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Uncertain Schema Matching

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Uncertain Schema Matching Avigdor Gal,2011-03-02 Schema matching is the task of providing correspondences between concepts describing the meaning of data in various heterogeneous distributed data sources Schema matching is one of the basic operations required by the process of data and schema integration and thus has a great effect on its outcomes whether these involve targeted content delivery view integration database integration query rewriting over heterogeneous sources duplicate data elimination or automatic streamlining of workflow activities that involve heterogeneous data sources Although schema matching research has been ongoing for over 25 years more recently a realization has emerged that schema matchers are inherently uncertain Since 2003 work on the uncertainty in schema matching has picked up along with research on uncertainty in other areas of data management This lecture presents various aspects of uncertainty in schema matching within a single unified framework We introduce basic formulations of uncertainty and provide several alternative representations of schema matching uncertainty Then we cover two common methods that have been proposed to deal with uncertainty in schema matching namely ensembles and top K matchings and analyze them in this context We conclude with a set of real world applications Table of Contents Introduction Models of Uncertainty Modeling Uncertain Schema Matching Schema Matcher Ensembles Top K Schema Matchings Applications Conclusions and Future Work **Uncertain Schema Matching** Avigdor Gal,2022-05-31 Schema matching is the task of providing correspondences between concepts describing the meaning of data in various heterogeneous distributed data sources Schema matching is one of the basic operations required by the process of data and schema integration and thus has a great effect on its outcomes whether these involve targeted content delivery view integration database integration query rewriting over heterogeneous sources duplicate data elimination or automatic streamlining of workflow activities that involve heterogeneous data sources Although schema matching research has been ongoing for over 25 years more recently a realization has emerged that schema matchers are inherently uncertain Since 2003 work on the uncertainty in schema matching has picked up along with research on uncertainty in other areas of data management This lecture presents various aspects of uncertainty in schema matching within a single unified framework We introduce basic formulations of uncertainty and provide several alternative representations of schema matching uncertainty Then we cover two common methods that have been proposed to deal with uncertainty in schema matching namely ensembles and top K matchings and analyze them in this context We conclude with a set of real world applications Table of Contents Introduction Models of Uncertainty Modeling Uncertain Schema Matching Schema Matcher Ensembles Top K Schema Matchings Applications Conclusions and Future Work Query Processing over Uncertain Databases Lei Chen,Xiang Lian,2022-05-31 Due to measurement errors transmission lost or injected noise for privacy protection uncertainty exists in the data of many real applications However query processing techniques for deterministic data cannot be directly applied to uncertain data because they do not have mechanisms to handle data

uncertainty Therefore efficient and effective manipulation of uncertain data is a practical yet challenging research topic In this book we start from the data models for imprecise and uncertain data move on to defining different semantics for queries on uncertain data and finally discuss the advanced query processing techniques for various probabilistic queries in uncertain databases The book serves as a comprehensive guideline for query processing over uncertain databases Table of Contents Introduction Uncertain Data Models Spatial Query Semantics over Uncertain Data Models Spatial Query Processing over Uncertain Databases Conclusion **Business Processes** Tova Milo,Daniel Deutsch,2022-06-01 While classic data management focuses on the data itself research on Business Processes also considers the context in which this data is generated and manipulated namely the processes users and goals that this data serves This provides the analysts a better perspective of the organizational needs centered around the data As such this research is of fundamental importance Much of the success of database systems in the last decade is due to the beauty and elegance of the relational model and its declarative query languages combined with a rich spectrum of underlying evaluation and optimization techniques and efficient implementations Much like the case for traditional database research elegant modeling and rich underlying technology are likely to be highly beneficiary for the Business Process owners and their users both can benefit from easy formulation and analysis of the processes While there have been many important advances in this research in recent years there is still much to be desired specifically there have been many works that focus on the processes behavior flow and many that focus on its data but only very few works have dealt with both the state of the art in a database approach to Business Process modeling and analysis the progress towards a holistic flow and data framework for these tasks and highlight the current gaps and research directions Table of Contents Introduction Modeling Querying Business Processes Other Issues Conclusion *Probabilistic Ranking Techniques in Relational Databases* Ihab Ilyas,Mohamed Soliman,2022-05-31 Ranking queries are widely used in data exploration data analysis and decision making scenarios While most of the currently proposed ranking techniques focus on deterministic data several emerging applications involve data that are imprecise or uncertain Ranking uncertain data raises new challenges in query semantics and processing making conventional methods inapplicable Furthermore the interplay between ranking and uncertainty models introduces new dimensions for ordering query results that do not exist in the traditional settings This lecture describes new formulations and processing techniques for ranking queries on uncertain data The formulations are based on marriage of traditional ranking semantics with possible worlds semantics under widely adopted uncertainty models In particular we focus on discussing the impact of tuple level and attribute level uncertainty on the semantics and processing techniques of ranking queries Under the tuple level uncertainty model we describe new processing techniques leveraging the capabilities of relational database systems to recognize and handle data uncertainty in score based ranking Under the attribute level uncertainty model we describe new probabilistic ranking models and a set of query evaluation algorithms including sampling based techniques We also discuss supporting

