

Chapter 51

Big Data Analytics Platforms for Electric Vehicle Integration in Transport Oriented Smart Cities: Computing Platforms for Platforms for Electric Vehicle Integration in Smart Cities

Md Muzakkir Hussain

 <https://orcid.org/0000-0002-6371-2545>

Aligarh Muslim University, Aligarh, India

M.M. Sufyan Beg

Aligarh Muslim University, Aligarh, India

Mohammad Saad Alam

Aligarh Muslim University, Aligarh, India

Shahedul Haque Laskar

NIT SILCHAR, Silchar, India

ABSTRACT

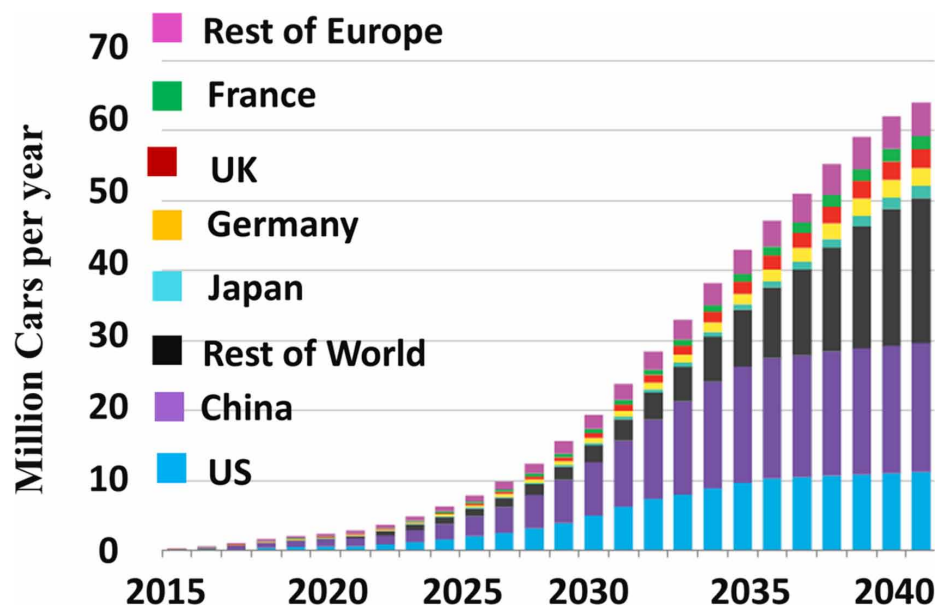
Electric vehicles (EVs) are key players for transport oriented smart cities (TOSC) powered by smart grids (SG) because they help those cities to become greener by reducing vehicle emissions and carbon footprint. In this article, the authors analyze different use-cases to show how big data analytics (BDA) can play vital role for successful electric vehicle (EV) to smart grid (SG) integration. Followed by this, this article presents an edge computing model and highlights the advantages of employing such distributed edge paradigms towards satisfying the store, compute and networking (SCN) requirements of smart EV applications in TOSCs. This article also highlights the distinguishing features of the edge paradigm, towards supporting BDA activities in EV to SG integration in TOSCs. Finally, the authors provide a detailed overview of opportunities, trends, and challenges of both these computing techniques. In particular, this article discusses the deployment challenges and state-of-the-art solutions in edge privacy and edge forensics.

DOI: 10.4018/978-1-7998-2466-4.ch051

INTRODUCTION

Due to rigorous research and development efforts and stringent protocols related to vehicle emissions (Yang, Zhu, & Wu, 2016), fuel economy, constraints in conventional energy reserves and the innate global warming, the electric vehicles (EVs) have been receiving an utmost attention from automobile industries, policy makers, R&D, as well as consumers (He, Venkatesh, & Guan, 2012). The EV integration programs create potential research thrusts, as they seem to serve as the sustainable and efficient powertrains for the emerging electrified transportation system (Hussain, Alam, & Beg, 2018). The EVs can significantly help emerging transport oriented smart cities (TOSC) to become greener by reducing carbon footprints of the transportation sector (Alam & Beg, 2018). Such characteristic features of EV welcome nations to undertake heavy investments towards EV rollout. According to Bloomberg executive report on global EV forecast (Figure 1), the sale EV will be 41 million per year, which will contribute to 54% of new car sales across the globe (New & Finance, 2017).

Figure 1. Annual global EV sales forecast across different Nations



While executing a fully electrified fleet, the uncoordinated charging of candidate EVs may pose serious impact on reliable and efficient operation of the associated electric utility (Bitam, 2012). Thorough study of literatures reveal that perforation of large scale EVs fleet can pose a huge challenge and will disrupt the operation of underlying Smart Grid (SG) network, unless their operations are monitored and coordinated properly (Kumar, Singh, Zeadally, Rodrigues, & Rho, 2015). The side effects may be in the form of power losses, incremental investment on the pre-existing network, potential violations of statutory voltage limits, degradation in power quality etc (Hussain, Alam, & Beg, 2018). Lack of coordinated charging strategies can also create demand peaks during rush hours which in turn put pressure on the power grids. However, use of proper charging strategies may circumvent significant proportion of burdens from the overall architecture. Indeed, it has been empirically estimated that even if all the

20 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:
www.igi-global.com/chapter/big-data-analytics-platforms-for-electric-vehicle-integration-in-transport-oriented-smart-cities/251466

Related Content

The Triumph of Fear: Connecting the Dots about Whistleblowers and Surveillance

David L. Altheide (2014). *International Journal of Cyber Warfare and Terrorism* (pp. 1-7).

www.irma-international.org/article/the-triumph-of-fear/110977

The Role of Media in the Perception of Syrian Refugees as Terrorists

Devrim ahinand Safiye Kocaday (2022). *Media and Terrorism in the 21st Century* (pp. 28-42).

www.irma-international.org/chapter/the-role-of-media-in-the-perception-of-syrian-refugees-as-terrorists/301079

What We Know and What Else We Need to Do to Address the Problem of Violent Extremism Online: Concluding Chapter

Majeed Khader (2020). *Cyber Warfare and Terrorism: Concepts, Methodologies, Tools, and Applications* (pp. 1618-1628).

www.irma-international.org/chapter/what-we-know-and-what-else-we-need-to-do-to-address-the-problem-of-violent-extremism-online/251514

Cyber Attacks and Preliminary Steps in Cyber Security in National Protection

Faruk Aydinand O. Tolga Pusatli (2015). *Cybersecurity Policies and Strategies for Cyberwarfare Prevention* (pp. 269-285).

www.irma-international.org/chapter/cyber-attacks-and-preliminary-steps-in-cyber-security-in-national-protection/133934

End Game

(2019). *Utilization of New Technologies in Global Terror: Emerging Research and Opportunities* (pp. 109-122).

www.irma-international.org/chapter/end-game/229243