Frontiers in Artificial Intelligence and Applications

# ADAPTIVE STREAM MINING: PATTERN LEARNING AND MINING FROM EVOLVING DATA STREAMS

Albert Bifet



# Adaptive Stream Mining Pattern Learning And Mining From Evolving Data Streams Volume 207 Frontiers In Artificial Intelligence And Applications

William J. Tastle

# Adaptive Stream Mining Pattern Learning And Mining From Evolving Data Streams Volume 207 Frontiers In Artificial Intelligence And Applications:

Machine Learning for Data Streams Albert Bifet, Ricard Gavalda, Geoffrey Holmes, Bernhard Pfahringer, 2018-03-16 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 *Adaptive* Stream Mining Albert Bifet, 2010 This book is a significant contribution to the subject of mining time changing data streams and addresses the design of learning algorithms for this purpose It introduces new contributions on several different aspects of the problem identifying research opportunities and increasing the scope for applications It also includes an in depth study of stream mining and a theoretical analysis of proposed methods and algorithms The first section is concerned with the use of an adaptive sliding window algorithm ADWIN Since this has rigorous performance guarantees using it in place of counters or accumulators it offers the possibility of extending such guarantees to learning and mining algorithms not initially designed for drifting data Testing with several methods including Na ve Bayes clustering decision trees and ensemble methods is discussed as well The second part of the book describes a formal study of connected acyclic graphs or trees from the point of view of closure based mining presenting efficient algorithms for subtree testing and for mining ordered and unordered frequent closed trees Lastly a general methodology to identify closed patterns in a data stream is outlined This is applied to develop an incremental method a sliding window based method and a method that mines closed trees adaptively from data streams These are used to introduce classification methods for tree data streams Algorithms on Trees and Graphs Gabriel Valiente, 2021-10-11 Graph algorithms is a well established subject in mathematics and computer science Beyond classical application fields such as approximation combinatorial optimization graphics and operations research graph algorithms have

recently attracted increased attention from computational molecular biology and computational chemistry Centered around the fundamental issue of graph isomorphism this text goes beyond classical graph problems of shortest paths spanning trees flows in networks and matchings in bipartite graphs Advanced algorithmic results and techniques of practical relevance are presented in a coherent and consolidated way This book introduces graph algorithms on an intuitive basis followed by a detailed exposition in a literate programming style with correctness proofs as well as worst case analyses Furthermore full C implementations of all algorithms presented are given using the LEDA library of efficient data structures and algorithms

Data Mining for Business Applications Carlos A. Mota Soares, Rayid Ghani, 2010 Data mining is already incorporated into the business processes in sectors such as health retail automotive finance telecom and insurance as well as in government This book contains extended versions of a selection of papers presented at a series of workshops held between 2005 and 2008 on the subject of data mining for business applications **New Trends in Software Methodologies, Tools and Techniques** Hamido Fujita, 2010 Contains 30 papers from the SoMeT 10 international conference on new trends in software methodology tools and techniques in Yokohama Japan This book offers an opportunity for the software science community to reflect on where they are and how they can work to achieve an optimally harmonized performance between the design tool ECAI 2010 Helder Coelho, Rudi Studer, Michael Wooldridge, Michael J. Wooldridge, 2010 LC copy bound Computational Models of Argument Pietro Baroni, 2010 Presents papers from the in 2 v v 1 p 1 509 v 2 p 509 1153 Third Conference on Computational Models of Argument held in September 2010 in Desanzano del Garda Italy Providing a view of this important research field this book is of interest to those involved in the use and development of artificial intelligence systems Modular Ontologies Oliver Kutz, 2010 Title page Preface Contents Towards Ontology Use Re Use and Abuse in a Computational Creativity Collective Ontology Modularity Information Flow and Interaction Situated Semantics The Modular Structure of an Ontology An Empirical Study Extracting and Merging Contextualized Ontology Modules A Metric Suite for Evaluating Cohesion and Coupling in Modular Ontologies Towards a Functional Approach to Modular Ontologies Using Institutions Introducing Ontology Best Practices and Design Patterns into Robotics USAREnv Modular Upper Level Ontologies for Semantic Complex Event Processing Conditional and Preferential Logics Gian Luca Pozzato, 2010 Revised and updated version of the author's Ph D dissertation University of Torino **Human Language Technologies** Inguna Skadina, Andrejs Vasiljevs, 2010 This book contains papers from the Fourth International Conference on Human Language Technologies the Baltic Perspective Baltic HLT 2010 held in Riga in October 2010 This conference is the latest in a series which provides a forum for sharing recent advances in human language processing and promotes cooperation between the computer science and linguistics communities of the Baltic countries and the rest of the world Bringing together scientists developers providers and users the conference is an opportunity to exchange information discuss problems find new synergies and promote i Uncertainty Treatment Using Paraconsistent Logic João Inácio da Silva

