

# A comprehensive review on Data Stream Mining techniques for data classification; and future trends

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## Abstract

Data Mining is a developing interdisciplinary control managing Data Reclamation and Data Stream Mining techniques, whose subject is gathering, overseeing, processing, breaking down, and visualizing the huge volume of organized or unstructured data. Data stream mining indicates how to look at Unknown patterns from a massive amount of data over algorithms. It has experienced quick improvement with significant progress in math, statistics, data science, and computer science domains. Data streams are commonly generated by various sources such as sensor networks, social media feeds, financial transactions, online retail, network traffic, and many other applications. The gathered data could be additionally utilized for various purposes, for example, execution assessment, irregularity discovery, change identification, or issue finding of the operating systems. This data streams analysis is done using different data stream mining techniques. This paper provides a broad overview of the distinct approaches used for data stream mining. Initially, we studied the different techniques of data stream mining. Next, we discuss the different clustering and classification techniques and their benefits. Then we examine the evaluation of different data stream mining techniques results that some techniques are feasible for real-time data streams and some of not. This study provides a complete understanding of techniques and their benefits. The studies done so far need to be sufficiently exhaustive for data mining techniques, so future work is needed to assess which technique is feasible for real-time data streams.

**Keywords:** Data Stream Mining, Rapid Development, Classification, Clustering, D-Stream, HP Stream, ANNCAD, CDM, AWSOM, Clustream, Approximate Frequent Counts

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## 1. Introduction

Data streams mean data flow continuously; for example, data arrive from different sources of real-time applications such as Facebook, internet traffic, socket markets, etc. Therefore, data speed and volume are critical challenges in data stream mining [1].

Now, online applications are generating data constantly, and data is growing very fast, for a considerable amount of data is generated by applications used to start different stream data approaches. Data stream mining techniques are used to analyze vast volumes of data to find patterns required to make business decisions. In real-time making a business decision, stream data mining has become important research work and uses different areas of computer science and engineering. These techniques are challenges to processing huge amounts of data. Stream data can be trained algorithms by example that continuously huge amounts of data with high speed from different sources as shown in Figure 1.

Data stream mining is a very famous and fascinating area of research in computer science that has gotten very important in the last two decades. Although the systems of the modern era are very advanced, the hardware and software are advancing day to day for the benefit of human beings. As a result, data generation is increasing with these advanced hardware devices, like Fire detection systems in hospitals or rooms, Earth Quack detection, and flood detection. This speedily produced data is called "data streams" [2].

The transactions of debit cards, online transactions, remote sensors, scientific process, stock market, our search queries on Google Search Engine or any search engine, the phone calls in a city, the daily posts on different social platforms like Facebook, tweets, Instagram's, whats-app, linked-in as well as the internet traffics or so many others distinct data streams. We need to carefully analyze streaming data for these kinds of real-time data streaming applications. Traditional data mining techniques still need to fulfill the rapidly growing needs of data stream mining. We have been developing new and adopting existing techniques that enable them to stay activated till yet in a streaming environment with the help of Ran-

