



Co Clustering

Hyuk Cho



Co Clustering:

Co-Clustering Gérard Govaert, Mohamed Nadif, 2013-12-31 Cluster or co cluster analyses are important tools in a variety of scientific areas The introduction of this book presents a state of the art of already well established as well as more recent methods of co clustering The authors mainly deal with the two mode partitioning under different approaches but pay particular attention to a probabilistic approach Chapter 1 concerns clustering in general and the model based clustering in particular The authors briefly review the classical clustering methods and focus on the mixture model They present and discuss the use of different mixtures adapted to different types of data The algorithms used are described and related works with different classical methods are presented and commented upon This chapter is useful in tackling the problem of co clustering under the mixture approach Chapter 2 is devoted to the latent block model proposed in the mixture approach context The authors discuss this model in detail and present its interest regarding co clustering Various algorithms are presented in a general context Chapter 3 focuses on binary and categorical data It presents in detail the appropriated latent block mixture models Variants of these models and algorithms are presented and illustrated using examples Chapter 4 focuses on contingency data Mutual information ϕ^2 and model based co clustering are studied Models algorithms and connections among different approaches are described and illustrated Chapter 5 presents the case of continuous data In the same way the different approaches used in the previous chapters are extended to this situation Contents 1 Cluster Analysis 2 Model Based Co Clustering 3 Co Clustering of Binary and Categorical Data 4 Co Clustering of Contingency Tables 5 Co Clustering of Continuous Data About the Authors Gérard Govaert is Professor at the University of Technology of Compiègne France He is also a member of the CNRS Laboratory Heudiasyc Heuristic and diagnostic of complex systems His research interests include latent structure modeling model selection model based cluster analysis block clustering and statistical pattern recognition He is one of the authors of the MIXMOD MIXtureMODelling software Mohamed Nadif is Professor at the University of Paris Descartes France where he is a member of LIPADE Paris Descartes computer science laboratory in the Mathematics and Computer Science department His research interests include machine learning data mining model based cluster analysis co clustering factorization and data analysis Cluster Analysis is an important tool in a variety of scientific areas Chapter 1 briefly presents a state of the art of already well established as well more recent methods The hierarchical partitioning and fuzzy approaches will be discussed amongst others The authors review the difficulty of these classical methods in tackling the high dimensionality sparsity and scalability Chapter 2 discusses the interests of coclustering presenting different approaches and defining a co cluster The authors focus on co clustering as a simultaneous clustering and discuss the cases of binary continuous and co occurrence data The criteria and algorithms are described and illustrated on simulated and real data Chapter 3 considers co clustering as a model based co clustering A latent block model is defined for different kinds of data The estimation of parameters and co clustering is tackled under two

approaches maximum likelihood and classification maximum likelihood Hard and soft algorithms are described and applied on simulated and real data Chapter 4 considers co clustering as a matrix approximation The trifactorization approach is considered and algorithms based on update rules are described Links with numerical and probabilistic approaches are established A combination of algorithms are proposed and evaluated on simulated and real data Chapter 5 considers a co clustering or bi clustering as the search for coherent co clusters in biological terms or the extraction of co clusters under conditions Classical algorithms will be described and evaluated on simulated and real data Different indices to evaluate the quality of coclusters are noted and used in numerical experiments

Co-Clustering Gérard Govaert, Mohamed Nadif, 2013-12-11 Cluster or co cluster analyses are important tools in a variety of scientific areas The introduction of this book presents a state of the art of already well established as well as more recent methods of co clustering The authors mainly deal with the two mode partitioning under different approaches but pay particular attention to a probabilistic approach Chapter 1 concerns clustering in general and the model based clustering in particular The authors briefly review the classical clustering methods and focus on the mixture model They present and discuss the use of different mixtures adapted to different types of data The algorithms used are described and related works with different classical methods are presented and commented upon This chapter is useful in tackling the problem of co clustering under the mixture approach Chapter 2 is devoted to the latent block model proposed in the mixture approach context The authors discuss this model in detail and present its interest regarding co clustering Various algorithms are presented in a general context Chapter 3 focuses on binary and categorical data It presents in detail the appropriated latent block mixture models Variants of these models and algorithms are presented and illustrated using examples Chapter 4 focuses on contingency data Mutual information ϕ^2 and model based co clustering are studied Models algorithms and connections among different approaches are described and illustrated Chapter 5 presents the case of continuous data In the same way the different approaches used in the previous chapters are extended to this situation

