Mining Heterogeneous Information Networks
Principles and Methodologies

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    <u>Mining Heterogeneous Information Networks</u> Yizhou Sun,Jiawei Han,2012-08-15 Real world physical and abstract data objects are interconnected forming gigantic interconnected networks By structuring these data objects and interactions between these objects into multiple types such networks become semi structured heterogeneous information networks Most real world applications that handle big data including interconnected social media and social networks scientific engineering or medical information systems online e commerce systems and most database systems can be structured into heterogeneous information networks Therefore effective analysis of large scale heterogeneous information networks poses an interesting but critical challenge In this monograph we investigate the principles and methodologies of mining heterogeneous information networks Departing from many existing network models that view data as homogeneous graphs or networks our semi structured heterogeneous information network model leverages the rich semantics of typed nodes and links in a network and uncovers surprisingly rich knowledge from interconnected data This semi structured heterogeneous network modeling leads to a series of new principles and powerful methodologies for mining interconnected data including 1 rank based clustering and classification 2 meta path based similarity search and mining 3 relation strength aware mining and many other potential developments This monograph introduces this new research frontier and points out some promising research directions   *Mining Heterogeneous Information Networks* Yizhou Sun,2012   **Correlation Clustering** Francesco Bonchi,David García-Soriano,Francesco Gullo,2022-03-08 Given a set of objects and a pairwise similarity measure between them the goal of correlation clustering is to partition the objects in a set of clusters to maximize the similarity of the objects within the same cluster and minimize the similarity of the objects in different clusters In most of the variants of correlation clustering the number of clusters is not a given parameter instead the optimal number of clusters is automatically determined Correlation clustering is perhaps the most natural formulation of clustering as it just needs a definition of similarity its broad generality makes it applicable to a wide range of problems in different contexts and particularly makes it naturally suitable to clustering structured objects for which feature vectors can be difficult to obtain Despite its simplicity generality and wide applicability correlation clustering has so far received much more attention from an algorithmic theory perspective than from the data mining community The goal of this lecture is to show how correlation clustering can be a powerful addition to the toolkit of a data mining researcher and practitioner and to encourage further research in the area

    <u>Exploiting the Power of Group Differences</u> Guozhu Dong,2022-05-31 This book presents pattern based problem solving methods for a variety of machine learning and data analysis problems The methods are all based on techniques that exploit the power of group differences They make use of group differences represented using emerging patterns aka contrast patterns which are patterns that match significantly different numbers of instances in different data groups A large number of applications outside of the computing discipline are also included Emerging patterns EPs are useful in many ways EPs can

be used as features as simple classifiers as subpopulation signatures characterizations and as triggering conditions for alerts EPs can be used in gene ranking for complex diseases since they capture multi factor interactions The length of EPs can be used to detect anomalies outliers and novelties Emerging contrast pattern based methods for clustering analysis and outlier detection do not need distance metrics avoiding pitfalls of the latter in exploratory analysis of high dimensional data EP based classifiers can achieve good accuracy even when the training datasets are tiny making them useful for exploratory compound selection in drug design EPs can serve as opportunities in opportunity focused boosting and are useful for constructing powerful conditional ensembles EP based methods often produce interpretable models and results In general EPs are useful for classification clustering outlier detection gene ranking for complex diseases prediction model analysis and improvement and so on EPs are useful for many tasks because they represent group differences which have extraordinary power Moreover EPs represent multi factor interactions whose effective handling is of vital importance and is a major challenge in many disciplines Based on the results presented in this book one can clearly say that patterns are useful especially when they are linked to issues of interest We believe that many effective ways to exploit group differences power still remain to be discovered Hopefully this book will inspire readers to discover such new ways besides showing them existing ways to solve various challenging problems **Provenance Data in Social Media** Geoffrey Barbier,Zhuo Feng,Pritam Gundecha,Huan Liu,2022-05-31 Social media shatters the barrier to communicate anytime anywhere for people of all walks of life The publicly available virtually free information in social media poses a new challenge to consumers who have to discern whether a piece of information published in social media is reliable For example it can be difficult to understand the motivations behind a statement passed from one user to another without knowing the person who originated the message Additionally false information can be propagated through social media resulting in embarrassment or irreversible damages Provenance data associated with a social media statement can help dispel rumors clarify opinions and confirm facts However provenance data about social media statements is not readily available to users today Currently providing this data to users requires changing the social media infrastructure or offering subscription services Taking advantage of social media features research in this nascent field spearheads the search for a way to provide provenance data to social media users thus leveraging social media itself by mining it for the provenance data Searching for provenance data reveals an interesting problem space requiring the development and application of new metrics in order to provide meaningful provenance data to social media users This lecture reviews the current research on information provenance explores exciting research opportunities to address pressing needs and shows how data mining can enable a social media user to make informed judgements about statements published in social media Table of Contents Information Provenance in Social Media Provenance Attributes Provenance via Network Information Provenance Data **Publications Combined: The Role of Social Media in Crisis - Data Collection By The Public And Private Sectors As A Strategic Asset And**

