Preface

The *Handbook of Research on Applications and Implementations of Machine Learning Techniques* provides an overview of recent research and development activities in the field of machine learning systems along with its applications. This book contains 21chapters starting from basic concept level to research and application level.

The main objective of machine learning is used to understand the structure of data and fit the data into a model that can be well understood and utilized by people depending on their needs. Although machine learning is a field within the computer science domain, it differs from traditional computing where human is involved. In traditional computing, techniques are sets of explicitly programmed instructions used by computers to calculate or solve problem whereas machine learning techniques instead allow for computers to train on data inputs and use statistical analysis in order to output values that fall within a specific range. Because of this, machine learning facilitates computers in building models from sample data in order to automate decision-making processes based on data inputs. Any technology user today has benefited from machine learning. Some of the applications are,

- Facial recognition technology allows social media platforms to help users tag and share photos of friends.
- Optical character recognition (OCR) technology converts images of text into movable type.
- Recommendation engines, powered by machine learning, suggest what movies or television shows to watch next based on user preferences.
- Self-driving cars that rely on machine learning to navigate may soon be available to consumers.

Therefore, machine learning is an emerging area in computing field. Because of this, there are some considerations to keep in mind as you work with machine learning methodologies, or analyze the impact of machine learning processes. Therefore, contributions in this book aim to enrich the information system discipline by providing latest research and case studies from all around the world.

All the books published earlier by different authors only address on theoretical study of machine learning in any one application areas or it does not address the practical applications / implementation of various machine learning techniques in various fields like agriculture, medical, Image processing, networking etc. Hence, it is decided to propose a book which not only discusses the research issues in various domains, also solve those problems with help of machine learning. It also provides research insight into machine learning areas. This book also focuses on three categories of users such as beginners, intermediate, sophisticated readers and provides content accordingly. So this is very much useful

for students, academicians and research scholars to explore further in their field of study. It is very much opt for readers who seeking learning from examples.

This book, *Handbook of Research on Applications and Implementations of Machine Learning Techniques*, is a reference text. It is a collection of 21 chapters, authored by 55 academics and practitioners from all around the world. The contributions in this book aim to enrich the information system discipline by providing latest research and case studies from around the world. These are organized as follows,

Chapter 1: Machine Learning (ML) is one of the hottest fields in research prospective. ML is acquiring wide level acceptance owing to the variety of real-life applications that can be implemented using different ML techniques. ML is unique in its feature of gathering knowledge from various fields like pattern recognition, data mining, statistics, signal processing etc. Hence, ML is not a new science topic but it is a multidisciplinary research topic. The key objective of this chapter is to present the current researches on the machine learning applications and its novel paradigms towards the detection of breast cancer. This chapter gives an idea of the applications of various machine learning techniques for the computer assisted diagnosis of breast cancer. This chapter comprises of various sections. Section one provides the introduction and background of breast cancer including structure of the breast, information about biopsy and different screening methods. The next section explains the computer assisted analysis of breast cancer using various ML techniques. Finally, this chapter discusses about future scope for the research in this area. This chapter will be informative for researchers, experts and students who are fascinated in the area of machine learning techniques for breast cancer detection.

Chapter 2: Information Security is one of the key areas for protecting information in the case of availability, data integrity, and privacy. The purpose of information security is to protect the information from illegal use and unauthorized access. In order to gain the most benefit from information security it must be applied to the business as a whole. Image steganography provides the solution to attain Information Security. Applying Cognitive method for selecting right image for Hiding Data is one of the challenges which is attained in this chapter.

Chapter 3: Agriculture is one of the most important fields to be concentrated for the welfare of the nation. In order to provide good yield in the field of agriculture, identifying the type of the disease in the leaf plays an important role. There are several algorithms and architectures available for classification. Convolutional Neural Network is widely used architecture for computer vision applications. This architecture is widely used in many applications such as video recognition, medical image analysis, agricultural data and image analysis etc., This chapter will explain the working of convolutional neural network for identifying the type of the disease in the plant leaves.

Chapter 4: In recent days, researchers are doing research studies for clustering of data which are heterogeneous in nature. The data generated in many real world applications like data form IoT environments and big data domains are heterogeneous in nature. Most of the available clustering algorithm is deals with data in homogeneous nature and there are few algorithms discussed in the literature to deal the data with numeric and categorical nature. Applying the clustering algorithm used by homogenous data to the heterogeneous data it leads to information loss. This paper proposes a new Genetically Modified K-Mediod clustering Algorithm (GMODKMD) which takes Fused Distance Matrix as input that adopts from applying individual distance measures for each attributes based on its characteristics. The GMODKMD is modified algorithm where Davies Boudlin Index is applied in the iteration phase. The proposed algorithm is compared with existing techniques based on accuracy. The experimental result shows that the modified algorithm with Fused Distance Matrix outperforms the existing clustering technique.

