

Intelligent Systems Reference Library

Volume 163

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Editors

Multimedia Big Data Computing for IoT Applications

Concepts, Paradigms and Solutions

 Springer

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Preface

With an exponential increase in the provisioning of multimedia devices over the Internet of Things (IoT), a significant amount of multimedia big data has been generated from different devices located across the globe. Current proposals in the literature mainly focus on scalar sensor data with less emphasis on the streaming multimedia big data generated from different devices. This textbook examines the unique nature and complexity of MMBD computing for IoT applications and provides unique characteristics and applications divided into different chapters for MMBD over IoT. A number of research challenges are associated with MMBD, such as scalability, accessibility, reliability, heterogeneity, and quality-of-service (QoS) requirements. This textbook is the first-ever “how-to” guide addressing one of the most overlooked practical, methodological, and moral questions in any nations’ journeys to handle the massive amount of multimedia big data being generated from IoT devices’ interactions: For example, how to handle the complexity of facilitating MMBD over IoT? How to organize the unstructured and heterogeneous data? How to deal with cognition and understand complexity associated with MMBD? How to address the real-time and quality-of-service requirements for MMBD applications? How to ensure scalability and computing efficiency.

The book is organized into four parts. Part I is focused on technological development, which includes five chapters. Part II discussed the multimedia big data analytics, which has five chapters. Part III illustrates the societal impact of multimedia big data with well-structured four chapters. Finally, Part IV highlights the application environments for multimedia big data analytics with four chapters.

Part I Technological Developments

Chapter “[Introduction to Multimedia Big Data Computing for IoT](#)” presents an introduction to the multimedia big data computing for IoT applications. This chapter addresses the gap between multimedia big data challenges in IoT and

multimedia big data solutions by offering the present multimedia big data framework, their advantages and limitations of the existing techniques, and the potential applications in IoT. It also presents a comprehensive overview of the multimedia big data computing for IoT applications, fundamental challenges, and research openings for multimedia big data era.

Chapter “[Energy Conservation in Multimedia Big Data Computing and the Internet of Things—A Challenge](#)” highlights various ways to achieve energy conservation in the MMBD IoT environment. The authors have focused on the investigation of the existing technologies and mechanisms in the above domains. The authors have first presented the need for energy conservation briefly and then discuss the key points of the existing solutions for saving energy in IoT communications. At the end of the paper, the authors have summarized the findings to describe the advantages and limitations of the existing mechanisms and provide insights into possible research directions.

Chapter “[Deep Learning for Multimedia Data in IoT](#)” highlights the importance and convergence of deep learning techniques with IoT. Emphasis is laid on the classification of IoT data using deep learning and the essential fine-tuning of parameters. A virtual sensor device implemented in Python is used for simulation. An account of protocols used for communication of IoT devices is briefly discussed. A case study is also provided regarding the classification of Air Quality Dataset using deep learning techniques. Later in this chapter, the challenges faced by IoT are discussed, and deep learning is explained in detail. At the end, the future research directions are discussed.

Chapter “[Random Forest-Based Sarcastic Tweet Classification Using Multiple Feature Collection](#)” proposes a model with an accuracy slightly higher than 84%, which depicts a clear improvement in comparison with the existing models. The authors have used random forest-based classification model which outperformed all other candidates deployed under the experiment. Through simulations, the authors have obtained an accuracy of 84.7%, which outperforms the SVM (78.6%), KNN (73.1%), and maximum entropy (80.5%).

Part II Multimedia Big Data Analytics

Chapter “[Peak-to-Average Power Ratio Reduction in FBMC Using SLM and PTS Techniques](#)” presents an overview of a novel selective mapping (SLM) and partial transmit sequence (PTS) PAPR reduction technique which is suggested for FBMC. The authors have proposed a technique which was implemented by using an elementary successive optimization technique that upsurges the PAPR performance and ensures the design difficulty is taken low. PAPR and bit error rate (BER) parameters are analyzed and simulated for the proposed and conventional PAPR reduction techniques. The authors have performed simulation which shows that the SLM and PTS accomplished an excellent PAPR reduction up to 2.8 dB and 4.8 dB as compared to other peak power minimization techniques.

Chapter “[Intelligent Personality Analysis on Indicators in IoT-MMBD-Enabled Environment](#)” enlightens the use of personality detection test in academics, job placement, group interaction, and self-reflection. It provides the use of multimedia and IoT to detect the personality and to analyze the different human behaviors. It also includes the concept of big data for the storage and processing of the data which will be generated while analyzing the personality through IoT. In this chapter, authors have used supervised learning. Algorithms like Linear Regression, Multiple Linear Regression, Decision Tree and Random Forest to build the model for personality detection test.