rank join queries on uncertain data and we show how to extend current rank join methods to handle uncertainty in scoring attributes Table of Contents Introduction Uncertainty Models Query Semantics Methodologies Uncertain Rank Join Conclusion *Natural Language Data Management and Interfaces* Yunyao Li,Davood Rafiei,2022-06-01 The volume of natural language text data has been rapidly increasing over the past two decades due to factors such as the growth of the Web the low cost associated with publishing and the progress on the digitization of printed texts This growth combined with the proliferation of natural language systems for search and retrieving information provides tremendous opportunities for studying some of the areas where database systems and natural language processing systems overlap This book explores two interrelated and important areas of overlap 1 managing natural language data and 2 developing natural language interfaces to databases It presents relevant concepts and research questions state of the art methods related systems and research opportunities and challenges covering both areas Relevant topics discussed on natural language data management include data models data sources queries storage and indexing and transforming natural language text Under naturallanguage interfaces it presents the anatomy of these interfaces to databases the challenges related to query understanding and query translation and relevant aspects of user interactions Each of the challenges is covered in a systematic way first starting with a quick overview of the topics followed by a comprehensive view of recent techniques that have been proposed to address the challenge along with illustrative examples It also reviews some notable systems in details in terms of how they address different challenges and their contributions Finally it discusses open challenges and opportunities for natural language management and interfaces The goal of this book is to provide an introduction to the methods problems and solutions that are used in managing natural language data and building natural language interfaces to databases It serves as a starting point for readers who are interested in pursuing additional work on these exciting topics in both academic andindustrial environments *Human Interaction with Graphs* Sourav S. Bhowmick,Byron Choi,Chengkai Li,2022-06-01 Interacting with graphs using queries has emerged as an important research problem for real world applications that center on large graph data Given the syntactic complexity of graph query languages e g SPARQL Cypher visual graph query interfaces make it easy for non programmers to query such graph data repositories In this book we present recent developments in the emerging area of visual graph querying paradigm that bridges traditional graph querying with human computer interaction HCI Specifically we focus on techniques that emphasize deep integration between the visual graph query interface and the underlying graph query engine We discuss various strategies and guidance for constructing graph queries visually interleaving processing of graph queries and visual actions visual exploration of graph query results and automated performance study of visual graph querying frameworks In addition this book highlights open problems and new research directions In summary in this book we review and summarize the research thus far into the integration of HCI and graph querying to facilitate user friendly interaction with graph structured data giving researchers a snapshot of the current state

