Embracing Interference in Wireless Systems

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Embracing Interference in Wireless Systems Shyamnath Gollakota,2014-06-01 The wireless medium is a shared resource If nearby devices transmit at the same time their signals interfere resulting in a collision In traditional networks collisions cause the loss of the transmitted information For this reason wireless networks have been designed with the assumption that interference is intrinsically harmful and must be avoided This book a revised version of the author s award winning Ph D dissertation takes an alternate approach Instead of viewing interference as an inherently counterproductive phenomenon that should to be avoided we design practical systems that transform interference into a harmless and even a beneficial phenomenon To achieve this goal we consider how wireless signals interact when they interfere and use this understanding in our system designs Specifically when interference occurs the signals get mixed on the wireless medium By understanding the parameters of this mixing we can invert the mixing and decode the interfered packets thus making interference harmless Furthermore we can control this mixing process to create strategic interference that allow decodability at a particular receiver of interest but prevent decodability at unintended receivers and adversaries Hence we can transform interference into a beneficial phenomenon that provides security Building on this approach we make four main contributions We present the first WiFi receiver that can successfully reconstruct the transmitted information in the presence of packet collisions Next we introduce a WiFi receiver design that can decode in the presence of high power cross technology interference from devices like baby monitors cordless phones microwave ovens or even unknown technologies We then show how we can harness interference to improve security In particular we develop the first system that secures an insecure medical implant without any modification to the implant itself Finally we present a solution that establishes secure connections between any two WiFi devices without having users enter passwords or use pre shared secret keys **Computational Prediction of Protein Complexes from Protein Interaction Networks** Sriganesh Srihari,Chern Han Yong,Limsoon Wong,2017-05-30 Complexes of physically interacting proteins constitute fundamental functional units that drive almost all biological processes within cells A faithful reconstruction of the entire set of protein complexes the complexosome is therefore important not only to understand the composition of complexes but also the higher level functional organization within cells Advances over the last several years particularly through the use of high throughput proteomics techniques have made it possible to map substantial fractions of protein interactions the interactomes from model organisms including Arabidopsis thaliana a flowering plant Caenorhabditis elegans a nematode Drosophila melanogaster fruit fly and Saccharomyces cerevisiae budding yeast These interaction datasets have enabled systematic inquiry into the identification and study of protein complexes from organisms Computational methods have played a significant role in this context by contributing accurate efficient and exhaustive ways to analyze the enormous amounts of data These methods have helped to compensate for some of the limitations in experimental datasets including the presence of biological and technical noise and the relative paucity of

credible interactions In this book we systematically walk through computational methods devised to date approximately between 2000 and 2016 for identifying protein complexes from the network of protein interactions the protein protein interaction PPI network We present a detailed taxonomy of these methods and comprehensively evaluate them for protein complex identification across a variety of scenarios including the absence of many true interactions and the presence of false positive interactions noise in PPI networks Based on this evaluation we highlight challenges faced by the methods for instance in identifying sparse sub or small complexes and in discerning overlapping complexes and reveal how a combination of strategies is necessary to accurately reconstruct the entire complexosome **Declarative Logic Programming** Michael Kifer,Yanhong Annie Liu,2018-09-19 The idea of this book grew out of a symposium that was held at Stony Brook in September 2012 in celebration of David S Warren s fundamental contributions to Computer Science and the area of Logic Programming in particular Logic Programming LP is at the nexus of Knowledge Representation Artificial Intelligence Mathematical Logic Databases and Programming Languages It is fascinating and intellectually stimulating due to the fundamental interplay among theory systems and applications brought about by logic Logic programs are more declarative in the sense that they strive to be logical specifications of what to do rather than how to do it and thus they are high level and easier to understand and maintain Yet without being given an actual algorithm LP systems implement the logical specifications automatically Several books cover the basics of LP but focus mostly on the Prolog language with its incomplete control strategy and non logical features At the same time there is generally a lack of accessible yet comprehensive collections of articles covering the key aspects in declarative LP These aspects include among others well founded vs stable model semantics for negation constraints object oriented LP updates probabilistic LP and evaluation methods including top down vs bottom up and tabling For systems the situation is even less satisfactory lacking accessible literature that can help train the new crop of developers practitioners and researchers There are a few guides onWarren s Abstract Machine WAM which underlies most implementations of Prolog but very little exists on what is needed for constructing a state of the art declarative LP inference engine Contrast this with the literature on say Compilers where one can first study a book on the general principles and algorithms and then dive in the particulars of a specific compiler Such resources greatly facilitate the ability to start making meaningful contributions quickly There is also a dearth of articles about systems that support truly declarative languages especially those that tie into first order logic mathematical programming and constraint solving LP helps solve challenging problems in a wide range of application areas but in depth analysis of their connection with LP language abstractions and LP implementation methods is lacking Also rare are surveys of challenging application areas of LP such as Bioinformatics Natural Language Processing Verification and Planning The goal of this book is to help fill in the previously mentioned void in the LP literature It offers a number of overviews on key aspects of LP that are suitable for researchers and practitioners as well as graduate students The following chapters in theory systems and applications of LP