Relational Data Clustering Bo Long, Zhongfei Zhang, Philip S. Yu, 2010-05-19 A culmination of the authors years of extensive research on this topic Relational Data Clustering Models Algorithms and Applications addresses the fundamentals and applications of relational data clustering It describes theoretic models and algorithms and through examples shows how to apply these models and algorithms to solve real world problems After defining the field the book introduces different types of model formulations for relational data clustering presents various algorithms for the corresponding models and demonstrates applications of the models and algorithms through extensive experimental results The authors cover six topics of relational data clustering Clustering on bi type heterogeneous relational data Multi type heterogeneous relational data Homogeneous relational data clustering Clustering on the most general case of relational data Individual relational clustering framework Recent research on evolutionary clustering This book focuses on both practical algorithm derivation and theoretical framework construction for

relational data clustering It provides a complete self contained introduction to advances in the field Pattern Recognition in Bioinformatics Tetsuo Shibuya, Hisashi Kashima, Jun Sese, Shandar Ahmad, 2012-11-04 This book constitutes the refereed proceedings of the 7th International Conference on Pattern Recognition in Bioinformatics PRIB 2012 held in Tokyo Japan in November 2012 The 24 revised full papers presented were carefully reviewed and selected from 33 submissions Their topics are widely ranging from fundamental techniques sequence analysis to biological network analysis The papers are organized in topical sections on generic methods visualization image analysis and platforms applications of pattern recognition techniques protein structure and docking complex data analysis and sequence analysis Co-clustering Algorithms Hyuk Cho, 2008 Co clustering is rather a recent paradigm for unsupervised data analysis but it has become increasingly popular because of its potential to discover latent local patterns otherwise unapparent by usual unsupervised algorithms such as k means Wide deployment of co clustering however requires addressing a number of practical challenges such as data transformation cluster initialization scalability and so on Therefore this thesis focuses on developing sophisticated co clustering methodologies to maturity and its ultimate goal is to promote co clustering as an invaluable and indispensable unsupervised analysis tool for varied practical applications To achieve this goal we explore the three specific tasks 1 development of co clustering algorithms to be functional adaptable and scalable co clustering algorithms 2 extension of co clustering algorithms to incorporate application specific requirements extensions and 3 application of co clustering algorithms broadly to existing and emerging problems in practical application domains applications As for co clustering algorithms we develop two fast Minimum Sum Squared Residue Co clustering MSSRCC algorithms CDGS04 which simultaneously cluster data points and features via an alternating minimization scheme and generate co clusters in a checkerboard structure The first captures co clusters with constant values while the other discovers co clusters with coherent trends as well as constant values We note that the proposed algorithms are two special cases bases 2 and 6 with Euclidean distance respectively of the general co clustering framework Bregman Co clustering BCC BDG 07 which contains six Euclidean BCC and six I divergence BCC algorithms Then we substantially enhance the performance of the two MSSRCC algorithms by escaping from poor local minima and resolving the degeneracy problem of generating empty clusters in partitional clustering algorithms through the three specific strategies 1 data transformation 2 deterministic spectral initialization and 3 local search strategy Concerning co clustering extensions we investigate general algorithmic strategies for the general BCC framework since it is applicable to a large class of distance measures and data types We first formalize various data transformations for datasets with varied scaling and shifting factors mathematically justify their effects on the six Euclidean BCC algorithms and empirically validate the analysis results We also adapt the local search strategy initially developed for the two MSSRCC algorithms to all the twelve BCC algorithms Moreover we consider variations of cluster assignments and cluster updates including greedy vs non greedy cluster assignment online vs batch cluster update and so on

Furthermore in order to provide better scalability and usability we parallelize all the twelve BCC algorithms which are capable of co clustering large scaled datasets over multiple processors Regarding co clustering applications we extend the functionality of BCC to incorporate application specific requirements 1 discovery of inverted patterns whose goal is to find anti correlation 2 discovery of coherent co clusters from noisy data whose purpose is to do dimensional reduction and feature selection and 3 discovery of patterns from time series data whose motive is to guarantee critical time locality Furthermore we employ co clustering to pervasive computing for mobile devices where the task is to extract latent patterns from usage logs as well as to recognize specific situations of mobile device users Finally we demonstrate the applicability of our proposed algorithms for aforementioned applications through empirical results on various synthetic and real world datasets In summary we present co clustering algorithms to discover latent local patterns propose their algorithmic extensions to incorporate specific requirements and provide their applications to a wide range of practical domains *Scalable*

Information Systems Jason J. Jung,Costin Badica,Attila Kiss,2015-04-06 This book constitutes the thoroughly refereed post conference proceedings of the International Conference on Scalable Information Systems INFOSCALE 2014 held in September 2014 in Seoul South Korea The 9 revised full papers presented were carefully reviewed and selected from 14 submissions The papers cover a wide range of topics such as scalable data analysis and big data applications