of the art in this topic and future research directions **Query Processing over Incomplete Databases** Yunjun Gao,Xiaoye Miao,2022-06-01 Incomplete data is part of life and almost all areas of scientific studies Users tend to skip certain fields when they fill out online forms participants choose to ignore sensitive questions on surveys sensors fail resulting in the loss of certain readings publicly viewable satellite map services have missing data in many mobile applications and in privacy preserving applications the data is incomplete deliberately in order to preserve the sensitivity of some attribute values Query processing is a fundamental problem in computer science and is useful in a variety of applications In this book we mostly focus on the query processing over incomplete databases which involves finding a set of qualified objects from a specified incomplete dataset in order to support a wide spectrum of real life applications We first elaborate the three general kinds of methods of handling incomplete data including i discarding the data with missing values ii imputation for the missing values and iii just depending on the observed data values For the third method type we introduce the semantics of k nearest neighbor kNN search skyline query and top k dominating query on incomplete data respectively In terms of the three representative queries over incomplete data we investigate some advanced techniques to process incomplete data queries including indexing pruning as well as crowdsourcing techniques **Deep Web Query Interface Understanding and Integration** Eduard C. Dragut,Weiyi Meng,Clement Yu,2022-05-31 There are millions of searchable data sources on the Web and to a large extent their contents can only be reached through their own query interfaces There is an enormous interest in making the data in these sources easily accessible There are primarily two general approaches to achieve this objective The first is to surface the contents of these sources from the deep Web and add the contents to the index of regular search engines The second is to integrate the searching capabilities of these sources and support integrated access to them In this book we introduce the state of the art techniques for extracting understanding and integrating the query interfaces of deep Web data sources These techniques are critical for producing an integrated query interface for each domain The interface serves as the mediator for searching all data sources in the concerned domain While query interface integration is only relevant for the deep Web integration approach the extraction and understanding of query interfaces are critical for both deep Web exploration approaches This book aims to provide in depth and comprehensive coverage of the key technologies needed to create high quality integrated query interfaces automatically The following technical issues are discussed in detail in this book query interface modeling query interface extraction query interface clustering query interface matching query interface attribute integration and query interface integration Table of Contents Introduction Query Interface Representation and Extraction Query Interface Clustering and Categorization Query Interface Matching Query Interface Attribute Integration Query Interface Integration Summary and Future Research On Transactional Concurrency Control Goetz Graefe,2022-05-31 This book contains a number of chapters on transactional database concurrency control This volume s entire sequence of chapters can summarized as follows A two sentence summary

of the volume s entire sequence of chapters is this traditional locking techniques can be improved in multiple dimensions notably in lock scopes sizes lock modes increment decrement and more lock durations late acquisition early release and lock acquisition sequence to avoid deadlocks Even if some of these improvements can be transferred to optimistic concurrency control notably a fine granularity of concurrency control with serializable transaction isolation including phantom protection pessimistic concurrency control is categorically superior to optimistic concurrency control i e independent of application workload deployment hardware and software implementation **Data Exploration Using Example-Based Methods** Matteo Lissandrini,Davide Mottin,Themis Palpanas,Yannis Velegrakis,2022-06-01 Data usually comes in a plethora of formats and dimensions rendering the exploration and information extraction processes challenging Thus being able to perform exploratory analyses in the data with the intent of having an immediate glimpse on some of the data properties is becoming crucial Exploratory analyses should be simple enough to avoid complicate declarative languages such as SQL and mechanisms and at the same time retain the flexibility and expressiveness of such languages Recently we have witnessed a rediscovery of the so called example based methods in which the user or the analyst circumvents query languages by using examples as input An example is a representative of the intended results or in other words an item from the result set Example based methods exploit inherent characteristics of the data to infer the results that the user has in mind but may not able to easily express They can be useful in cases where a user is looking for information in an unfamiliar dataset when the task is particularly challenging like finding duplicate items or simply when they are exploring the data In this book we present an excursus over the main methods for exploratory analysis with a particular focus on example based methods We show how that different data types require different techniques and present algorithms that are specifically designed for relational textual and graph data The book presents also the challenges and the new frontiers of machine learning in online settings which recently attracted the attention of the database community The lecture concludes with a vision for further research and applications in this area *Instant Recovery with Write-Ahead Logging* Goetz Graefe,Wey Guy,Caetano Sauer,2022-11-10 Traditional theory and practice of write ahead logging and of database recovery techniques revolve around three failure classes transaction failures resolved by rollback system failures typically software faults resolved by restart with log analysis redo and undo phases and media failures typically hardware faults resolved by restore operations that combine multiple types of backups and log replay The recent addition of single page failures and single page recovery has opened new opportunities far beyond its original aim of immediate lossless repair of single page wear out in novel or traditional storage hardware In the contexts of system and media failures efficient single page recovery enables on demand incremental redo and undo as part of system restart or media restore operations This can give the illusion of practically instantaneous restart and restore instant restart permits processing new queries and updates seconds after system reboot and instant restorepermits resuming queries and updates on empty replacement media as if those were already fully recovered In