are included **On Monotonicity Testing and the 2-to-2 Games Conjecture** Dor Minzer,2022-12-06 This book discusses two questions in Complexity Theory the Monotonicity Testing problem and the 2 to 2 Games Conjecture Monotonicity testing is a problem from the field of property testing first considered by Goldreich et al in 2000 The input of the algorithm is a function and the goal is to design a tester that makes as few queries to the function as possible accepts monotone functions and rejects far from monotone functions with a probability close to 1 The first result of this book is an essentially optimal algorithm for this problem The analysis of the algorithm heavily relies on a novel directed and robust analogue of a Boolean isoperimetric inequality of Talagrand from 1993 The probabilistically checkable proofs PCP theorem is one of the cornerstones of modern theoretical computer science One area in which PCPs are essential is the area of hardness of approximation Therein the goal is to prove that some optimization problems are hard to solve even approximately Many hardness of approximation results were proved using the PCP theorem however for some problems optimal results were not obtained This book touches on some of these problems and in particular the 2 to 2 games problem and the vertex cover problem The second result of this book is a proof of the 2 to 2 games conjecture with imperfect completeness which implies new hardness of approximation results for problems such as vertex cover and independent set It also serves as strong evidence towards the unique games conjecture a notorious related open problem in theoretical computer science At the core of the proof is a characterization of small sets of vertices in Grassmann graphs whose edge expansion is bounded away from 1 Prophets of Computing Dick van Lente,2022-12-14 When electronic digital computers first appeared after World War II they appeared as a revolutionary force Business management the world of work administrative life the nation state and soon enough everyday life were expected to change dramatically with these machines use Ever since diverse prophecies of computing have continually emerged through to the present day As computing spread beyond the US and UK such prophecies emerged from strikingly different economic political and cultural conditions This volume explores how these expectations differed assesses unexpected commonalities and suggests ways to understand the divergences and convergences This book examines thirteen countries based on source material in ten different languages the effort of an international team of scholars In addition to analyses of debates political changes and popular speculations we also show a wide range of pictorial representations of the future with computers *Code Nation* Michael J. Halvorson,2020-04-22 Code Nation explores the rise of software development as a social cultural and technical phenomenon in American history The movement germinated in government and university labs during the 1950s gained momentum through corporate and counterculture experiments in the 1960s and 1970s and became a broad based computer literacy movement in the 1980s As personal computing came to the fore learning to program was transformed by a groundswell of popular enthusiasm exciting new platforms and an array of commercial practices that have been further amplified by distributed computing and the Internet The resulting society can be depicted as a Code Nation a globally connected world that is saturated with computer