Filho, Germano Lambert Torres, Jair Minoro Abe, 2010 This book aggregates much of this research from 1999 up to the present Organized to facilitate an understanding of the theory and the development of the applied methods Uncertainty Treatment Using Praconsistent Logic presents the material in a sequential fashion and is divided into three parts Formal Ontology in Information Systems Antony Galton, Riichiro Mizoguchi, 2010 Ontology began life in ancient times as a fundamental part of philosophical enquiry concerned with the analysis and categorisation of what exists In recent years the subject has taken a practical turn with the advent of complex computerised information systems which are reliant on robust and coherent representations of their subject matter The systematisation and elaboration of such representations and their associated reasoning techniques constitute the modern discipline of formal ontology which is now being applied to such diverse domains as artificial intelligence computational linguistics bioinformatics GIS knowledge engineering information retrieval and the Semantic Web Researchers in all these areas are becoming increasingly aware of the need for serious engagement with ontology understood as a general theory of the types of entities and relations making up their respective domains of enquiry to provide a solid foundation for their work The conference series Formal Ontology in Information Systems FOIS provides a meeting point for researchers from these and other disciplines with an interest in formal ontology where both theoretical issues and concrete applications can be explored in a spirit of genuine interdisciplinarity. This volume contains the proceedings of the sixth FOIS conference held in Toronto Canada during 11 14 May 2010 including invited talks by Francis Jeffry Pelletier John Bateman and Alan Rector and the 28 peer reviewed submissions selected for presentation at the conference ranging from foundational issues to more application oriented topics IOS Press is an international science technical and medical publisher of high quality books for academics scientists and professionals in all fields Some of the areas we publish in Biomedicine Oncology Artificial intelligence Databases and information systems Maritime engineering Nanotechnology Geoengineering All aspects of physics E governance E commerce The knowledge economy Urban studies Arms control Understanding and responding to terrorism Medical informatics Computer Sciences Ontologies and Semantic Technologies for Intelligence Leo Joseph Obrst, Terry Janssen, Werner Ceusters, 2010 Featuring chapters by selected contributors to the second international Ontology for the Intelligence Community OIC conference this book offers a partial technology roadmap for decision makers in the field of information integration sharing and situational awareness in the use of ontologies and semantic technologies for intelligence Bridging the Socio-technical Gap in Decision **Support Systems** Ana Respício, 2010 The socio technical gap is the great divide between social activities such as coordination which researchers and practitioners aim to support and those that are actually supported by technology As the social interaction takes place through technology it is changed and mediated by the technology This gap between the two dimensions is being challenged by new and innovative approaches such as cognitive ergonomics and Web 2 0 3 0 Research in Decision Making DM theory and Decision Support Systems DSS shows that this gap is due in part to technical limitations and in part to the complexity of the contexts where decision support must be provided Thus DSS researchers face important questions concerned with the encapsulation of complex social aspects of managerial decision making as well as with the representation of key human cognitive mechanisms such as intuition and insight within computational systems This book presents the latest innovations and advances in decision support theory and practice with a special focus on bridging the socio technical gap These achievements will be of interest to all those involved in decision making activities and research The book covers a wide range of topics including Understanding DM Design of DSS Web 2 0 Systems in Decision Support Business Intelligence and Data Warehousing Applications of Multi Criteria Decision Analysis Intelligent DM Context in DM Knowledge Management ERP Systems Decision Support for Policy Making Decision Making in Emergency Scenarios Decision Support in Commerce and Decision Support for Production Planning Bridging the Socio-technical Gap in Decision Support Systems Frédéric Adam, Carlos Teixeira, João Telhada, 2010-06-15 The socio technical gap is the great divide between social activities such as coordination which researchers and practitioners aim to support and those that are actually supported by technology As the social interaction takes place through technology it is changed and mediated by the technology This gap between the two dimensions is being challenged by new and innovative approaches such as cognitive ergonomics and Web 2 0 3 0 Research in Decision Making DM theory and Decision Support Systems DSS shows that this gap is due in part to technical limitations and in part to the complexity of the contexts where decision support must be provided Thus DSS researchers face important questions concerned with the encapsulation of complex social aspects of managerial decision making as well as with the representation of key human cognitive mechanisms such as intuition and insight within computational systems This book presents the latest innovations and advances in decision support theory and practice with a special focus on bridging the socio technical gap These achievements will be of interest to all those involved in decision making activities and research The book covers a wide range of topics including Understanding DM Design of DSS Web 2 0 Systems in Decision Support Business Intelligence and Data Warehousing Applications of Multi Criteria Decision Analysis Intelligent DM Context in DM Knowledge Management ERP Systems Decision Support for Policy Making Decision Making in Emergency Scenarios Decision Support in Commerce and Decision Support for Production Planning Data Streams Charu C. Aggarwal, 2007-04-03 This book primarily discusses issues related to the mining aspects of data streams and it is unique in its primary focus on the subject This volume covers mining aspects of data streams comprehensively each contributed chapter contains a survey on the topic the key ideas in the field for that particular topic and future research directions The book is intended for a professional audience composed of researchers and practitioners in industry This book is also appropriate for advanced level students in computer science Novel Methods for Mining and Learning from Data Streams Ammar Shaker, 2017 Die vorliegende Arbeit befasst sich mit dem Erwerb von Wissen durch Lernen aus nichtstation ren Datenstr men Ein Datenstrom besteht aus einer kontinuierlichen Folge von Datenobjekten wobei sich Eigenschaften des