# Ieee Paper On Data Stream Mining

**Max Bramer, Miltos Petridis**



## **Ieee Paper On Data Stream Mining:**

New Research in Multimedia and Internet Systems Aleksander Zgrzywa, Kazimierz Choroś, Andrzej Siemiński, 2014-09-02 The rapid proliferation of Multimedia and Network Information Systems is one of the key features of our times What is also important is that the pace of change is ever increasing University projects of today will form the core of consumer products of tomorrow Therefore it is very important to have a broad view of the recent scientific investigation in that area This was the primary reason for gathering this collection of carefully selected and hopefully representative research projects found solutions and finally applications They are the achievements of scientific teams from several countries The contents of the monograph has been divided into four parts 1 Multimedia Information Technology 2 Information Systems Specification 3 Information Systems Applications 4 Web Systems and Network Technologies The book presents up to date research from the diverse fields of multimedia and Internet data processing Artificial Intelligence and Soft Computing Leszek Rutkowski, Marcin Korytkowski, Rafał Scherer, Ryszard Tadeusiewicz, Lotfi A. Zadeh, Jacek M. Zurada, 2016-05-30 The two volume set LNAI 9692 and LNAI 9693 constitutes the refereed proceedings of the 15th International Conference on Artificial Intelligence and Soft Computing ICAISC 2016 held in Zakopane Poland in June 2016 The 134 revised full papers presented were carefully reviewed and selected from 343 submissions The papers included in the first volume are organized in the following topical sections neural networks and their applications fuzzy systems and their applications evolutionary algorithms and their applications agent systems robotics and control and pattern classification The second volume is divided in the following parts bioinformatics biometrics and medical applications data mining artificial intelligence in modeling and simulation visual information coding meets machine learning and various problems of artificial intelligence **Big Data Analytics with Applications in Insider Threat Detection** Bhavani Thuraisingham, Pallabi Parveen, Mohammad Mehedy Masud, Latifur Khan, 2017-11-22 Today s malware mutates randomly to avoid detection but reactively adaptive malware is more intelligent learning and adapting to new computer defenses on the fly Using the same algorithms that antivirus software uses to detect viruses reactively adaptive malware deploys those algorithms to outwit antivirus defenses and to go undetected This book provides details of the tools the types of malware the tools will detect implementation of the tools in a cloud computing framework and the applications for insider threat detection **Frontiers of WWW Research and Development -- APWeb 2006** Xiaofang Zhou, Jianzhong Li, Heng Tao Shen, Masaru Kitsuregawa, Yanchun Zhang, 2006-01-09 This book constitutes the refereed proceedings of the 8th Asia Pacific Web Conference APWeb 2006 More than 100 papers cover all current issues on WWW related technologies and new advanced applications for researchers and practitioners from both academic and industry The Future of Artificial Intelligence and Robotics David Pastor-Escuredo, Imene Brigui, Nishtha Kesswani, Sushanta Bordoloi, Ashok Kumar Ray, 2024-08-19 This book includes the results from the 5th International Conference on Deep Learning Artificial Intelligence and Robotics ICDLAIR held in National Institute of

Technology Kurukshetra on December 07 09 2023 which brought together visionaries researchers and industry leaders at the forefront of technological innovation In the rapidly evolving landscape of technology deep learning artificial intelligence and robotics stand as a beacon of innovation and intellectual exchange Among the myriad of groundbreaking contributions a notable gem emerges a forthcoming book that promises to encapsulate the essence of the 5th International Conference on Deep Learning Artificial Intelligence and Robotics ICDLAIR 2023 proceedings Titled Progress in AI Driven Business Decisions Robotic Process Automation this publication is poised to become a cornerstone for enthusiasts researchers and professionals seeking a comprehensive understanding of the latest advancements in deep learning artificial intelligence and robotics Focused on the theme Progress in AI Driven Business Decisions Robotic Process Automation the conference showcased groundbreaking developments in the field exploring the intersection of deep learning artificial intelligence AI and robotics

**Big Data Analysis: New Algorithms for a New Society** Nathalie Japkowicz, Jerzy Stefanowski, 2015-12-16 This edited volume is devoted to Big Data Analysis from a Machine Learning standpoint as presented by some of the most eminent researchers in this area It demonstrates that Big Data Analysis opens up new research problems which were either never considered before or were only considered within a limited range In addition to providing methodological discussions on the principles of mining Big Data and the difference between traditional statistical data analysis and newer computing frameworks this book presents recently developed algorithms affecting such areas as business financial forecasting human mobility the Internet of Things information networks bioinformatics medical systems and life science It explores through a number of specific examples how the study of Big Data Analysis has evolved and how it has started and will most likely continue to affect society While the benefits brought upon by Big Data Analysis are underlined the book also discusses some of the warnings that have been issued concerning the potential dangers of Big Data Analysis along with its pitfalls and challenges

