Preface

Over the past few years, the Internet of things (IoT) has introduced the possibility to design a whole new concept of our world, "smart environments." The ability to connect every object of our surroundings to sensors and computers has offered a whole new level of welfare in our everyday lives by reducing the level of human interventions through automated machine-to-machine communications. Artificial intelligence/machine learning (AI/ML) approaches have emerged as powerful tools that can optimize the performances of every part of an IoT-based smart environment.

Our objective in this book is to propose a collection of contributions including new techniques, methods, algorithms, practical solutions, and models based on the incorporation of computational intelligence–based smart IoT into application on transportation and logistics. In addition, our book illustrates how AI can provide solid ground and address the challenges for both design and analysis of different emergent systems.

This volume focuses on the use of AI/ML-based techniques to solve issues related to IoT-based intelligent transportation systems (ITS), as well as their applications. It is a collection of original contributions regarding state-of-the-art AI/ML-based solutions for signal detection, channel modeling, routing protocol design, transport-layer optimization, user/application behavior prediction, software-defined networking, communication network optimization, and security and anomaly detection. Nine chapters in this book is an attempt to present solutions to these issues.

Chapter 1 offers an overview of the vehicle environment toward Internet of vehicles (IoV). First, they begin by presenting the main characteristics, the main types of applications, and the main components defining vehicular networks. Then, they present the types of vehicle-to-everything communication and the different access technologies used in this system. Finally, they justify the evolution of vehicular networks from an ad hoc approach toward a centralized approach, namely, the IoV and they introduce different technological solutions that could be integrated into the vehicular communication architecture to partially meet the limits of the ITS architecture.

Chapter 2 introduces the types of ad hoc networks and provides a comparative analysis of wireless communication technologies and routing protocols for vehicular ad hoc networks (VANETs). It also discusses different techniques like machine learning (ML), deep learning, metaheuristic search algorithms and optimization techniques, and their ability to enhance the capabilities of VANETs. In addition, for secure communication in VANETs, intrusion detection systems (IDS) are studied to identify different security attacks.

In order to ensure the accuracy of intrusion detection in IoV, the main purpose of Chapter 3 is to apply ML algorithms for training the IDS with a sufficient dataset of security menaces. The IDS based on ML will be able to make crucial decisions in case of intrusion detection whereas continuing to learn about their highly dynamic

https://doi.org/10.1515/9783110760477-202

environment. This chapter describes different security issues in IoV and presents diverse ML algorithms employed for constructing IDS toward protecting IoV from diverse cyber-attacks.

When it comes to self-driving autonomous cars, Chapter 4 has introduced a deep learning–based approach to optimize automated steering that recognizes the instant traffic patterns captured by the front camera placed at the front of the car dashboard.

Chapter 5 presents novel and functional deep fully convolutional neural (FCN) network architectures based on transfer learning for semantic pixel-wise segmentation. The first one is a fine-tuned FCN-based VGG 16, where the second uses this first model as an encoder and concatenates its output with a fine-tune-based Xception model, which works as a decoder. The second model breaks an input image into different coherent semantically meaningful regions. These regions are then classified into predetermined classes. Exhaustive experiments are executed on three real-world datasets that confirm the effectiveness of our models trained on large or small datasets.

Chapter 6 presents an ML-based framework for automatically detecting and diagnosing anomalous behavior in vehicles. The proposed model leverages historical data collected from various vehicle sensors to extract signatures of previously observed anomalies. By selecting the required features, the framework identifies anomalies and extracts their profiles.

Chapter 7 discusses how AI and IoT continue to revolutionize agriculture with the application of smart agriculture. AI and IoT's involvement in agriculture makes it easy to make predictions like temperature, rainfall, humidity, and soil statuses. Agriculture's AI and IoT continue to advance farming practices in the end bringing profitable ventures.

Chapter 8 covers a general, parametric, and performance analysis of four optical elements to be used in microconcentrator photovoltaic systems for electric car charging station using the same primary optic: the Fresnel lens. It concerns two nonimaging optics(pyramid and hyperbola) and two imaging optics (circular and square dome).

Chapter 9 presents a system for sentiment classification of reviews posted on social media in a way that can provide an advantage for supply chain managers. More clearly, the proposed system is a hybrid method of deep learning architectures, specifically recurrent neural networks and long short-term memory, using a word embedding Word2vec to embed the features in a review to predict the sentiment.