technology and enchanted by software and its creation Code Nation is a new history of personal computing that emphasizes the technical and business challenges that software developers faced when building applications for CP M MS DOS UNIX Microsoft Windows the Apple Macintosh and other emerging platforms It is a popular history of computing that explores the experiences of novice computer users tinkerers hackers and power users as well as the ideals and aspirations of leading computer scientists engineers educators and entrepreneurs Computer book and magazine publishers also played important if overlooked roles in the diffusion of new technical skills and this book highlights their creative work and influence Code Nation offers a behind the scenes look at application and operating system programming practices the diversity of historic computer languages the rise of user communities early attempts to market PC software and the origins of enterprise computing systems Code samples and over 80 historic photographs support the text The book concludes with an assessment of contemporary efforts to teach computational thinking to young people **The Handbook on Socially Interactive Agents** Birgit Lugrin,Catherine Pelachaud,David Traum,2022-10-19 The Handbook on Socially Interactive Agents provides a comprehensive overview of the research fields of Embodied Conversational Agents Intelligent Virtual Agents and Social Robotics Socially Interactive Agents SIAs whether virtually or physically embodied are autonomous agents that are able to perceive an environment including people or other agents reason decide how to interact and express attitudes such as emotions engagement or empathy They are capable of interacting with people and one another in a socially intelligent manner using multimodal communicative behaviors with the goal to support humans in various domains Written by international experts in their respective fields the book summarizes research in the many important research communities pertinent for SIAs while discussing current challenges and future directions The handbook provides easy access to modeling and studying SIAs for researchers and students and aims at further bridging the gap between the research communities involved In two volumes the book clearly structures the vast body of research The first volume starts by introducing what is involved in SIAs research in particular research methodologies and ethical implications of developing SIAs It further examines research on appearance and behavior focusing on multimodality Finally social cognition for SIAs is investigated using different theoretical models and phenomena such as theory of mind or pro sociality The second volume starts with perspectives on interaction examined from different angles such as interaction in social space group interaction or long term interaction It also includes an extensive overview summarizing research and systems of human agent platforms and of some of the major application areas of SIAs such as education aging support autism and games *Data Cleaning* Ihab F. Ilyas,Xu Chu,2019-06-18 This is an overview of the end to end data cleaning process Data quality is one of the most important problems in data management since dirty data often leads to inaccurate data analytics results and incorrect business decisions Poor data across businesses and the U S government are reported to cost trillions of dollars a year Multiple surveys show that dirty data is the most common barrier faced by data scientists Not surprisingly developing effective and efficient

data cleaning solutions is challenging and is rife with deep theoretical and engineering problems This book is about data cleaning which is used to refer to all kinds of tasks and activities to detect and repair errors in the data Rather than focus on a particular data cleaning task this book describes various error detection and repair methods and attempts to anchor these proposals with multiple taxonomies and views Specifically it covers four of the most common and important data cleaning tasks namely outlier detection data transformation error repair including imputing missing values and data deduplication Furthermore due to the increasing popularity and applicability of machine learning techniques it includes a chapter that specifically explores how machine learning techniques are used for data cleaning and how data cleaning is used to improve machine learning models This book is intended to serve as a useful reference for researchers and practitioners who are interested in the area of data quality and data cleaning It can also be used as a textbook for a graduate course Although we aim at covering state of the art algorithms and techniques we recognize that data cleaning is still an active field of research and therefore provide future directions of research whenever appropriate   Heterogeneous Computing Mohamed Zahran,2019-05-29 If you look around you will find that all computer systems from your portable devices to the strongest supercomputers are heterogeneous in nature The most obvious heterogeneity is the existence of computing nodes of different capabilities e g multicore GPUs FPGAs But there are also other heterogeneity factors that exist in computing systems like the memory system components interconnection etc The main reason for these different types of heterogeneity is to have good performance with power efficiency Heterogeneous computing results in both challenges and opportunities This book discusses both It shows that we need to deal with these challenges at all levels of the computing stack from algorithms all the way to process technology We discuss the topic of heterogeneous computing from different angles hardware challenges current hardware state of the art software issues how to make the best use of the current heterogeneous systems and what lies ahead The aim of this book is to introduce the big picture of heterogeneous computing Whether you are a hardware designer or a software developer you need to know how the pieces of the puzzle fit together The main goal is to bring researchers and engineers to the forefront of the research frontier in the new era that started a few years ago and is expected to continue for decades We believe that academics researchers practitioners and students will benefit from this book and will be prepared to tackle the big wave of heterogeneous computing that is here to stay

