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Evolutionary Computation, Machine Learning and Data Mining in Bioinformatics

7th European Conference, EvoBIO 2009
Tübingen, Germany, April 2009
Proceedings



 Springer

Evolutionary Computation In Data Mining

Chis, Monica



Evolutionary Computation In Data Mining:

Evolutionary Computation in Data Mining Ashish Ghosh, 2004-10-18 Data mining DM consists of extracting interesting knowledge from the world large and is the core step of a broader process called the knowledge discovery from databases KDD process. In addition to the DM step which actually extracts knowledge from data the KDD process includes several preprocessing or data preparation and post processing or knowledge refinement steps. The goal of data preprocessing methods is to transform the data to facilitate the application of a or several given DM algorithms whereas the goal of knowledge refinement methods is to validate and refine discovered knowledge. Ideally discovered knowledge should be not only accurate but also comprehensible and interesting to the user. The total process is highly computation intensive. The idea of automatically discovering knowledge from databases is a very attractive and challenging task both for academia and for industry. Hence there has been a growing interest in data mining in several AI related areas including evolutionary algorithms EAs. The main motivation for applying EAs to KDD tasks is that they are robust and adaptive search methods which perform a global search in the space of candidate solutions for instance rules or another form of knowledge representation.

Evolutionary Computation in Data Mining Ashish Ghosh, 2009-09-02 Data mining DM consists of extracting interesting knowledge from the world large and is the core step of a broader process called the knowledge discovery from databases KDD process. In addition to the DM step which actually extracts knowledge from data the KDD process includes several preprocessing or data preparation and post processing or knowledge refinement steps. The goal of data preprocessing methods is to transform the data to facilitate the application of a or several given DM algorithms whereas the goal of knowledge refinement methods is to validate and refine discovered knowledge. Ideally discovered knowledge should be not only accurate but also comprehensible and interesting to the user. The total process is highly computation intensive. The idea of automatically discovering knowledge from databases is a very attractive and challenging task both for academia and for industry. Hence there has been a growing interest in data mining in several AI related areas including evolutionary algorithms EAs. The main motivation for applying EAs to KDD tasks is that they are robust and adaptive search methods which perform a global search in the space of candidate solutions for instance rules or another form of knowledge representation.

Data Mining and Knowledge Discovery with Evolutionary Algorithms Alex A. Freitas, 2002-08-21 This book integrates two areas of computer science namely data mining and evolutionary algorithms. Both these areas have become increasingly popular in the last few years and their integration is currently an active research area. In general data mining consists of extracting knowledge from data. The motivation for applying evolutionary algorithms to data mining is that evolutionary algorithms are robust search methods which perform a global search in the space of candidate solutions. This book emphasizes the importance of discovering comprehensible interesting knowledge which is potentially useful for intelligent decision making. The text explains both basic concepts and advanced topics. *Evolutionary*

Decision Trees in Large-Scale Data Mining Marek Kretowski, 2019-06-05 This book presents a unified framework based on specialized evolutionary algorithms for the global induction of various types of classification and regression trees from data. The resulting univariate or oblique trees are significantly smaller than those produced by standard top down methods, an aspect that is critical for the interpretation of mined patterns by domain analysts. The approach presented here is extremely flexible and can easily be adapted to specific data mining applications, e.g. cost sensitive model trees for financial data or multi test trees for gene expression data. The global induction can be efficiently applied to large scale data without the need for extraordinary resources. With a simple GPU based acceleration datasets composed of millions of instances can be mined in minutes. In the event that the size of the datasets makes the fastest memory computing impossible, the Spark based implementation on computer clusters which offers impressive fault tolerance and scalability potential can be applied.

Automating the Design of Data Mining Algorithms Gisele L. Pappa, Alex Freitas, 2009-10-27 Data mining is a very active research area with many successful real world applications. It consists of a set of concepts and methods used to extract interesting or useful knowledge or patterns from real world datasets providing valuable support for decision making in industry, business, government and science. Although there are already many types of data mining algorithms available in the literature, it is still difficult for users to choose the best possible data mining algorithm for their particular data mining problem. In addition, data mining algorithms have been manually designed; therefore, they incorporate human biases and preferences. This book proposes a new approach to the design of data mining algorithms, instead of relying on the slow and ad hoc process of manual algorithm design, this book proposes systematically automating the design of data mining algorithms with an evolutionary computation approach. More precisely, we propose a genetic programming system, a type of evolutionary computation method that evolves computer programs to automate the design of rule induction algorithms, a type of classification method that discovers a set of classification rules from data. We focus on genetic programming in this book because it is the paradigmatic type of machine learning method for automating the generation of programs and because it has the advantage of performing a global search in the space of candidate solutions. Data mining algorithms in our case, but in principle other types of search methods for this task could be investigated in the future. **Evolutionary Computation, Machine**