To Prevent Terrorism ,2018-09-07 Over 1 800 total pages Included publications Social Media and the Policy Making Process a Traditional Novel Interaction Social Media Principles Applied to Critical Infrastructure Information Sharing Trolling New Media Violent Extremist Groups Recruiting Through Social Media An Initial Look at the Utility of Social Media as a Foreign Policy Tool Indicators of Suicide Found on Social Networks Phase 1 Validating the FOCUS Model Through an Analysis of Identity Fragmentation in Nigerian Social Media Providing Focus via a Social Media Exploitation Strategy Assessing the Use of Social Media in a Revolutionary Environment Social Media Integration into State Operated Fusion Centers and Local Law Enforcement Potential Uses and Challenges Using Social Media Tools to Enhance Tacit Knowledge Sharing Within the USMC Social Media Strategic Asset or Operational Vulnerability Tweeting Napoleon and Friending Clausewitz Social Media and the Military Strategist The U S Military and Social Media Balancing Social Media with Operations Security OPSEC in the 21st Century Division Level Social Media Understanding Violence Through Social Media The Investigation of Social Media Data Thresholds for Opinion Formation The Impact of Social Media on the Nature of Conflict and a Commander s Strategy for Social Media Provenance Data in Social Media Conflict Prediction Through Geo Spatial Interpolation of Radicalization in Syrian Social Media Social Media Effects on Operational Art Assessing the Potential of Societal Verification by Means of New Media Army Social Media Harnessing the Power of Networked Communications Analysis of Department of Defense Social Media Policy and Its Impact on Operational Security Social Media Valuable Tools in Today s Operational Environment Conflict Prediction Through Geo Spatial Interpolation of Radicalization in Syrian Social Media *Detecting Fake News on Social Media* Kai Shu,Huan Liu,2022-05-31 In the past decade social media has become increasingly popular for news consumption due to its easy access fast dissemination and low cost However social media also enables the wide propagation of fake news i e news with intentionally false information Fake news on social media can have significant negative societal effects Therefore fake news detection on social media has recently become an emerging research area that is attracting tremendous attention This book from a data mining perspective introduces the basic concepts and characteristics of fake news across disciplines reviews representative fake news detection methods in a principled way and illustrates challenging issues of fake news detection on social media In particular we discussed the value of news content and social context and important extensions to handle early detection weakly supervised detection and explainable detection The concepts algorithms and methods described in this lecture can help harness the power of social media to build effective and intelligent fake news detection systems This book is an accessible introduction to the study of detecting fake news on social media It is an essential reading for students researchers and practitioners to understand manage and excel in this area This book is supported by additional materials including lecture slides the complete set of figures key references datasets tools used in this book and the source code of representative algorithms The readers are encouraged to visit the book website for the latest information http dmml asu edu dfn **Graph Learning for Fashion Compatibility Modeling** Weili

Guan,Xuemeng Song,Xiaojun Chang,Liqiang Nie,2022-11-02 This book sheds light on state of the art theories for more challenging outfit compatibility modeling scenarios In particular this book presents several cutting edge graph learning techniques that can be used for outfit compatibility modeling Due to its remarkable economic value fashion compatibility modeling has gained increasing research attention in recent years Although great efforts have been dedicated to this research area previous studies mainly focused on fashion compatibility modeling for outfits that only involved two items and overlooked the fact that each outfit may be composed of a variable number of items This book develops a series of graph learning based outfit compatibility modeling schemes all of which have been proven to be effective over several public real world datasets This systematic approach benefits readers by introducing the techniques for compatibility modeling of outfits that involve a variable number of composing items To deal with the challenging task of outfit compatibility modeling this book provides comprehensive solutions including correlation oriented graph learning modality oriented graph learning unsupervised disentangled graph learning partially supervised disentangled graph learning and metapath guided heterogeneous graph learning Moreover this book sheds light on research frontiers that can inspire future research directions for scientists and researchers   **Mining Latent Entity Structures** Chi Wang,Jiawei Han,2022-05-31 The big data era is characterized by an explosion of information in the form of digital data collections ranging from scientific knowledge to social media news and everyone s daily life Examples of such collections include scientific publications enterprise logs news articles social media and general web pages Valuable knowledge about multi typed entities is often hidden in the unstructured or loosely structured interconnected data Mining latent structures around entities uncovers hidden knowledge such as implicit topics phrases entity roles and relationships In this monograph we investigate the principles and methodologies of mining latent entity structures from massive unstructured and interconnected data We propose a text rich information network model for modeling data in many different domains This leads to a series of new principles and powerful methodologies for mining latent structures including 1 latent topical hierarchy 2 quality topical phrases 3 entity roles in hierarchical topical communities and 4 entity relations This book also introduces applications enabled by the mined structures and points out some promising research directions   Dissertation Abstracts International ,2001   *IJCAI-03* International Joint Conferences on Artificial Intelligence,Mexican Society for Artificial Intelligence,2003   *IJCAI* ,2003   **Link Mining: Models, Algorithms, and Applications** Philip S. Yu,Jiawei Han,Christos Faloutsos,2010-09-16 This book offers detailed surveys and systematic discussion of models algorithms and applications for link mining focusing on theory and technique and related applications text mining social network analysis collaborative filtering and bioinformatics   *KDD ...* ,2005   **Link Mining: Models, Algorithms, and Applications** Philip S. Yu,Jiawei Han,Christos Faloutsos,2010-09-29 This book offers detailed surveys and systematic discussion of models algorithms and applications for link mining focusing on theory and technique and related applications text mining social network analysis