Applied Affective Computing Leimin Tian,Sharon Oviatt,Michal Muszynski,Brent Chamberlain,Jennifer Healey,Akane Sano,2022-02-04 Affective computing is a nascent field situated at the intersection of artificial intelligence with social and behavioral science It studies how human emotions are perceived and expressed which then informs the design of intelligent agents and systems that can either mimic this behavior to improve their intelligence or incorporate such knowledge to effectively understand and communicate with their human collaborators Affective computing research has recently seen significant advances and is making a critical transformation from exploratory studies to real world applications in the

emerging research area known as applied affective computing This book offers readers an overview of the state of the art and emerging themes in affective computing including a comprehensive review of the existing approaches to affective computing systems and social signal processing It provides in depth case studies of applied affective computing in various domains such as social robotics and mental well being It also addresses ethical concerns related to affective computing and how to prevent misuse of the technology in research and applications Further this book identifies future directions for the field and summarizes a set of guidelines for developing next generation affective computing systems that are effective safe and human centered For researchers and practitioners new to affective computing this book will serve as an introduction to the field to help them in identifying new research topics or developing novel applications For more experienced researchers and practitioners the discussions in this book provide guidance for adopting a human centered design and development approach to advance affective computing   Semantic Web for the Working Ontologist James Hendler,Fabien Gandon,Dean Allemang,2020-08-03 Enterprises have made amazing advances by taking advantage of data about their business to provide predictions and understanding of their customers markets and products But as the world of business becomes more interconnected and global enterprise data is no long a monolith it is just a part of a vast web of data Managing data on a world wide scale is a key capability for any business today The Semantic Web treats data as a distributed resource on the scale of the World Wide Web and incorporates features to address the challenges of massive data distribution as part of its basic design The aim of the first two editions was to motivate the Semantic Web technology stack from end to end to describe not only what the Semantic Web standards are and how they work but also what their goals are and why they were designed as they are It tells a coherent story from beginning to end of how the standards work to manage a world wide distributed web of knowledge in a meaningful way The third edition builds on this foundation to bring Semantic Web practice to enterprise Fabien Gandon joins Dean Allemang and Jim Hendler bringing with him years of experience in global linked data to open up the story to a modern view of global linked data While the overall story is the same the examples have been brought up to date and applied in a modern setting where enterprise and global data come together as a living linked network of data Also included with the third edition all of the data sets and queries are available online for study and experimentation at data world swwo   Hardness of Approximation Between P and NP Aviad Rubinstein,2019-06-07 Nash equilibrium is the central solution concept in Game Theory Since Nash s original paper in 1951 it has found countless applications in modeling strategic behavior of traders in markets human drivers and electronic routers in congested networks nations in nuclear disarmament negotiations and more A decade ago the relevance of this solution concept was called into question by computer scientists who proved under appropriate complexity assumptions that computing a Nash equilibrium is an intractable problem And if centralized specially designed algorithms cannot find Nash equilibria why should we expect distributed selfish agents to converge to one The remaining hope was that at least approximate Nash equilibria can be