Chapter “[Data Reduction in MMBD Computing](#)” provides an overarching view of data compression challenges related to big data and IoT environment. The authors have provided an overview of the various data compression techniques employed for multimedia big data computing, such as run-length coding, Huffman coding, arithmetic coding, delta modulation, discrete cosine transform, fast Fourier transform, Joint Photographic Experts Group, Moving Picture Experts Group, and H.261, including the essential theory, the taxonomy, necessary algorithmic details, mathematical foundations, and their relative benefits and disadvantages.

Chapter “[Large-Scale MMBD Management and Retrieval](#)” introduces the basics of multimedia data and the emergence of big data in multimedia. Then, the requirements that are essential for a Multimedia Database Management System to function properly and produce efficient results are discussed. Further, this chapter covers the annotation and indexing techniques that help manage a large amount of multimedia data. Finally, a detailed description of the databases can be put to use for storing, managing, and retrieving the multimedia big data.

Chapter “[Data Reduction Technique for Capsule Endoscopy](#)” explores data reduction techniques with the aim of maximizing the information gain. This technique exhibits high variance and low correlation to achieve this task. The proposed data reduction technique reduces the feature vector which is fed to a computer-based diagnosis system in order to detect ulcer in the gastrointestinal tract. The proposed data reduction technique reduces the feature set to 98.34%.

Part III Societal Impact of Multimedia Big Data

Chapter “[Multimedia Social Big Data: Mining](#)” presents an extensive and organized overview of the multimedia social big data mining. A comprehensive coverage of the taxonomy, types, and techniques of multimedia social big data mining is put forward. Then, a SWOT analysis is done to understand the feasibility and scope of social multimedia content and big data analytics is also illustrated. They concluded with the future research direction to validate and endorse the correlation of multimedia to big data for mining social data.

Chapter “[Advertisement Prediction in Social Media Environment Using Big Data Framework](#)” describes an advertisement prediction framework which uses prediction approaches on big data platforms. In addition, social media platforms are

used to collect data that is based on user interest. The authors have performed experiments on real-time data that is collected from social media platforms. Finally, the proposed framework can be served as a benchmark for business companies to send the appropriate advertisement to the individuals.

Chapter “[MMBD Sharing on Data Analytics Platform](#)” explores the field of multimedia big data sharing on data analytics platform. Multimedia data is a major contributor to the big data bubble. The authors have discussed various ways of data sharing. Further, this chapter covers cloud services as a recently developed area for storage and computation. Impacts of social media giants like Facebook and Twitter along with Google Drive have been discussed. Finally, this chapter ends with a brief mention of the security of online data and analysis of the MMBD.

Chapter “[Legal/Regulatory Issues for MMBD in IoT](#)” details the fundamental issues related to the use of MMBD in IoT applications and also presents a systematic discussion of some emerging questions regarding the transfer and use of data across the Internet. Thus, strict penalties are needed to be imposed on the offenders and misusers of MMBD, and an adequate legal framework is discussed in this chapter which addresses the regulatory and legal issues for MMBD in IoT that are required.

Part IV Application Environments

Chapter “[Recent Advancements in Multimedia Big Data Computing for IoT Applications in Precision Agriculture: Opportunities, Issues, and Challenges](#)” presents a survey on the existing techniques and architectures of MMBD computing for IoT applications in precision agriculture, along with the opportunities, issues, and challenges it poses in the context. As a consequence of the digital revolution and ease of availability of electronic devices, a massive amount of data is being acquired from a variety of sources. Moreover, this chapter focuses on major agricultural applications, cyber-physical systems for smart farming, multimedia data collection approaches, and various IoT sensors along with wireless communication technologies, employed in the field of precision agriculture.

Chapter “[Applications of Machine Learning in Improving Learning Environment](#)” presents various machine learning approaches that help educators to make the teaching and learning environment more fun and challenging with the aid of intelligent technologies and take our education to new heights, as soon as education system implements the machine learning concept in their curriculums.

Chapter “[Network-Based Applications of Multimedia Big Data Computing in IoT Environment](#)” gives a brief introduction on IoT with its structure. Then, different technologies are discussed in the field of IoT. The authors have described various application areas of IoT. Finally, big data and the importance of IoT-based sensor devices in big data are presented.

Chapter “[Evolution in Big Data Analytics on Internet of Things: Applications and Future Plan](#)” discusses some applications and explains the utilization of big

data and IoT in brief. Secondly, the deficiencies are also the matter of concern in this chapter. The desired solutions to overcome the drawbacks of the big data and Internet of Things are also discussed. The authors also have presented the development in the subject of big data on the Internet of things applications.

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Ahmedabad, Gujarat, India
Patiala, Punjab, India
Patiala, Punjab, India

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