**Research and Development in Intelligent Systems XXIX** Max Bramer, Miltos Petridis, 2012-10-30 The papers in this volume are the refereed papers presented at AI 2012 the Thirty second SGAI International Conference on Innovative Techniques and Applications of Artificial Intelligence held in Cambridge in December 2012 in both the technical and the application streams They present new and innovative developments and applications divided into technical stream sections on Data Mining Data Mining and Machine Learning Planning and Optimisation and Knowledge Management and Prediction followed by application stream sections on Language and Classification Recommendation Practical Applications and Systems and Data Mining and Machine Learning The volume also includes the text of short papers presented as posters at the conference This is the twenty ninth volume in the Research and Development in Intelligent Systems series which also incorporates the twentieth volume in the Applications and Innovations in Intelligent Systems series These series are essential reading for those who wish to keep up to date with developments in this important field

**Intelligent Systems and Applications** W.C.-C. Chu, H.-C. Chao, S.J.-H. Yang, 2015-04-14 This book presents the proceedings of the International

Computer Symposium 2014 ICS 2014 held at Tunghai University Taichung Taiwan in December ICS is a biennial symposium founded in 1973 and offers a platform for researchers educators and professionals to exchange their discoveries and practices to share research experiences and to discuss potential new trends in the ICT industry Topics covered in the ICS 2014 workshops include algorithms and computation theory artificial intelligence and fuzzy systems computer architecture embedded systems SoC and VLSI EDA cryptography and information security databases data mining big data and information retrieval mobile computing wireless communications and vehicular technologies software engineering and programming languages healthcare and bioinformatics among others There was also a workshop on information technology innovation industrial application and the Internet of Things ICS is one of Taiwan s most prestigious international IT symposiums and this book will be of interest to all those involved in the world of information technology

*International Conference on Artificial Intelligence for Smart Community* Rosdiazli Ibrahim,K. Porkumaran,Ramani Kannan,Nursyarizal Mohd Nor,S. Prabakar,2022-11-13 This conference proceeding gather a selection of peer reviewed papers presented at the 1st International Conference on Artificial Intelligence for Smart Community AISC 2020 held as a virtual conference on 17 18 December 2020 with the theme Re imagining Artificial Intelligence AI for Smart Community to apply computational intelligence for biomedical instruments automation control and smart community to develop suitable solution for various real world application The conference virtually brought together researchers scientists engineers industrial professionals and students presenting important results in the related field of healthcare technology soft computing technologies IoT evolutionary computations automation and control smart manufacturing and smart cities Researchers and scientist working in the allied domain of Artificial Intelligence and others will find the book useful as it will contain some latest computational intelligence methodologies and applications

*Intelligent Distributed Computing XII* Javier Del Ser,Eneko Osaba,Miren Nekane Bilbao,Javier J. Sanchez-Medina,Massimo Vecchio,Xin-She Yang,2018-09-14 This book gathers a wealth of research contributions on recent advances in intelligent and distributed computing and which present both architectural and algorithmic findings in these fields A major focus is placed on new techniques and applications for evolutionary computation swarm intelligence multi agent systems multi criteria optimization and Deep Shallow machine learning models all of which are approached as technological drivers to enable autonomous reasoning and decision making in complex distributed environments Part of the book is also devoted to new scheduling and resource allocation methods for distributed computing systems The book represents the peer reviewed proceedings of the 12th International Symposium on Intelligent Distributed Computing IDC 2018 which was held in Bilbao Spain from October 15 to 17 2018

**Research and Development in Intelligent Systems XXXI** Max Bramer,Miltos Petridis,2014-10-30 The papers in this volume are the refereed papers presented at AI 2014 the Thirty fourth SGAI International Conference on Innovative Techniques and Applications of Artificial Intelligence held in Cambridge in December 2014 in both the technical and the application streams They present new and

innovative developments and applications divided into technical stream sections on Knowledge Discovery and Data Mining Machine Learning and Agents Ontologies and Genetic Programming followed by application stream sections on Evolutionary Algorithms Dynamic Modelling Planning and Optimisation and Machine Learning and Data Mining The volume also includes the text of short papers presented as posters at the conference This is the thirty first volume in the Research and Development in Intelligent Systems series which also incorporates the twenty second volume in the Applications and Innovations in Intelligent Systems series These series are essential reading for those who wish to keep up to date with developments in this important field *Emerging Research in Electronics, Computer Science and Technology V.*