efficiently computed Understanding whether there is an efficient algorithm for approximate Nash equilibrium has been the central open problem in this field for the past decade In this book we provide strong evidence that even finding an approximate Nash equilibrium is intractable We prove several intractability theorems for different settings two player games and many player games and models computational complexity query complexity and communication complexity In particular our main result is that under a plausible and natural complexity assumption Exponential Time Hypothesis for PPAD there is no polynomial time algorithm for finding an approximate Nash equilibrium in two player games The problem of approximate Nash equilibrium in a two player game poses a unique technical challenge it is a member of the class PPAD which captures the complexity of several fundamental total problems i e problems that always have a solution and it also admits a quasipolynomial time algorithm Either property alone is believed to place this problem far below NP hard problems in the complexity hierarchy having both simultaneously places it just above P at what can be called the frontier of intractability Indeed the tools we develop in this book to advance on this frontier are useful for proving hardness of approximation of several other important problems whose complexity lies between P and NP Brouwer s fixed point market equilibrium CourseMatch A CEEI densest k subgraph community detection VC dimension and Littlestone dimension and signaling in zero sum games **Verified Functional Programming in Agda** Aaron Stump,2016-02-01 Agda is an advanced programming language based on Type Theory Agda s type system is expressive enough to support full functional verification of programs in two styles In external verification we write pure functional programs and then write proofs of properties about them The proofs are separate external artifacts typically using structural induction In internal verification we specify properties of programs through rich types for the programs themselves This often necessitates including proofs inside code to show the type checker that the specified properties hold The power to prove properties of programs in these two styles is a profound addition to the practice of programming giving programmers the power to guarantee the absence of bugs and thus improve the quality of software more than previously possible Verified Functional Programming in Agda is the first book to provide a systematic exposition of external and internal verification in Agda suitable for undergraduate students of Computer Science No familiarity with functional programming or computer checked proofs is presupposed The book begins with an introduction to functional programming through familiar examples like booleans natural numbers and lists and techniques for external verification Internal verification is considered through the examples of vectors binary search trees and Braun trees More advanced material on type level computation explicit reasoning about termination and normalization by evaluation is also included The book also includes a medium sized case study on Huffman encoding and decoding **Concurrency** Dahlia Malkhi,2019-09-16 This book is a celebration of Leslie Lamport s work on concurrency interwoven in four and a half decades of an evolving industry from the introduction of the first personal computer to an era when parallel and distributed multiprocessors are abundant His works lay formal foundations for concurrent computations executed by interconnected

computers Some of the algorithms have become standard engineering practice for fault tolerant distributed computing distributed systems that continue to function correctly despite failures of individual components He also developed a substantial body of work on the formal specification and verification of concurrent systems and has contributed to the development of automated tools applying these methods Part I consists of technical chapters of the book and a biography The technical chapters of this book present a retrospective on Lamport s original ideas from experts in the field Through this lens it portrays their long lasting impact The chapters cover timeless notions Lamport introduced the Bakery algorithm atomic shared registers and sequential consistency causality and logical time Byzantine Agreement state machine replication and Paxos temporal logic of actions TLA The professional biography tells of Lamport s career providing the context in which his work arose and broke new grounds and discusses LaTeX perhaps Lamport s most influential contribution outside the field of concurrency This chapter gives a voice to the people behind the achievements notably Lamport himself and additionally the colleagues around him who inspired collaborated and helped him drive worldwide impact Part II consists of a selection of Leslie Lamport s most influential papers This book touches on a lifetime of contributions by Leslie Lamport to the field of concurrency and on the extensive influence he had on people working in the field It will be of value to historians of science and to researchers and students who work in the area of concurrency and who are interested to read about the work of one of the most influential researchers in this field   *Shared-Memory Parallelism Can be Simple, Fast, and Scalable* Julian Shun,2017-06-01 Parallelism is the key to achieving high performance in computing However writing efficient and scalable parallel programs is notoriously difficult and often requires significant expertise To address this challenge it is crucial to provide programmers with high level tools to enable them to develop solutions easily and at the same time emphasize the theoretical and practical aspects of algorithm design to allow the solutions developed to run efficiently under many different settings This thesis addresses this challenge using a three pronged approach consisting of the design of shared memory programming techniques frameworks and algorithms for important problems in computing The thesis provides evidence that with appropriate programming techniques frameworks and algorithms shared memory programs can be simple fast and scalable both in theory and in practice The results developed in this thesis serve to ease the transition into the multicore era The first part of this thesis introduces tools and techniques for deterministic parallel programming including means for encapsulating nondeterminism via powerful commutative building blocks as well as a novel framework for executing sequential iterative loops in parallel which lead to deterministic parallel algorithms that are efficient both in theory and in practice The second part of this thesis introduces Ligra the first high level shared memory framework for parallel graph traversal algorithms The framework allows programmers to express graph traversal algorithms using very short and concise code delivers performance competitive with that of highly optimized code and is up to orders of magnitude faster than existing systems designed for distributed memory This part of the thesis also introduces Ligra which extends Ligra with