collaborative filtering and bioinformatics **Mining Heterogeneous Information Networks** □□□,2019 **Data Mining for Web Intelligence Jiawei Han; Kevin Chen-Chuan Chang** Data mining for web intelligence Jiawei Han; Kevin Chen-Chuan Chang, **Data Mining** Jiawei Han,Micheline Kamber,2012 Mining of Data with Complex Structures explores nature of data with complex structure including sequences trees and graphs Readers will find a detailed description of the state of the art of sequence mining tree mining and graph mining and more **Data Mining Restricted, International Edition, Concepts and Techniques** jiawei han,2006 Multidimensional Mining of Massive Text Data Chao Zhang,Jiawei Han,2019-03-21 Unstructured text as one of the most important data forms plays a crucial role in data driven decision making in domains ranging from social networking and information retrieval to scientific research and healthcare informatics In many emerging applications people s information need from text data is becoming multidimensional they demand useful insights along multiple aspects from a text corpus However acquiring such multidimensional knowledge from massive text data remains a challenging task This book presents data mining techniques that turn unstructured text data into multidimensional knowledge We investigate two core questions 1 How does one identify task relevant text data with declarative queries in multiple dimensions 2 How does one distill knowledge from text data in a multidimensional space To address the above questions we develop a text cube framework First we develop a cube construction module that organizes unstructured data into a cube structure by discovering latent multidimensional and multi granular structure from the unstructured text corpus and allocating documents into the structure Second we develop a cube exploitation module that models multiple dimensions in the cube space thereby distilling from user selected data multidimensional knowledge Together these two modules constitute an integrated pipeline leveraging the cube structure users can perform multidimensional multigranular data selection with declarative queries and with cube exploitation algorithms users can extract multidimensional patterns from the selected data for decision making The proposed framework has two distinctive advantages when turning text data into multidimensional knowledge flexibility and label efficiency First it enables acquiring multidimensional knowledge flexibly as the cube structure allows users to easily identify task relevant data along multiple dimensions at varied granularities and further distill multidimensional knowledge Second the algorithms for cube construction and exploitation require little supervision this makes the framework appealing for many applications where labeled data are expensive to obtain

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Table of Contents Mining Heterogeneous Information Networks Principles And Methodologies Jiawei Han

4. Exploring eBook Recommendations from Mining Heterogeneous Information Networks Principles And Methodologies Jiawei Han
    - Personalized Recommendations
    - Mining Heterogeneous Information Networks Principles And Methodologies Jiawei Han User Reviews and Ratings
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    - Mining Heterogeneous Information Networks Principles And Methodologies Jiawei Han eBook Subscription Services
    - Mining Heterogeneous Information Networks Principles And Methodologies Jiawei Han Budget-Friendly Options
6. Navigating Mining Heterogeneous Information Networks Principles And Methodologies Jiawei Han eBook Formats
    - ePub, PDF, MOBI, and More
    - Mining Heterogeneous Information Networks Principles And Methodologies Jiawei Han Compatibility with Devices
    - Mining Heterogeneous Information Networks Principles And Methodologies Jiawei Han Enhanced eBook Features
7. Enhancing Your Reading Experience
    - Adjustable Fonts and Text Sizes of Mining Heterogeneous Information Networks Principles And Methodologies Jiawei Han
    - Highlighting and Note-Taking Mining Heterogeneous Information Networks Principles And Methodologies Jiawei Han
    - Interactive Elements Mining Heterogeneous Information Networks Principles And Methodologies Jiawei Han
8. Staying Engaged with Mining Heterogeneous Information Networks Principles And Methodologies Jiawei Han
    - Joining Online Reading Communities
    - Participating in Virtual Book Clubs
    - Following Authors and Publishers Mining Heterogeneous Information Networks Principles And Methodologies Jiawei Han
9. Balancing eBooks and Physical Books Mining Heterogeneous Information Networks Principles And Methodologies

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