datengenerierenden Prozesses im Laufe der Zeit ndern k nnen Sowohl die Kontinuit t und Dynamik als auch die Nichtstationarit t von Datenstr men gehen einher mit neuen Herausforderungen fr Methoden des maschinellen Lernens Zwei neue Methoden zum berwachten Lernen Klassifikation und Regression auf Datenstr men werden in der Arbeit vorgestellt IBL Streams und eFPT IBLStreams ist ein instanzbasiertes Verfahren und als solches besonders gut geeignet inkrementell zu lernen und sich adaptiv an Ver nderungen des datengenerierenden Prozesses anzupassen vor allem im Vergleich zu modellbasierten Ans tzen Der zweite Ansatz evolving Fuzzy Pattern Trees eFPT kombiniert Konzepte der Fuzzy Logik mit der Flexibilit t nichtlinearer Aggregationsfunktionen und der Ausdrucksst rke hierarchischer Strukturen um interpretierbare Modelle in Form kompakter B ume zu induzieren F r diese sogenannten fuzzy pattern trees werden Lernverfahren entwickelt die es erm glichen B ume inkrementell zu lernen und an Ver nderungen des Datenstroms anzupassen Ein weiterer Beitrag der Arbeit ist ein experimenteller Ansatz der darauf abzielt eine wichtige Eigenschaft von Methoden zum Lernen auf Datenstr men zu untersuchen n mlich die F higkeit auf einen so genannten concept change zu reagieren Hierunter versteht man eine pl tzliche oder graduelle nderung des datengenerierenden Prozesses der in der Regel zu einer tempor ren Verschlechterung der Pr diktionsg te f hrt In this thesis we elaborate on knowledge acquisition and learning from non stationary data streams A data stream is formed by consecutively arriving data examples whose data generating process may change in the course of time Both the cumulative and the non stationary nature of the data within a stream create a challenge for traditional machine learning methods Concentrating on adaptive supervised learning from data streams we introduce two novel learning methods IBLStreams and eFPT IBLStreams is an instance based learner that shows how instance based learning approaches compared to model based approaches are naturally incremental besides their inherent ability to adapt upon the occurrence of a concept change Evolving fuzzy pattern trees eFPTs utilize the potential interpretability of the fuzzy logic concepts in inducing compact trees the induced trees offer the tradeoff between compact interpretable models and generalization performance eFPTs attempt to dynamically evolve the induced tree in order to reflect any change in the underlying data generating process We also introduce recovery analysis as a new type of evaluation for adaptive supervised learners on data streams It is an experimental protocol to assess the learner's ability to learn and recover after a concept change The resulting recovery pattern of the learning method can be analyzed both graphically and numerically using recovery measures Apart from the full supervision offered in the streams studied in the previous approaches we also consider streams of events such a stream contains temporal events emitted from instances under observation For a given instance the survival time is the time this instance spends in the study until experiencing the event of Data Mining Applications Using Artificial Adaptive Systems William J. Tastle, 2012-08-27 This volume directly interest addresses the complexities involved in data mining and the development of new algorithms built on an underlying theory consisting of linear and non linear dynamics data selection filtering and analysis while including analytical projection and