Chapter 5: The retinal parts segmentation has been recognized as a key component in both ophthalmological and cardiovascular sickness analysis. The parts of retinal pictures are vessels, optic disc and macula segmentations will add to the indicative outcome. In any case, the manual segmentation of retinal parts is tedious and dreary work, and it additionally requires proficient aptitudes. This book chapter proposes a supervised method to segment blood vessel utilizing deep learning methods. All the more explicitly, the proposed part has connected the completely convolutional network, which is normally used to perform semantic segmentation undertaking, with exchange learning. The convolutional neural system has turned out to be an amazing asset for a few computer vision assignments. As of late, restorative picture investigation bunches over the world are rapidly entering this field and applying convolutional neural systems and other deep learning philosophies to a wide assortment of uses, and uncommon outcomes are rising constantly.

Chapter 6: Medical imaging includes diverse imaging modalities and methods to image the human body for diagnostic and treatment intentions, and therefore plays a vital role to improve public health. Acquisition of medical image is a challenging task, which may be affected with various noises and intensity inhomogeneity. In order to overcome these issues, it is necessary to preprocess the images. This book chapter aims at providing a novel method for intensity inhomogeneity correction for MRI brain tumor images. This chapter first introduces the need for preprocessing in MR images, then summarizes the existing methods and finally describes the novel method for intensity inhomogeneity correction.

Chapter 7: Electronic commerce associated with highly powerful we b technology and mobile communication is currently dominating the Business world. Current advancements in Machine Learning (ML) have also further coordinated to creative business applications and E-commerce administrations to reason about complex system and better solution. In the course of recent years, the business security and machine-learning networks have created novel strategies for secured business frameworks based on computationally learned models. With the improvement of the Internet and digital marketing every financial platform has been more secured and user friendly for monetary transactions.

Chapter 8: The basis for this research originally stemmed from our passion for machine learning and various data mining techniques. The new unhealthy lifestyle of the modern world is becoming a cause for diseases like type 2 diabetes, blood pressure, etc. These real life problems can be creatively solved by using the predictions made by classifiers built on attribute specific data. These models can predict whether a person with given attributes will have diabetes or not. Once the prediction is acquired, necessary precautions can be taken to avert the disease. Machine learning has proved useful not only in the medical sector but also in the commerce, banking and financial sectors. Python is a user friendly high level language which has been on the rise because of its simplicity and ease of use. Using python and it's libraries for building classifiers and analysis is a recent trend in the field of machine learning.

Chapter 9: Text classification in medical domain could result in shortage of medical technicians in third world countries. Due to various nuances present in understanding language in general, a requirement of large volumes of text based data is required for algorithms to learn patterns properly. Text classification is an easier way of handling large volumes of medical data. They can be segregated depending on the type of diseases, which can be determined by extracting the decisive key texts from the original document. This chapter will explain about the process in classification of text for matching diseases with various kinds of medical documents.

Chapter 10: In Machine learning, the system should be able to arrive at decisions that transform a given situation into a desired situation or goal. Reinforcement learning is a part of machine learning which uses mathematical formalism that captures trial and error learning and that had wide applicability such

as autonomous driving, autonomous flying, game playing, etc. The roots of Reinforcement learning are from behavioral psychology. In this chapter, through mathematical approach the learning process has been modeled. The agent is allowed to learn entirely by itself in reinforcement learning. An autonomous agent behaves in an intelligent manner to find optimized fitness function for data mining process. We focus on reinforcement learning for mining High Utility Itemset (HUI) from a given transactional database which is growing exponentially. Through this chapter reader can learn how Reinforcement learning improves the efficiency of traditional evolutionary algorithms. Most appropriate fitness function for evaluation can be selected automatically during execution of an algorithm. Furthermore, during the optimization process when distinct functions are skillful, dynamic selection of current optimal function is done.

Chapter 11: Presents an analysis of machine learning techniques to address the most needful and challenging issues in prediction of risk during surgical operations. Emphasizes the importance of missing values imputation in prediction of risk as well as provide an appropriate novel method to handle missing values to increase model accuracy. The developed model works well with different surgical datasets and produced promising accuracy results.