Learning and Data Mining in Bioinformatics Clara Pizzuti, Marylyn D. Ritchie, Mario Giacobini, 2011-03-30

Evolutionary Computation, Machine Learning and Data Mining in Bioinformatics Elena Marchiori, 2007-04-02 This book constitutes the refereed proceedings of the 5th European Conference on Evolutionary Computation, Machine Learning and Data Mining in Bioinformatics, EvoBIO 2007, held in Valencia, Spain, April 2007. Coverage brings together experts in computer science with experts in bioinformatics and the biological sciences. It presents contributions on fundamental and theoretical issues along with papers dealing with different applications areas. **Evolutionary Computation, Machine Learning and Data Mining in Bioinformatics** Clara Pizzuti, Marylyn D. Ritchie, Mario

Giacobini,2010-04-03 This book constitutes the refereed proceedings of the 7th European Conference on Evolutionary Computation Machine Learning and Data Mining in Bioinformatics EvoBIO 2010 held in Istanbul Turkey in April 2010 co located with the Evo 2010 events This 15 revised full papers were carefully reviewed and selected from 40 submissions EvoBIO is the premiere European event for those interested in the interface between evolutionary computation machine learning data mining bioinformatics and computational biology Topics addressed by the papers include biomarker discovery cell simulation and modeling ecological modeling fluxomics gene networks biotechnology metabolomics microarray analysis phylogenetics protein interactions proteomics sequence analysis and alignment and systems biology **Multi-Objective**

Evolutionary Algorithms for Knowledge Discovery from Databases Ashish Ghosh,Satchidananda Dehuri,Susmita Ghosh,2008-02-28 The present volume provides a collection of seven articles containing new and high quality research results demonstrating the significance of Multi objective Evolutionary Algorithms MOEA for data mining tasks in Knowledge Discovery from Databases KDD These articles are written by leading experts around the world It is shown how the different MOEAs can be utilized both in individual and integrated manner in various ways to efficiently mine data from large databases

Evolutionary Computation, Machine Learning and Data Mining in Bioinformatics Mario Giacobini,Leonardo Vanneschi,William S. Bush,2012-03-28 This book constitutes the refereed proceedings of the 10th European Conference on Evolutionary Computation Machine Learning and Data Mining in Bioinformatics EvoBIO 2012 held in M laga Spain in April 2012 co located with the Evo 2012 events The 15 revised full papers presented together with 8 poster papers were carefully reviewed and selected from numerous submissions Computational Biology is a wide and varied discipline incorporating aspects of statistical analysis data structure and algorithm design machine learning and mathematical modeling toward the processing and improved understanding of biological data Experimentalists now routinely generate new information on such a massive scale that the techniques of computer science are needed to establish any meaningful result As a consequence biologists now face the challenges of algorithmic complexity and tractability and combinatorial explosion when conducting even basic analyses Evolutionary Computation, Machine Learning and Data Mining in Bioinformatics Leonardo

Vanneschi,William S. Bush,Mario Giacobini,2013-02-26 This book constitutes the refereed proceedings of the 11th European Conference on Evolutionary Computation Machine Learning and Data Mining in Bioinformatics EvoBIO 2013 held in Vienna Austria in April 2013 colocated with the Evo 2013 events EuroGP EvoCOP EvoMUSART and EvoApplications The 10 revised full papers presented together with 9 poster papers were carefully reviewed and selected from numerous submissions The papers cover a wide range of topics in the field of biological data analysis and computational biology They address important problems in biology from the molecular and genomic dimension to the individual and population level often drawing inspiration from biological systems in order to produce solutions to biological problems **Evolutionary Computation, Machine Learning and Data Mining in Bioinformatics** Clara Pizzuti,Marylyn D. Ritchie,Mario Giacobini,2009-04-10 This