addition to these instant recovery techniques the discussion introduces much faster offline restore operations without slowdown in backup operations and with hardly any slowdown in log archiving operations The new restore techniques also render differential and incremental backups obsolete complete backup commands on the database server practically instantly and even permit taking full backups without imposing any load on the database server Table of Contents Preface Acknowledgments Introduction Related Prior Work Single Page Recovery Applications of Single Page Recovery Instant Restart after a System Failure Single Pass Restore Applications of Single Pass Restore Instant Restore after a Media Failure Multiple Failures Conclusions References Author Biographies Perspectives on Business Intelligence Raymond T. Ng,Patricia C. Arocena,Denilson Barbosa,Giuseppe Carenini,Luiz Gomes,Stephan Jou,Anthony Leung,Evangelos Milios,Renée J. Miller,John Mylopoulos,Rachel A Pottinger,Frank Tompa,Eric Yu,2022-05-31 In the 1980s traditional Business Intelligence BI systems focused on the delivery of reports that describe the state of business activities in the past such as for questions like How did our sales perform during the last quarter A decade later there was a shift to more interactive content that presented how the business was performing at the present time answering questions like How are we doing right now Today the focus of BI users are looking into the future Given what I did before and how I am currently doing this quarter how will I do next quarter Furthermore fuelled by the demands of Big Data BI systems are going through a time of incredible change Predictive analytics high volume data unstructured data social data mobile consumable analytics and data visualization are all examples of demands and capabilities that have become critical within just the past few years and are growing at an unprecedented pace This book introduces research problems and solutions on various aspects central to next generation BI systems It begins with a chapter on an industry perspective on how BI has evolved and discusses how game changing trends have drastically reshaped the landscape of BI One of the game changers is the shift toward the consumerization of BI tools As a result for BI tools to be successfully used by business users rather than IT departments the tools need a business model rather than a data model One chapter of the book surveys four different types of business modeling However even with the existence of a business model for users to express queries the data that can meet the needs are still captured within a data model The next chapter on vivification addresses the problem of closing the gap which is often significant between the business and the data models Moreover Big Data forces BI systems to integrate and consolidate multiple and often wildly different data sources One chapter gives an overview of several integration architectures for dealing with the challenges that need to be overcome While the book so far focuses on the usual structured relational data the remaining chapters turn to unstructured data an ever increasing and important component of Big Data One chapter on information extraction describes methods for dealing with the extraction of relations from free text and the web Finally BI users need tools to visualize and interpret new and complex types of information in a way that is compelling intuitive but accurate The last chapter gives an overview of information visualization for decision support and text Data-Intensive Workflow Management Daniel C. M. de

Oliveira,Ji Liu,Esther Pacitti,2022-06-01 Workflows may be defined as abstractions used to model the coherent flow of activities in the context of an in silico scientific experiment They are employed in many domains of science such as bioinformatics astronomy and engineering Such workflows usually present a considerable number of activities and activations i e tasks associated with activities and may need a long time for execution Due to the continuous need to store and process data efficiently making them data intensive workflows high performance computing environments allied to parallelization techniques are used to run these workflows At the beginning of the 2010s cloud technologies emerged as a promising environment to run scientific workflows By using clouds scientists have expanded beyond single parallel computers to hundreds or even thousands of virtual machines More recently Data Intensive Scalable Computing DISC frameworks e g Apache Spark and Hadoop and environments emerged and are being used to execute data intensive workflows DISC environments are composed of processors and disks in large commodity computing clusters connected using high speed communications switches and networks The main advantage of DISC frameworks is that they support and grant efficient in memory data management for large scale applications such as data intensive workflows However the execution of workflows in cloud and DISC environments raise many challenges such as scheduling workflow activities and activations managing produced data collecting provenance data etc Several existing approaches deal with the challenges mentioned earlier This way there is a real need for understanding how to manage these workflows and various big data platforms that have been developed and introduced As such this book can help researchers understand how linking workflow management with Data Intensive Scalable Computing can help in understanding and analyzing scientific big data In this book we aim to identify and distill the body of work on workflow management in clouds and DISC environments We start by discussing the basic principles of data intensive scientific workflows Next we present two workflows that are executed in a single site and multi site clouds taking advantage of provenance Afterward we go towards workflow management in DISC environments and we present in detail solutions that enable the optimized execution of the workflow using frameworks such as Apache Spark and its extensions **P2P Techniques for Decentralized Applications** Esther Pacitti,Reza Akbaranian,Manal El-Dick,2022-06-01 As an alternative to traditional client server systems Peer to Peer P2P systems provide major advantages in terms of scalability autonomy and dynamic behavior of peers and decentralization of control Thus they are well suited for large scale data sharing in distributed environments Most of the existing P2P approaches for data sharing rely on either structured networks e g DHTs for efficient indexing or unstructured networks for ease of deployment or some combination However these approaches have some limitations such as lack of freedom for data placement in DHTs and high latency and high network traffic in unstructured networks To address these limitations gossip protocols which are easy to deploy and scale well can be exploited In this book we will give an overview of these different P2P techniques and architectures discuss their trade offs and illustrate their use for decentralizing several large scale data sharing applications Table of Contents P2P