Computational Methods of Feature Selection Huan Liu,Hiroshi Motoda,2007-10-29 Due to increasing demands for dimensionality reduction research on feature selection has deeply and widely expanded into many fields including computational statistics pattern recognition machine learning data mining and knowledge discovery Highlighting current research issues Computational Methods of Feature Selection introduces the Euro-Par 2011 Parallel Processing Emmanuel Jeannot,Raymond Namyst,Jean Roman,2011-08-12 The two volume set LNCS 6852 6853 constitutes the refereed proceedings of the 17th International Euro Par Conference held in Bordeaux France in August September 2011 The 81 revised full papers presented were carefully reviewed and selected from 271 submissions The papers are organized in topical sections on support tools and environments performance prediction and evaluation scheduling and load balancing high performance architectures and compilers parallel and distributed data management grid cluster and cloud computing peer to peer computing distributed systems and algorithms parallel and distributed programming parallel numerical algorithms multicore and manycore programming theory and algorithms for parallel computation high performance networks and mobile ubiquitous computing **Data Warehousing and Knowledge Discovery** A Min Tjoa,2006-09-21 This book

constitutes the refereed proceedings of the 8th International Conference on Data Warehousing and Knowledge Discovery DaWaK 2006 held in conjunction with DEXA 2006 The book presents 53 revised full papers organized in topical sections on ETL processing materialized view multidimensional design OLAP and multidimensional model cubes processing data warehouse applications mining techniques frequent itemsets mining data streams ontology based mining clustering advanced

mining techniques association rules miscellaneous applications and classification **Issues in Artificial Intelligence, Robotics and Machine Learning: 2012 Edition**, 2013-01-10 Issues in Artificial Intelligence Robotics and Machine Learning 2012 Edition is a ScholarlyEditions eBook that delivers timely authoritative and comprehensive information about Pattern Analysis The editors have built Issues in Artificial Intelligence Robotics and Machine Learning 2012 Edition on the vast information databases of ScholarlyNews You can expect the information about Pattern Analysis in this eBook to be deeper than what you can access anywhere else as well as consistently reliable authoritative informed and relevant The content of Issues in Artificial Intelligence Robotics and Machine Learning 2012 Edition has been produced by the world s leading scientists engineers analysts research institutions and companies All of the content is from peer reviewed sources and all of it is written assembled and edited by the editors at ScholarlyEditions and available exclusively from us You now have a source you can cite with authority confidence and credibility More information is available at [http www ScholarlyEditions com](http://www.ScholarlyEditions.com)

Rough Sets and Knowledge Technology Tianrui Li,Hung Son Nguyen,Guoyin Wang,Jerzy W. Grzymala-Busse,Ryszard Janicki,Aboul Ella Hassanien,Hong Yu,2012-07-27 This book constitutes the refereed proceedings of the 7th International Conference on Rough Sets and Knowledge Technology RSKT 2012 held in Chengdu China during August 2012 as one of the co located conferences of the 2012 Joint Rough Set Symposium JRS 2012 The 63 revised papers including 42 regular and 21 short papers were carefully reviewed and selected from numerous submissions The papers are organized in topical sections on rough sets and its generalizations rough sets in data and knowledge processing knowledge technology advances in granular computing AGC 2012 workshop decision theoretic rough set model and applications special session intelligent decision making and granular computing special session rough set foundations special session

Advances in Intelligent Data Analysis XV Henrik Boström,Arno Knobbe,Carlos Soares,Panagiotis Papapetrou,2016-09-23 This book constitutes the refereed conference proceedings of the 15th International Conference on Intelligent Data Analysis which was held in October 2016 in Stockholm Sweden The 36 revised full papers presented were carefully reviewed and selected from 75 submissions The traditional focus of the IDA symposium series is on end to end intelligent support for data analysis The symposium aims to provide a forum for inspiring research contributions that might be considered preliminary in other leading conferences and journals but that have a potentially dramatic impact *Algorithms and Architectures for Parallel Processing* Sang-Soo Yeo,Jong Hyuk Park,Laurence Tianruo Yang,Ching-Hsien Hsu,2010-05-29 It is our great pleasure to welcome you to the proceedings of the 10th annual event of the International Conference on Algorithms and Architectures for Parallel Processing ICA3PP ICA3PP is recognized as the main regular event covering the many dimensions of parallel algorithms and architectures encompassing fundamental theoretical proaches practical experimental projects and commercial components and systems As applications of computing systems have permeated every aspect of daily life the power of computing systems has become increasingly critical Therefore ICA3PP 2010 aimed to permit researchers and

practitioners from industry to exchange information regarding advancements in the state of the art and practice of IT driven services and applications as well as to identify emerging research topics and define the future directions of parallel processing We received a total of 157 submissions this year showing by both quantity and quality that ICA3PP is a premier conference on parallel processing In the first stage all papers submitted were screened for their relevance and general submission requirements These manuscripts then underwent a rigorous peer review process with at least three reviewers per paper In the end 47 papers were accepted for presentation and included in the main proceedings comprising a 30% acceptance rate