Sridhar,M.C. Padma,K.A. Radhakrishna Rao,2019-04-24 This book presents the proceedings of the International Conference on Emerging Research in Electronics Computer Science and Technology ICERECT organized by PES College of Engineering in Mandya Featuring cutting edge peer reviewed articles from the field of electronics computer science and technology it is a valuable resource for members of the scientific research community **Data Mining and Knowledge Discovery**

**Handbook** Oded Maimon,Lior Rokach,2010-09-10 Knowledge Discovery demonstrates intelligent computing at its best and is the most desirable and interesting end product of Information Technology To be able to discover and to extract knowledge from data is a task that many researchers and practitioners are endeavoring to accomplish There is a lot of hidden knowledge waiting to be discovered this is the challenge created by today s abundance of data Data Mining and Knowledge Discovery Handbook Second Edition organizes the most current concepts theories standards methodologies trends challenges and applications of data mining DM and knowledge discovery in databases KDD into a coherent and unified repository This handbook first surveys then provides comprehensive yet concise algorithmic descriptions of methods including classic methods plus the extensions and novel methods developed recently This volume concludes with in depth descriptions of data mining applications in various interdisciplinary industries including finance marketing medicine biology engineering telecommunications software and security Data Mining and Knowledge Discovery Handbook Second Edition is designed for research scientists libraries and advanced level students in computer science and engineering as a reference This handbook is also suitable for professionals in industry for computing applications information systems management and strategic research management **Machine Learning for Data Streams** Albert Bifet,Ricard Gavaldà,Geoffrey Holmes,Bernhard Pfahringer,2023-05-09 A hands on approach to tasks and techniques in data stream mining and real time analytics with examples in MOA a popular freely available open source software framework Today many information sources including sensor networks financial markets social networks and healthcare monitoring are so called data streams arriving sequentially and at high speed Analysis must take place in real time with partial data and without the capacity to store the entire data set This book presents algorithms and techniques used in data stream mining and real time analytics Taking a hands on approach the book demonstrates the techniques using MOA Massive Online Analysis a popular freely available open source

software framework allowing readers to try out the techniques after reading the explanations The book first offers a brief introduction to the topic covering big data mining basic methodologies for mining data streams and a simple example of MOA More detailed discussions follow with chapters on sketching techniques change classification ensemble methods regression clustering and frequent pattern mining Most of these chapters include exercises an MOA based lab session or both Finally the book discusses the MOA software covering the MOA graphical user interface the command line use of its API and the development of new methods within MOA The book will be an essential reference for readers who want to use data stream mining as a tool researchers in innovation or data stream mining and programmers who want to create new algorithms for MOA

Bio-inspired Algorithms for Data Streaming and Visualization, Big Data Management, and Fog Computing Simon James Fong, Richard C. Millham, 2020-08-25 This book aims to provide some insights into recently developed bio inspired algorithms within recent emerging trends of fog computing sentiment analysis and data streaming as well as to provide a more comprehensive approach to the big data management from pre processing to analytics to visualization phases The subject area of this book is within the realm of computer science notably algorithms meta heuristic and more particularly bio inspired algorithms Although application domains of these new algorithms may be mentioned the scope of this book is not on the application of algorithms to specific or general domains but to provide an update on recent research trends for bio inspired algorithms within a specific application domain or emerging area These areas include data streaming fog computing and phases of big data management One of the reasons for writing this book is that the bio inspired approach does not receive much attention but shows considerable promise and diversity in terms of approach of many issues in big data and streaming Some novel approaches of this book are the use of these algorithms to all phases of data management not just a particular phase such as data mining or business intelligence as many books focus on effective demonstration of the effectiveness of a selected algorithm within a chapter against comparative algorithms using the experimental method Another novel approach is a brief overview and evaluation of traditional algorithms both sequential and parallel for use in data mining in order to provide an overview of existing algorithms in use This overview complements a further chapter on bio inspired algorithms for data mining to enable readers to make a more suitable choice of algorithm for data mining within a particular context In all chapters references for further reading are provided and in selected chapters the author also include ideas for future research

