Abstract

The spread of the *COVID-19* virus has become a threat to human health. One way to prevent the spread of the virus is with *physical distancing* procedures. However, people often ignore *physical distancing* procedures and there are no strict supervisors to monitor and give warnings so that *physical distancing* is carried out. There are already solutions to this problem, solutions with machine learning-based systems with cameras that detect *physical distancing*. However, some of the solutions offered only focus on accuracy and do not look at the mobility of the device, which is needed for *physical distancing* detection. Therefore, this research proposes an early warning system against *physical distancing* on a constrained computer. The system is built on a constrained computer and a camera that has high mobility. The system uses *Tensorflow Lite* to perform machine learning and *SSD MobileNet pre-train* model to perform human classification. The test scenarios carried out are the calculation of distance accuracy and *physical distancing* detection accuracy. The system had accuracy in detecting *physical distancing* negligence with 86% accuracy and 87% F-1 Score. The system built can run on a constrained computer by used 4.59 MB of memory that is 0.001% of total memory, and the cumulative utilization of four cores was 139%. The system performs 10% better in accuracy than a similar related work.

Keywords: *Covid-19*, *physical distancing*, early warning, *TensorFlow lite*, machine learning, constrained computer

1. Introduction

The use of technology to improve quality and maintain health is needed during the coronavirus disease 2019 (*COVID-19*) pandemic [1], [2]. *COVID-19* can be transmitted from someone who has been infected to others through splashing water from the mouth or nose when coughing, sneezing, and talking. The World Health Organization (WHO) stated that *COVID-19* has infected 222 countries [3]. One of the currently crucial technological needs is to support the reduction of the spread of the *COVID-19* disease outbreak. One way to prevent the spread of the virus is to practice *physical distancing*.

Physical distancing activities are the procedures to maintain a distance between individuals, especially in public spaces [4]–[6]. The defined safe distance is 1 meter [7], [8]. *Physical distancing* procedures are seen to be capable of reducing the number of spreading [5], [9]. However, people often ignore the rules for doing *physical*