Chapter 3
Achieving Ambient Intelligence in Addressing the COVID-19 Pandemic Using Fog Computing-Driven IoT

Oshin Rawlley

Birla Institute of Technology and Science, Pilani, India

Shashank Gupta

Birla Institute of Technology and Science, Pilani, India

ABSTRACT

In this chapter, the authors present a comprehensive review on how the fog computing-based IoT can be utilized for the outbreak prevention and its existing control systems. The authors have also explained how numerous edge computing devices (e.g., sensors/actuators, RFID systems, webcams, drones, etc.) are playing a key role in controlling this disease using IoT protocols like 6LoWPAN. In addition, the authors also emphasize IoT security attacks and vulnerabilities which are prevalent in the existing infrastructure setup of smart cities. The key aspects of emerging uses of IoT (such as smart retail store automation, smart transportation, smart waste management, etc.) are described that played a key role in controlling this epidemic in the existing infrastructure of sustainable smart cities. Finally, some future research directions are also discussed that highlight the steps in mitigating the effect of this pandemic using fog-enabled IoT and AI techniques.

INTRODUCTION

Data has become an integral part in every walk of life. In today's digital world, technology is the new driving force of different businesses and other applications. This information technology age has started producing enormous amount of data to be handled. According to the reports of International Data Corporation (IDC), the digital data as of now has almost crossed zettabytes in 2010. On a daily basis, 2.5

zettabytes data is produced since 2011 (Yousef et.al., 2019). It is anticipated that in near future, by 2020, around 50 billion connected devices will generate new dataFor instance, IoT applications in healthcare showed data of 25k tuples were produced per second by 30 million users (Sarkar et al., 2015).

One of the computing paradigms- cloud computing has proved to be an efficient way which has high power of processing, computing, storage capacity gained much prevalence (Yousef et.al., 2019). All data to be processed is sent to the centralized cloud & further analysis is done. Cloud computing is a centralized paradigm of computing model where all the steps of data pre-processing, post-processing is done in the cloud itself at a principal place. But due to multiplication of devices & its data generated the bandwidth is not considerate in satisfying the latency needs. The bandwidth factor has become a bottleneck in cloud computing (Kharrufa et al., 2019).

The chapter elucidates the various technology paradigms evolving to newer paradigms like fog computing for addressing Covid-19 pandemic by controlling existing systems. The section of "Inception of Covid-19" states the augmentation of fog computing paradigm with the existing models for better identification & tracing of the virus. This chapter produces sufficient background as a knowledge base for establishing the concept of fog technology enabled IoT devices by reaffirming the relevance of fog Computing in Covid-19 & the abstract layers of the connection mechanism.

Inception of Covid-19

The first case was detected with symptoms of pneumonia in Wuhan, China on Dec 08, 2019. Following which many incidents were reported in China by WHO. Figure 1 highlights the timeline of corona virus. Then Europe witnessed the proliferation of the disease & announced its first case on Jan 07, 2020. The sudden escalation led to deaths, the first death in China. Pneumonia affecting people & leading to death raised an alarm all over the world arising the situation of Global red alert & nations declaring national lockdowns in March 2020. Even after lockdown more than 50k deaths were reported. The year 2020 was a mere spectator of the pandemic having no solution to this outbreak. In Jan 2021, medical science was able to administer few drugs to counter the virus with the introduction of vaccinations for Covid-19 all over the world (Rasheed et al, 2020).

It is onerous on the part of apt identification of the disease & is much demanding to address this problem of identification of cases by utilizing some existing technologies. The sudden outbreak of black fungus & white fungus has further fanned the flames of COVID-19 aggravating the pandemic situation to be more intensified. Indeed, there is a need for greater strides to make towards ameliorating the condition. Fog computing frameworks can be augmented to the cloud computing community for fast tracing of the cases. Mobile devices can be made as fog devices with tracing apps installed in them.

Related Content

Note on the Application of Intuitionistic Fuzzy TOPSIS Model for Dealing With Dependent Attributes
Daniel Osezua Aikhuele (2019). *International Journal of Applied Industrial Engineering (pp. 20-32).*
www.irma-international.org/article/note-on-the-application-of-intuitionistic-fuzzy-topsis-model-for-dealing-with-dependent-attributes/233847

Industry 4.0 and Its Effects on the Insurance Sector
smail Yldrm (2021). *Research Anthology on Cross-Industry Challenges of Industry 4.0 (pp. 983-998).*
www.irma-international.org/chapter/industry-40-and-its-effects-on-the-insurance-sector/276859

Emotional Labor and Its Influence on Employees' Work and Personal Life in a Philippine Franchise Dining Industry Setting
Leahlizbeth A. Sia (2016). *International Journal of Applied Industrial Engineering (pp. 74-85).*
www.irma-international.org/article/emotional-labor-and-its-influence-on-employees-work-and-personal-life-in-a-philippine-franchise-dining-industry-setting/159086

Continuous Review Inventory Model with Fuzzy Stochastic Demand and Variable Lead Time
Nita H. Shahand Hardik N. Soni (2012). *International Journal of Applied Industrial Engineering (pp. 7-24).*
www.irma-international.org/article/continuous-review-inventory-model-with-fuzzy-stochastic-demand-and-variable-lead-time/93012

Cultural Models and Variations
Yongjiang Shiand Zheng Liu (2013). *Industrial Engineering: Concepts, Methodologies, Tools, and Applications (pp. 1560-1573).*
www.irma-international.org/chapter/cultural-models-variations/69354