ECAI 2023 K. Gal, A. Nowé, G.J. Nalepa, 2023-10-18 Artificial intelligence or AI now affects the day to day life of almost everyone on the planet and continues to be a perennial hot topic in the news This book presents the proceedings of ECAI 2023 the 26th European Conference on Artificial Intelligence and of PAIS 2023 the 12th Conference on Prestigious Applications of Intelligent Systems held from 30 September to 4 October 2023 and on 3 October 2023 respectively in Krak w Poland Since 1974 ECAI has been the premier venue for presenting AI research in Europe and this annual conference has become the place for researchers and practitioners of AI to discuss the latest trends and challenges in

all subfields of AI and to demonstrate innovative applications and uses of advanced AI technology ECAI 2023 received 1896 submissions a record number of which 1691 were retained for review ultimately resulting in an acceptance rate of 23% The 390 papers included here cover topics including machine learning natural language processing multi agent systems and vision and knowledge representation and reasoning PAIS 2023 received 17 submissions of which 10 were accepted after a rigorous review process Those 10 papers cover topics ranging from fostering better working environments behavior modeling and citizen science to large language models and neuro symbolic applications and are also included here Presenting a comprehensive overview of current research and developments in AI the book will be of interest to all those working in the field

*Advances in Embedded Computer Vision* Branislav Kisačanin, Margrit Gelautz, 2014-11-26 This illuminating collection offers a fresh look at the very latest advances in the field of embedded computer vision Emerging areas covered by this comprehensive text reference include the embedded realization of 3D vision technologies for a variety of applications such as stereo cameras on mobile devices Recent trends towards the development of small unmanned aerial vehicles UAVs with embedded image and video processing algorithms are also examined Topics and features discusses in detail three major success stories the development of the optical mouse vision for consumer robotics and vision for automotive safety reviews state of the art research on embedded 3D vision UAVs automotive vision mobile vision apps and augmented reality examines the potential of embedded computer vision in such cutting edge areas as the Internet of Things the mining of large data streams and in computational sensing describes historical successes current implementations and future challenges

Modern Approaches in Applied Intelligence Kishan G. Mehrotra, Chilukuri Krishna Mohan, Jae C. Oh, Pramod K. Varshney, Moonis Ali, 2011-06-27 The two volume set LNAI 6703 and LNAI 6704 constitutes the thoroughly refereed conference proceedings of the 24th International Conference on Industrial Engineering and Other Applications of Applied Intelligent Systems IEA AIE 2011 held in Syracuse NY USA in June July 2011 The total of 92 papers selected for the proceedings were carefully reviewed and selected from 206 submissions The papers cover a wide number of topics including feature extraction discretization clustering classification diagnosis data refinement neural networks genetic algorithms learning classifier systems Bayesian and probabilistic methods image processing robotics navigation optimization scheduling routing game theory and agents cognition emotion and beliefs

**Proceedings of the 2nd Cognitive Mobility Conference** Péter Baranyi, László Palkovics, Máté Zöldy, 2025-05-29 This book features selected papers presented at the 2nd International Conference on Cognitive Mobility which took place on October 19 20 2023 in Budapest Bosch Innovation Campus This conference brought together innovative research that explores the intersection of mobility transportation and social sciences offering valuable insights for professionals in these fields The proceedings encompass a diverse range of topics including Deep learning models for classification in mobility contexts Vehicle engineering advancements Social impacts of transportation systems Designed for researchers practitioners and policymakers this book serves as a vital



resource for understanding and advancing cognitive mobility They provide practical applications and theoretical frameworks that can enhance decision making and innovation in transportation solutions      Third International Congress on Information and Communication Technology Xin-She Yang, Simon Sherratt, Nilanjan Dey, Amit Joshi, 2018-09-28 The book includes selected high quality research papers presented at the Third International Congress on Information and Communication Technology held at Brunel University London on February 27 28 2018 It discusses emerging topics pertaining to information and communication technology ICT for managerial applications e governance e agriculture e education and computing technologies the Internet of Things IOT and e mining Written by experts and researchers working on ICT the book is suitable for new researchers involved in advanced studies

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