book constitutes the refereed proceedings of the 7th European Conference on Evolutionary Computation Machine Learning and Data Mining in Bioinformatics EvoBIO 2009 held in Tbingen Germany in April 2009 colocated with the Evo 2009 events The 17 revised full papers were carefully reviewed and selected from 44 submissions EvoBio is the premiere European event for experts in computer science meeting with experts in bioinformatics and the biological sciences all interested in the interface between evolutionary computation machine learning data mining bioinformatics and computational biology Topics addressed by the papers include biomarker discovery cell simulation and modeling ecological modeling uxomics gene networks biotechnology metabolomics microarray analysis phylogenetics protein interactions proteomics sequence analysis and alignment as well as systems biology

Evolutionary Computation and Optimization Algorithms in Software Engineering: Applications and Techniques Chis, Monica,2010-06-30

Evolutionary Computation and Optimization Algorithms in Software Engineering Applications and Techniques lays the foundation for the successful integration of evolutionary computation into software engineering It surveys techniques ranging from genetic algorithms to swarm optimization theory to ant colony optimization demonstrating their uses and capabilities These techniques are applied to aspects of software engineering such as software testing quality assessment reliability assessment and fault prediction models among others to providing researchers scholars and students with the knowledge needed to expand this burgeoning application

Soft Computing for Data Mining Applications K. R. Venugopal,K.G. Srinivasa,L. M. Patnaik,2009-03-11 The authors have consolidated their research work in this volume titled Soft Computing for Data Mining Applications The monograph gives an insight into the research in the elds of Data Mining in combination with Soft Computing methodologies In these days the data continues to grow ponentially Much of the data is implicitly or explicitly imprecise Database discovery seeks to discover noteworthy unrecognized associations between the data items in the existing database The potential of discovery comes from the realization that alternate contexts may reveal additional valuable information The rate at which the data is storedis growing at a phenomenal rate As a result traditionalad hocmixtures of statistical techniques and data management tools are no longer adequate for analyzing this vast collection of data

Several domains where large volumes of data are stored in centralized or

distributed databases include applications like electronic commerce bio formatics computer security Web intelligence intelligent learning database systems nance marketing healthcare telecommunications and other elds E cient tools and algorithms for knowledge discovery in large data sets have been devised during the recent years These methods exploit the capability of computers to search huge amounts of data in a fast and effective manner However the data to be analyzed is imprecise and affected with certainty In the case of heterogeneous data sources such as text and video the data might moreover be ambiguous and partly conflicting Besides patterns and relationships of interest are usually approximate Thus in order to make the information mining process more robust it requires tolerance toward imprecision uncertainty and

exceptions **Intelligent Soft Computation and Evolving Data Mining: Integrating Advanced Technologies** Wang, Leon Shyue-Liang, Hong, Tzung-Pei, 2010-03-31 This book provides a reference to researchers practitioners and students in both soft computing and data mining communities for generating creative ideas of securing and managing data mining Provided by publisher **Pattern Mining with Evolutionary Algorithms** Sebastián Ventura, José María Luna, 2016-06-13 This book provides a comprehensive overview of the field of pattern mining with evolutionary algorithms To do so it covers formal definitions about patterns patterns mining type of patterns and the usefulness of patterns in the knowledge discovery process As it is described within the book the discovery process suffers from both high runtime and memory requirements especially when high dimensional datasets are analyzed To solve this issue many pruning strategies have been developed Nevertheless with the growing interest in the storage of information more and more datasets comprise such a dimensionality that the discovery of interesting patterns becomes a challenging process In this regard the use of evolutionary algorithms for mining pattern enables the computation capacity to be reduced providing sufficiently good solutions This book offers a survey on evolutionary computation with particular emphasis on genetic algorithms and genetic programming Also included is an analysis of the set of quality measures most widely used in the field of pattern mining with evolutionary algorithms This book serves as a review of the most important evolutionary algorithms for pattern mining It considers the analysis of different algorithms for mining different type of patterns and relationships between patterns such as frequent patterns infrequent patterns patterns defined in a continuous domain or even positive and negative patterns A completely new problem in the pattern mining field mining of exceptional relationships between patterns is discussed In this problem the goal is to identify patterns which distribution is exceptionally different from the distribution in the complete set of data records Finally the book deals with the subgroup discovery task a method to identify a subgroup of interesting patterns that is related to a dependent variable or target attribute This subgroup of patterns satisfies two essential conditions interpretability and interestingness Evolutionary Computation, Machine Learning and Data Mining in Bioinformatics Elena Marchiori, 2008-03-14 This book constitutes the refereed proceedings of the 6th European Conference on Evolutionary Computation Machine Learning and Data Mining in Bioinformatics EvoBIO 2008 held in Naples Italy in March 2008 colocated with the Evo 2008 events The 18 revised full papers were carefully reviewed and selected from 63 submissions EvoBio is the premiere European event for experts in computer science meeting with experts in bioinformatics and the biological sciences all interested in the interface between evolutionary computation machine learning data mining bioinformatics and computational biology Topics addressed by the papers include biomarker discovery cell simulation and modeling ecological modeling uxomics gene networks biotechnology metabolomics microarray analysis phylogenetics protein interactions proteomics sequence analysis and alignment as well as systems biology *Advances in Evolutionary Computing* Ashish Ghosh, Shigeyoshi Tsutsui, 2012-12-06 The term evolutionary computing refers to the study of the foundations and