Chapter 12: In the past years, the usage of internet and quantity of digital data generated by large organizations, firms, and governments have paved way for the researchers to focus on security issues of private data. This collected data is usually related to a definite necessity. For example, in the medical field, health record systems are used for the exchange of medical data. In addition to services based on users' current location, many potential services rely on users' location history or their spatial- temporal provenance. However, most of the collected data contain data identifying individual which is of sensitive nature. This chapter portrait various machine learning and deep learning techniques to preserve the privacy of the sensitive and private data of all individuals. It reviews the current literature on privacy ML and deep learning techniques, along with the non-cryptographic differential privacy approach for ensuring sensitive data privacy.

Chapter 13: Dengue is a major public health problem in India. Some studies have reported that an epidemiological shift in dengue viruses and climate change might be responsible for the observed increase in dengue burden across India. The full life cycle of dengue fever virus involves the role of mosquito as a transmitter (or vector) and humans as the main victim and source of infection. Accurate and timely forecasts of dengue incidence in India are still lacking. The epidemiology of dengue fevers in the Indian subcontinent has been very complex and has substantially changed over almost past six decades in terms of prevalent strains, affected geographical locations and severity of disease. In this work, the state-of-the-art machine learning algorithms are used to develop an accurate predictive model of dengue. In this work, Several machine learning algorithms, including the Support Vector Regression (SVR) algorithm, Step-down Linear Regression(SLR) model, Gradient Boosted Regression Tree (GBRT) algorithm, Negative Binomial Regression (NBM)model, Least Absolute Shrinkage and Selection Operator (LASSO) linear regression model and Generalized Additive Model (GAM)are as candidate models to predict dengue incidence. Performance and goodness of fit of the models were assessed using the root-mean-square error (RMSE) and R-squared measures.

Chapter 14: Deep Learning is an artificial intelligence function that reproduces the mechanisms of the human mind in processing records and evolving shapes to be used in selection construction. The main objective of this chapter is to provide a complete examination of deep learning algorithms and its applications in various fields. Deep learning has detonated in the public alertness, primarily as inspective and analytical products fill our world, in the form of numerous human-centered smart-world systems, with besieged advertisements, natural language supporters and interpreters, and prototype self-driving

vehicle systems. Therefore, it provides a broad orientation for those seeking a primer on deep learning algorithms and its various applications, platforms, and uses in a variety of smart-world systems. Also, this survey delivers a precious orientation for new deep learning practitioners, as well as those seeking to innovate in the application of deep learning.

Chapter 15: The chapter discusses about the recent advancement of machine learning techniques in healthcare. The chapter explains the applications fields like Drug detection and Analysis, Assistive Technologies, Medical Image Diagnosis, Smart Health records and so on. The machine learning techniques plays a predominant role in healthcare and it will lead to a robotic healthcare all over the universe in future. The researchers and students in Engineering and Science can get a greater exposure on the applications of machine learning techniques in healthcare. It will create an impact for the researchers to do research in the machine learning techniques, implementing healthcare products, providing an exposure to the society, teaching to the public about the invents.

Chapter 16: Neural networks are very useful and are proving to be very beneficial in various fields. Biomedical applications such as breast cancer image classification, differentiating between the malignant and benign type of breast cancer, etc. are now seen to be making use of neural networks rapidly. Neural networks are showing remarkable results of their effectiveness in these biomedical applications and are proving to be immensely profitable. Another field such as agriculture, which is a very crucial field for survival of human life, can be benefitted from neural networks. Likewise various fields can gain enormous benefits from the usage of neural networks. In this chapter, titled "Contribution of Neural Networks in Different Applications", by the authors, shall explain neural networks in detail. Also, the authors shall provide a brief and detailed insight of the contribution of neural networks in different applications, along with its analysis.

