

Preface

Machine learning is a way to infuse intelligence in data analytics. With the growth of civilization, researchers have invested efforts to mimic human traits in designing intelligent algorithms for solving real world problems. This volume is intended to give a bird's eye view of the latest trends in computationally intelligent algorithms and devices helpful for the mankind. This volume would benefit engineering students, tutors, research scholars and entrepreneurs with enriched interdisciplinary approaches to find new ways of applications in machine learning.

The volume is attempted to address emerging trends in machine learning applications. Recent trends in information identification have identified huge scope to in applying machine learning techniques for gaining meaningful insights. Random growth of unstructured data poses new research challenges to handle this huge source of information. Efficient designing of machine learning techniques is the need of the hour. Recent literature in machine learning has emphasized on single technique of information identification. Huge scope exists in developing hybrid machine learning models with reduced computational complexity for enhanced accuracy of information identification. This book will focus on techniques to reduce feature dimension for designing light weight techniques for real time identification and decision fusion. Key Findings of the book will be the use of machine learning in daily lives and the applications of it to improve livelihood. However, it will not be able to cover the entire domain in machine learning in its limited scope. This book is going to benefit the research scholars, entrepreneurs and interdisciplinary approaches to find new ways of applications in machine learning and thus will have novel research contributions. The lightweight techniques can be well used in real time which will add value to practice.

The volume contains seven well versed chapters entailing recent machine learning techniques and applications.

Humans are considered as the smartest animal because of their capacity to solve complex jobs. These various tasks can be divided into two different classes, namely, simple tasks and complicated tasks. The categorization depends on the complexity of the task level. The complexity of a task can be measured and it depends on the steps through which the task is solved. It can, therefore, be said that some suitable sequential steps are necessary to finish a specific assignment. However, appropriate data is required to achieve this objective. At the same moment, human attempts to learn and obtain other associated data or features that can effectively help enhance a job. Hence, suitable information along with previous experiences can help to complete a task more efficiently with less number of errors or mistakes. With this analogy to human beings, the capability of a system can be improved through learning from the continuous process of observation and past experiences which is itself a repetitive task. Chapter 1 provides a brief introduction to the subject area along with highlights of recent research trends.

Rapid use of social media for communication and information sharing, use of world wide web as a huge information repository, advancement in data and image capturing techniques have drastically increased the volume and size of the data. Analyzing, processing and searching such a huge volume of data is a complex task. This also reduces the accuracy as well as diminishes performance. To overcome these problems dimension reduction techniques are used to reduce the size of data and features without the loss of valuable information. Dimension of features can be reduced by projecting the features to a low dimensional space or using feature selection or feature encoding techniques. These techniques can be linear or non-linear depending on the relationship between data in higher and lower dimensions. In Chapter 2, a detailed analysis has been performed on some of the non-linear dimensionality reduction techniques and their applications.

With the growth of the internet and social media, music data is growing at an enormous rate. Music analytics has a wide canvas covering all aspects related to music. Chapter 3 provides a glimpse of this large canvas with sample applications covered in detail. Machine learning has taken a central role in the progress of many domains including music analytics. This chapter will help the readers to understand various applications of machine learning in computational musicology. Music feature learning and musical pattern recognition give conceptual understanding and the challenges involved. Feature engineering algorithms for pitch detection or tempo estimation are covered in more detail with available popular feature extraction tools. Music classification and clustering examples explore the use of machine learning. Various applications ranging from the query by humming to music recommendation are provided for efficient music information retrieval. Future directions and challenges with deep learning as a new approach and incorporation of human cognition and perception as a challenge make this domain a challenging research domain.

Character recognition is a challenging area in Machine Learning, Pattern Recognition or Image Processing. The accuracy to recognize handwritten character by human is far better compared to machine recognition. To develop an interface which can differentiate characters written by human yet requires intensive research. Though number of researches have presented in this area, still research is going on to achieve human like accuracy. Both handwritten and printed character recognition are categorized into two types, online and offline. A good number of researches have done work in the area of optical character recognition in different languages but for the Odia language, development is negligible. Odia (formerly it was Oriya), one of the 22 scheduled language recognized by the constitution of India and it is the official language of the state of Odisha (Orissa), more than 40 million people speak Odia. Due to the roundish shape of Odia character, large number of modified and compound characters and similarity between different characters makes this language very hard to create a satisfactory classifier. In the present survey undertaken we have discussed what are challenges be for Odia language and the machine learning techniques used in the recognition of Odia character recognition. Chapter 4 describes the complete process of character recognition i.e. pre-processing, extrac-

tion and selection of feature set and character recognition elaborately with comparison analysis and the metrics used to evaluate machine learning algorithms.

Recommendation systems have been the integral part of web and mobile applications in the domains of e commerce, e learning, e health, e governance, social networking and search engines. The problem of spending more time in getting the required relevant information from the many options available, also called as the information overload problem is addressed by the recommendation systems. The context based recommendation systems are the types of recommendation systems which use the context information to provide the recommended items. The context is the data about the application or the surroundings or the purpose with which the user is interacting with the system which can be like time, location, type of product, user's purpose or any situation describing the interaction. In Chapter 5, the architecture of the context based recommendation system is proposed with the pre filtering method with context rules. The class and object based model of context with rules and recommendation system is proposed which can be converted into a relational model for data storage for the recommendation system. One of the actions like rating is used to predict the preference of items for the current user. The analysis of the system is carried out with the Het Rec 2011 MovieLens data set. The accuracy measure MAE (Mean Absolute Error) is analysed in the proposed work and the relevance is measured in terms of precision, recall and F1 measure. The experimental result shows the influence of context on action and improvement in quality of recommendation with the proposed method.

In some underdeveloped and developing country, crop disease detection depends on the field experience of the farmer and this may cause degradation in production quality. The production quality can be improved, if the diseases detected in an earlier stage and machine-learning techniques are applied for detection of the crop diseases. The implementation of the decision support system is also an important part because the farmer needs to know proper information in a real-time manner and hence proper action can be taken in an earlier stage. Several advanced techniques are proposed for early detection of the crop diseases and it is inspired to survey on the techniques of machine learning based decision support system, address the issues related to productivity in agriculture. Chapter 6 analyzes and discusses the specific model of machine learning techniques. Our finding indicates the justification and efficiency of incorporating the machine learning techniques with a decision support system for early detection of crop diseases.

Chapter 7 concludes with a discussion on the takeaways from the volume. This chapter also focuses on the future directions of research in the machine learning domain.

This volume has readily addressed all these shortcomings of the existing competing titles and has proposed chapters to identify and solve real time problems raised due to lack of feature dimension reduction. An extra characteristic has been added to this volume with introduction of hybrid machine learning. Reduced dimension of multiview features will encourage various fusion techniques and will enhance the ac-

curacy of identification. Thus the volume qualifies to be a work related to current state of problem definition and will definitely show new paradigms for information identification using machine learning techniques.

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