applications of certain heuristic techniques based on the principles of natural evolution thus the aim of designing evolutionary algorithms EAs is to mimic some of the processes taking place in natural evolution These algorithms are classified into three main categories depending more on historical development than on major functional techniques In fact their biological basis is essentially the same Hence EC GA uGP uES uEP EC Evolutionary Computing GA Genetic Algorithms GP Genetic Programming ES Evolution Strategies EP Evolutionary Programming Although the details of biological evolution are not completely understood even nowadays there is some strong experimental evidence to support the following points Evolution is a process operating on chromosomes rather than on organisms Natural selection is the mechanism that selects organisms which are well adapted to the environment to reproduce more often than those which are not The evolutionary process takes place during the reproduction stage that includes mutation which causes the chromosomes of offspring to be different from those of the parents and recombination which combines the chromosomes of the parents to produce the offspring Based upon these features the previously mentioned three models of evolutionary computing were independently and almost simultaneously developed An evolutionary algorithm EA is an iterative and stochastic process that operates on a set of individuals called a population

Evolutionary Computation for Modeling and Optimization Daniel

Ashlock, 2006-04-04 Evolutionary Computation for Optimization and Modeling is an introduction to evolutionary computation a field which includes genetic algorithms evolutionary programming evolution strategies and genetic programming The text is a survey of some application of evolutionary algorithms It introduces mutation crossover design issues of selection and replacement methods the issue of populations size and the question of design of the fitness function It also includes a methodological material on efficient implementation Some of the other topics in this book include the design of simple evolutionary algorithms applications to several types of optimization evolutionary robotics simple evolutionary neural computation and several types of automatic programming including genetic programming The book gives applications to biology and bioinformatics and introduces a number of tools that can be used in biological modeling including evolutionary game theory Advanced techniques such as cellular encoding grammar based encoding and graph based evolutionary algorithms are also covered This book presents a large number of homework problems projects and experiments with a goal of illustrating single aspects of evolutionary computation and comparing different methods Its readership is intended for an undergraduate or first year graduate course in evolutionary computation for computer science engineering or other computational science students Engineering computer science and applied math students will find this book a useful guide to using evolutionary algorithms as a problem solving tool

Applications of Multi-objective Evolutionary Algorithms Carlos A. Coello Coello, Gary B. Lamont, 2004 Detailed MOEA applications discussed by international experts State of the art practical insights in tackling statistical optimization with MOEAs A unique monograph covering a wide spectrum of real world applications Step by step discussion of MOEA applications in a variety of domains

Reviewing **Evolutionary Computation In Data Mining**: Unlocking the Spellbinding Force of Linguistics

In a fast-paced world fueled by information and interconnectivity, the spellbinding force of linguistics has acquired newfound prominence. Its capacity to evoke emotions, stimulate contemplation, and stimulate metamorphosis is really astonishing. Within the pages of "**Evolutionary Computation In Data Mining**," an enthralling opus penned by a very acclaimed wordsmith, readers set about an immersive expedition to unravel the intricate significance of language and its indelible imprint on our lives. Throughout this assessment, we shall delve into the book's central motifs, appraise its distinctive narrative style, and gauge its overarching influence on the minds of its readers.

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