Chapter 17: Deep learning refers to as part of machine learning. Learning here consists of various methods using neural network algorithm. Learning from the big vast data can be supervised or unsupervised. It enables the machine to learn gradually by itself from all the related situations or date provided. Nowadays, Deep Learning is playing vital role with greater success in various applications, such as Digital Image Processing, Human Computer interaction, Computer Vision and Natural Language Processing, Robotics, Biological Applications etc. Unlike traditional machine learning approaches, Deep Learning has effective ability of learning and makes better use of data set for feature extraction. Because of its repetitive learning ability, Deep Learning has become more popular in the present day research works

Chapter 18: Machine Learning (ML) is one of the exciting sub-fields of artificial intelligence (AI). The term Machine learning is generally stated as the ability to learn without being explicitly programmed. In recent years, Machine learning has become one of the thrust areas of research across various business verticals. The technical advancements in the field of big data have provided the ability to gain access over large volumes of diversified data at ease. This massive amount of data can be processed at high speeds in a reasonable amount of time with the help of emerging hardware capabilities. Hence the Machine learning algorithms have been the most effective at leveraging all of Big Data to provide almost near real-time solutions even for the complex business problems. This chapter aims in giving a solid introduction to various widely adopted machine learning techniques and its applications categorized into Supervised, Unsupervised and Reinforcement and will serve a simplified guide for the aspiring data and machine learning enthusiasts.

Chapter 19: Introduction to artificial intelligence is a book chapter about the science of artificial intelligence (AI). AI is the study of the design of intelligent computational agents. The book is structured to be accessible to a wide audience. We composed this book chapter since we are amped up for

the development of AI as an incorporated science. Similarly as with any science being created, AI has an intelligent, formal hypothesis and a test wing. Here we balance hypothesis and examination and tell the best way to interface them together personally. We build up the investigation of AI together with its designing applications. We trust the aphorism, "There is nothing as down to earth as a decent hypothesis." The soul of our methodology is caught by the announcement, "Everything ought to be made as basic as would be prudent, however not less complex." We should manufacture the science on strong establishments; we present the establishments, yet just sketch, and give a few instances of, the unpredictability required to assemble valuable canny frameworks. The book chapter can be used as an introductory text on artificial intelligence for advanced undergraduate or graduate students in computer science or related disciplines such as computer engineering, philosophy, cognitive science, or psychology. It will appeal more to the technically minded; parts are technically challenging, focusing on learning by doing: designing, building, and implementing systems. Any curious scientifically oriented reader will benefit from studying the book.

Chapter 20: Machine Learning is the part of artificial intelligence that makes machines to learn without being expressly programmed and predict the future. Machine learning application built up the upcoming modern world. Machine learning techniques mainly classified into three techniques supervised, unsupervised and semi-supervised. Machine learning is an interdisciplinary field, which can be joined in different areas including science, business, and research. Supervised techniques applied in agriculture, email spam, malware filtering, online fraud detection, optical character recognition, natural language processing, and face detection. Unsupervised techniques applied in market segmentation, and sentiment analysis and anomaly detection. Deep learning is being utilized in a broad scope of filed such as sound, image, video, Time series, and Text. This chapter covers applications of various machine learning techniques, social media, agriculture and task scheduling in a distributed system.

Chapter 21: Machine learning provides the system to automatically learn without human intervention and improve their performance with the help of previous experience. It can access the data and use it for learning by itself. Even though many algorithms are developed to solve machine learning issues, it is difficult to handle all kinds of inputs data in-order to arrive at accurate decisions. The domain knowledge of statistical science, probability, logic, mathematical optimization, reinforcement learning and control theory plays a major role in developing machine learning based algorithms. The key consideration in selecting a suitable programming language for implementing machine learning algorithm includes performance, concurrence, application development, learning curve. This chapter deals with few of the top programming languages used for developing machine learning applications. They are python, R, and Java. Top three programming languages preferred by data scientist are: (1) Python more than 57%, (2) R more than 31% and (3) java used by 17% of the data scientist.

This edited book has specific salient features. They are:

- It deals with important and timely topic of emerging areas like Healthcare, Information Security, Medical Image Processing, agriculture and other unattended areas.
- It presents research findings and materials authored by global experts in the field.
- It serves as a comprehensive source of information and reference material on the topic machine learning.
- It presents latest development of the topic related to machine learning and its related areas.
- It presents the research findings in well organized and structured manner.
- Even though it is not a text book, it can serve as a complete reference material for data analysts.

- It can certainly be used as one for graduate courses and research oriented courses dealing with machine learning or data science.
- It can serve as light house of knowledge in machine learning research lab including data science lab.

This comprehensive and timely publication aims to be an essential reference source, building on the available literature in the field of machine learning to boost further research in this dynamic and challenging field. It is expected that this text book will provide the resources necessary for technology developers, scientists and manufacturer to adopt and implement new inventions across the globe.

In short, I am very happy with both experience and end product of our sincere efforts. It is certain that this book will continue as an essential and indispensable resource for all concerned for coming years.

With Regards

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