prediction The results derived from the analysis are then further manipulated such that a visual representation is derived with an accompanying analysis The book brings very current methods of analysis to the forefront of the discipline provides researchers and practitioners the mathematical underpinning of the algorithms and the non specialist with a visual representation such that a valid understanding of the meaning of the adaptive system can be attained with careful attention to the visual representation The book presents as a collection of documents sophisticated and meaningful methods that can be immediately understood and applied to various other disciplines of research The content is composed of chapters addressing An application of adaptive systems methodology in the field of post radiation treatment involving brain volume differences in children A new adaptive system for computer aided diagnosis of the characterization of lung nodules A new method of multi dimensional scaling with minimal loss of information A description of the semantics of point spaces with an application on the analysis of terrorist attacks in Afghanistan The description of a new family of meta classifiers A new method of optimal informational sorting A general method for the unsupervised adaptive classification for learning and the presentation of two new theories one in target diffusion and the other in twisting theory **New Frontiers in Mining** Complex Patterns Michelangelo Ceci, Corrado Loglisci, Giuseppe Manco, Elio Masciari, Zbigniew Ras, 2020-05-13 This book constitutes the refereed post conference proceedings of the 8th International Workshop on New Frontiers in Mining Complex Patterns NFMCP 2019 held in conjunction with ECML PKDD 2019 in W rzburg Germany in September 2019 The workshop focused on the latest developments in the analysis of complex and massive data sources such as blogs event or log data medical data spatio temporal data social networks mobility data sensor data and streams **Data Mining Patterns: New** Methods and Applications Poncelet, Pascal, Masseglia, Florent, Teisseire, Maguelonne, 2007-08-31 This book provides an overall view of recent solutions for mining and explores new patterns offering theoretical frameworks and presenting challenges and possible solutions concerning pattern extractions emphasizing research techniques and real world applications It portrays research applications in data models methodologies for mining patterns multi relational and multidimensional pattern mining fuzzy data mining data streaming and incremental mining Provided by publisher

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