Overlays Query Routing and Gossiping Content Distribution in P2P Systems Recommendation Systems Top k Query Processing in P2P Systems **Databases on Modern Hardware** Anastasia Ailamaki,Erietta Liarou,Pınar Tözün,Danica Porobic,Iraklis Psaroudakis,2022-06-01 Data management systems enable various influential applications from high performance online services e g social networks like Twitter and Facebook or financial markets to big data analytics e g scientific exploration sensor networks business intelligence As a result data management systems have been one of the main drivers for innovations in the database and computer architecture communities for several decades Recent hardware trends require software to take advantage of the abundant parallelism existing in modern and future hardware The traditional design of the data management systems however faces inherent scalability problems due to its tightly coupled components In addition it cannot exploit the full capability of the aggressive micro architectural features of modern processors As a result today s most commonly used server types remain largely underutilized leading to a huge waste of hardware resources and energy In this book we shed light on the challenges present while running DBMS on modern multicore hardware We divide the material into two dimensions of scalability implicit vertical and explicit horizontal The first part of the book focuses on the vertical dimension it describes the instruction and data level parallelism opportunities in a core coming from the hardware and software side In addition it examines the sources of under utilization in a modern processor and presents insights and hardware software techniques to better exploit the microarchitectural resources of a processor by improving cache locality at the right level of the memory hierarchy The second part focuses on the horizontal dimension i e scalability bottlenecks of database applications at the level of multicore and multisocket multicore architectures It first presents a systematic way of eliminating such bottlenecks in online transaction processing workloads which is based on minimizing unbounded communication and shows several techniques that minimize bottlenecks in major components of database management systems Then it demonstrates the data and work sharing opportunities for analytical workloads and reviews advanced scheduling mechanisms that are aware of nonuniform memory accesses and alleviate bandwidth saturation

Declarative Networking Boon Thau Loo,Wenchao Zhou,2022-05-31 Declarative Networking is a programming methodology that enables developers to concisely specify network protocols and services which are directly compiled to a dataflow framework that executes the specifications Declarative networking proposes the use of a declarative query language for specifying and implementing network protocols and employs a dataflow framework at runtime for communication and maintenance of network state The primary goal of declarative networking is to greatly simplify the process of specifying implementing deploying and evolving a network design In addition declarative networking serves as an important step towards an extensible evolvable network architecture that can support flexible secure and efficient deployment of new network protocols This book provides an introduction to basic issues in declarative networking including language design optimization and dataflow execution The methodology behind declarative programming of networks is presented including

