# Blockchain and AI-Empowered Social Distancing Scheme to Combat COVID-19 Situations

**SUDEEP TANWAR**[1], **(Senior Member, IEEE), RAJESH GUPTA**[1], **(Student Member, IEEE),**
**MOHIL MAHESHKUMAR PATEL**[1]**, ARPIT SHUKLA**[1]**, GULSHAN SHARMA**[2]**,**
**AND INNOCENT E. DAVIDSON**[2]**, (Senior Member, IEEE)**
[1]Department of Computer Science and Engineering, Institute of Technology, Nirma University, Ahmedabad, Gujarat 382481, India
[2]Department of Electrical Power Engineering, Durban University of Technology, Steve Biko Campus, Durban 4001, South Africa

Corresponding authors: Gulshan Sharma (gulshanS1@dut.ac.za) and Sudeep Tanwar (sudeep.tanwar@nirmauni.ac.in)

**ABSTRACT** The COVID-19 pandemic situation has proved to be disastrous for humanity throughout the world. However, during this period, people must take precautions for safety purposes. One of the essential steps towards eliminating or reducing the effect of COVID-19 is maintaining social distancing while in public places. Some people are neglecting the social distancing norms while on the move. Still, no surveillance system exists, which monitors the people's movement for social distancing and securely & efficiently shares the information with the concerned administration department. There also exists no penalty system which forces the people to ensure social distancing. Motivated from the aforementioned facts, in this paper, we present a blockchain and artificial intelligence (AI)-envisioned scheme for monitoring social distancing to combat COVID-19 situations. The proposed scheme uses fast region-based convolutional neural networks (RCNN) and you only look once (YOLO) models for the object (i.e., human) detection through the live video feed captured from the static CCTV cameras as well as lens-equipped drones. Further, the efficient euclidean distance calculation is embedded for calculating the distance between two humans. Blockchain technology ensures the secure and trusted exchange of information between the entities at the physical layer and the administration departments. Blockchain wallets are also used to pay the fine when people do not follow social distance norms. The performance of the proposed scheme is evaluated based on three broad parameters such as (i) human detection and violation identification, (ii) blockchain simulation and analysis, and (iii) network performance comparison. The parameters considered for (i) is confidence score, for (ii) are scalability, hash rate, and simulation interface, and for (iii) are network bandwidth, throughput, packet loss rate, and network latency. By analyzing all the parameters mentioned above, we observe the proposed scheme outperforms the traditional approaches.

**INDEX TERMS** COVID-19, social distancing, blockchain, artificial intelligence, smart contracts, YOLO, region based convolutional neural networks.

## I. INTRODUCTION

Pandemics pose significant concern about public health and simulate catastrophic social, economic, and political crises in countries infected. The "Coronavirus Disease - 2019", commonly known as COVID-19, is an ongoing global pandemic, which has affected millions of people across the globe [1]. It is caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2). In humans, the virus mostly attacked their respiratory system with symptoms such as

fever, dry cough, fatigue, muscle, joint pain, and others in its diverse variants [2], [3].

As of September, 4 2020, the number of infected people was more than 21.9Cr worldwide, with 45.5L people who had lost their lives [4]. FIGURE 1 depicts the geographical representation of total number of COVID-19 cases worldwide and FIGURE 2 shows the total count of affected people and deaths for some worst-hit countries.

The coronavirus is considered extremely harmful due to its highly contagious nature and a long incubation period of 1-14 days. Another reason is that an infected person may show asymptomatic behavior, i.e., the person is infected with the virus but shows no symptoms [5]. Such people become

The associate editor coordinating the review of this manuscript and approving it for publication was Sedat Akleylek.