Data Warehousing and Mining: Concepts, Methodologies, Tools, and Applications Wang, John, 2008-05-31 In recent years the science of managing and analyzing large datasets has emerged as a critical area of research In the race to answer vital questions and make knowledgeable decisions impressive amounts of data are now being generated at a rapid pace increasing the opportunities and challenges associated with the ability to effectively analyze this data

Algorithms and Computation Hee-Kap Ahn, Chan-Su Shin, 2014-11-07 This book constitutes the refereed proceedings of the 25th International Symposium on Algorithms and Computation ISAAC 2014 held in Jeonju Korea in December 2014 The 60 revised full papers presented together with 2 invited talks were carefully reviewed and selected from 171 submissions for inclusion in the book The focus of the volume is on the following topics computational geometry combinatorial optimization graph algorithms enumeration matching and assignment data structures and algorithms fixed parameter tractable algorithms scheduling algorithms computational complexity approximation algorithms graph theory and algorithms online and approximation algorithms and network and scheduling algorithms

Machine Learning and Knowledge Discovery in Databases Wray Buntine, Marko Grobelnik, Dunja Mladenic, John Shawe-Taylor, 2009-08-28 This book constitutes the refereed proceedings of the joint conference on Machine Learning and Knowledge Discovery in Databases ECML PKDD 2009 held in Bled Slovenia in September 2009 The 106 papers presented in two volumes together with 5 invited talks were carefully reviewed and selected from 422 paper submissions In addition to the regular papers the volume contains 14 abstracts of papers appearing in full version in the Machine Learning Journal and the Knowledge Discovery and Databases Journal of Springer The conference intends to provide an international forum for the discussion of the latest high quality research results in all areas related to machine learning and knowledge discovery in databases The topics addressed are application of machine learning and data mining methods to real world problems particularly exploratory research that describes novel learning and mining tasks and applications requiring non standard techniques

Multimedia Content Analysis Ajay Divakaran, 2009-03-02 Multimedia Content Analysis Theory and Applications covers the latest in multimedia content analysis and applications based on such analysis As research has progressed it has become clear that this field has to appeal to other disciplines such as psycho physics media production etc This book consists of invited chapters that cover the entire range of the field Some of the topics covered include low level audio visual analysis based

retrieval and indexing techniques the TRECVID effort video browsing interfaces content creation and content analysis and multimedia analysis based applications among others The chapters are written by leading researchers in the multimedia field

Recent Advances on Soft Computing and Data Mining Tutut Herawan,Rozaida Ghazali,Mustafa Mat

Deris,2014-05-29 This book constitutes the refereed proceedings of the First International Conference on Soft Computing and Data Mining SCDM 2014 held in Universiti Tun Hussein Onn Malaysia in June 16th 18th 2014 The 65 revised full papers presented in this book were carefully reviewed and selected from 145 submissions and organized into two main topical sections Data Mining and Soft Computing The goal of this book is to provide both theoretical concepts and especially practical techniques on these exciting fields of soft computing and data mining ready to be applied in real world applications The exchanges of views pertaining future research directions to be taken in this field and the resultant dissemination of the latest research findings makes this work of immense value to all those having an interest in the topics covered **Data**

Warehousing and Knowledge Discovery Alfredo Cuzzocrea,Umeshwar Dayal,2011-08-19 This book constitutes the refereed proceedings of the 13th International Conference on Data Warehousing and Knowledge Discovery DaWak 2011 held in Toulouse France in August September 2011 The 37 revised full papers presented were carefully reviewed and selected from 119 submissions The papers are organized in topical sections on physical and conceptual data warehouse models data warehousing design methodologies and tools data warehouse performance and optimization pattern mining matrix based mining techniques and stream sensor and time series mining **Discovery Science** Petra Kralj Novak,Tomislav Šmuc,Sašo

Džeroski,2019-10-18 This book constitutes the proceedings of the 22nd International Conference on Discovery Science DS 2019 held in Split Croatia in October 2019 The 21 full and 19 short papers presented together with 3 abstracts of invited talks in this volume were carefully reviewed and selected from 63 submissions The scope of the conference includes the development and analysis of methods for discovering scientific knowledge coming from machine learning data mining intelligent data analysis big data analysis as well as their application in various scientific domains The papers are organized in the following topical sections Advanced Machine Learning Applications Data and Knowledge Representation Feature Importance Interpretable Machine Learning Networks Pattern Discovery and Time Series

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