roots in Datalog extensions for networked environments and the semantics of long running queries over network state The book focuses on a representative declarative networking language called Network Datalog NDlog which is based on extensions to the Datalog recursive query language An overview of declarative network protocols written in NDlog is provided and its usage is illustrated using examples from routing protocols and overlay networks This book also describes the implementation of a declarative networking engine and NDlog execution strategies that provide eventual consistency semantics with significant flexibility in execution Two representative declarative networking systems P2 and its successor RapidNet are presented Finally the book highlights recent advances in declarative networking and new declarative approaches to related problems Table of Contents Introduction Declarative Networking Language Declarative Networking Overview Distributed Recursive Query Processing Declarative Routing Declarative Overlays Optimization of NDlog Recent Advances in Declarative Networking Conclusion Big Data Integration Xin Luna Dong,Divesh Srivastava,2022-05-31 The big data era is upon us data are being generated analyzed and used at an unprecedented scale and data driven decision making is sweeping through all aspects of society Since the value of data explodes when it can be linked and fused with other data addressing the big data integration BDI challenge is critical to realizing the promise of big data BDI differs from traditional data integration along the dimensions of volume velocity variety and veracity First not only can data sources contain a huge volume of data but also the number of data sources is now in the millions Second because of the rate at which newly collected data are made available many of the data sources are very dynamic and the number of data sources is also rapidly exploding Third data sources are extremely heterogeneous in their structure and content exhibiting considerable variety even for substantially similar entities Fourth the data sources are of widely differing qualities with significant differences in the coverage accuracy and timeliness of data provided This book explores the progress that has been made by the data integration community on the topics of schema alignment record linkage and data fusion in addressing these novel challenges faced by big data integration Each of these topics is covered in a systematic way first starting with a quick tour of the topic in the context of traditional data integration followed by a detailed example driven exposition of recent innovative techniques that have been proposed to address the BDI challenges of volume velocity variety and veracity Finally it presents merging topics and opportunities that are specific to BDI identifying promising directions for the data integration community

Transaction Processing on Modern Hardware Mohammad Sadoghi,Spyros Blanas,2022-05-31 The last decade has brought groundbreaking developments in transaction processing This resurgence of an otherwise mature research area has spurred from the diminishing cost per GB of DRAM that allows many transaction processing workloads to be entirely memory resident This shift demanded a pause to fundamentally rethink the architecture of database systems The data storage lexicon has now expanded beyond spinning disks and RAID levels to include the cache hierarchy memory consistency models cache coherence and write invalidation costs NUMA regions and coherence domains New memory technologies promise fast non

volatile storage and expose unchartered trade offs for transactional durability such as exploiting byte addressable hot and cold storage through persistent programming that promotes simpler recovery protocols In the meantime the plateauing single threaded processor performance has brought massive concurrency within a single node first in the form of multi core andnow with many core and heterogeneous processors The exciting possibility to reshape the storage transaction logging and recovery layers of next generation systems on emerging hardware have prompted the database research community to vigorously debate the trade offs between specialized kernels that narrowly focus on transaction processing performance vs designs that permit transactionally consistent data accesses from decision support and analytical workloads In this book we aim to classify and distill the new body of work on transaction processing that has surfaced in the last decade to navigate researchers and practitioners through this intricate research subject **Data Management in the Cloud** Divyakant Agrawal,Sudipto Das,Amr El Abbadi,2022-05-31 Cloud computing has emerged as a successful paradigm of service oriented computing and has revolutionized the way computing infrastructure is used This success has seen a proliferation in the number of applications that are being deployed in various cloud platforms There has also been an increase in the scale of the data generated as well as consumed by such applications Scalable database management systems form a critical part of the cloud infrastructure The attempt to address the challenges posed by the management of big data has led to a plethora of systems This book aims to clarify some of the important concepts in the design space of scalable data management in cloud computing infrastructures Some of the questions that this book aims to answer are the appropriate systems for a specific set of application requirements the research challenges in data management for the cloud and what is novel in the cloud for database researchers We also aim to address one basic question whether cloud computing poses new challenges in scalable data management or it is just a reincarnation of old problems We provide a comprehensive background study of state of the art systems for scalable data management and analysis We also identify important aspects in the design of different systems and the applicability and scope of these systems A thorough understanding of current solutions and a precise characterization of the design space are essential for clearing the cloudy skies of data management and ensuring the success of DBMSs in the cloud thus emulating the success enjoyed by relational databases in traditional enterprise settings Table of Contents Introduction Distributed Data Management Cloud Data Management Early Trends Transactions on Co located Data Transactions on Distributed Data Multi tenant Database Systems Concluding Remarks

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