graph compression techniques to reduce space usage and improve parallel performance at the same time and is also the first graph processing system to support in memory graph compression The third and fourth parts of this thesis bridge the gap between theory and practice in parallel algorithm design by introducing the first algorithms for a variety of important problems on graphs and strings that are efficient both in theory and in practice For example the thesis develops the first linear work and polylogarithmic depth algorithms for suffix tree construction and graph connectivity that are also practical as well as a work efficient polylogarithmic depth and cache efficient shared memory algorithm for triangle computations that achieves a 2 5x speedup over the best existing algorithms on 40 cores This is a revised version of the thesis that won the 2015 ACM Doctoral Dissertation Award   **The Handbook of Multimodal-Multisensor Interfaces, Volume 1** Sharon Oviatt,Björn Schuller,Philip Cohen,Daniel Sonntag,Gerasimos Potamianos,2017-06-01 The Handbook of Multimodal Multisensor Interfaces provides the first authoritative resource on what has become the dominant paradigm for new computer interfaces user input involving new media speech multi touch gestures writing embedded in multimodal multisensor interfaces These interfaces support smart phones wearables in vehicle and robotic applications and many other areas that are now highly competitive commercially This edited collection is written by international experts and pioneers in the field It provides a textbook reference and technology roadmap for professionals working in this and related areas This first volume of the handbook presents relevant theory and neuroscience foundations for guiding the development of high performance systems Additional chapters discuss approaches to user modeling and interface designs that support user choice that synergistically combine modalities with sensors and that blend multimodal input and output This volume also highlights an in depth look at the most common multimodal multisensor combinations for example touch and pen input haptic and non speech audio output and speech centric systems that co process either gestures pen input gaze or visible lip movements A common theme throughout these chapters is supporting mobility and individual differences among users These handbook chapters provide walk through examples of system design and processing information on tools and practical resources for developing and evaluating new systems and terminology and tutorial support for mastering this emerging field In the final section of this volume experts exchange views on a timely and controversial challenge topic and how they believe multimodal multisensor interfaces should be designed in the future to most effectively advance human performance

   Communities of Computing Thomas J. Misa,2016-11-10 Communities of Computing is the first book length history of the Association for Computing Machinery ACM founded in 1947 and with a membership today of 100 000 worldwide It profiles ACM s notable SIGs active chapters and individual members setting ACM s history into a rich social and political context The book s 12 core chapters are organized into three thematic sections Defining the Discipline examines the 1960s and 1970s when the field of computer science was taking form at the National Science Foundation Stanford University and through ACM s notable efforts in education and curriculum standards Broadening the Profession looks outward into the

wider society as ACM engaged with social and political issues and as members struggled with balancing a focus on scientific issues and awareness of the wider world Chapters examine the social turbulence surrounding the Vietnam War debates about the women s movement efforts for computing and community education and international issues including professionalization and the Cold War Expanding Research Frontiers profiles three areas of research activity where ACM members and ACM itself shaped notable advances in computing including computer graphics computer security and hypertext Featuring insightful profiles of notable ACM leaders such as Edmund Berkeley George Forsythe Jean Sammet Peter Denning and Kelly Gotlieb and honest assessments of controversial episodes the volume deals with compelling and complex issues involving ACM and computing It is not a narrow organizational history of ACM committees and SIGS although much information about them is given All chapters are original works of research Many chapters draw on archival records of ACM s headquarters ACM SIGs and ACM leaders This volume makes a permanent contribution to documenting the history of ACM and understanding its central role in the history of computing **The Continuing Arms Race** Per Larsen,Ahmad-Reza Sadeghi,2018-02-23 As human activities moved to the digital domain so did all the well known malicious behaviors including fraud theft and other trickery There is no silver bullet and each security threat calls for a specific answer One specific threat is that applications accept malformed inputs and in many cases it is possible to craft inputs that let an intruder take full control over the target computer system The nature of systems programming languages lies at the heart of the problem Rather than rewriting decades of well tested functionality this book examines ways to live with the programming sins of the past while shoring up security in the most efficient manner possible We explore a range of different options each making significant progress towards securing legacy programs from malicious inputs The solutions explored include enforcement type defenses which excludes certain program executions because they never arise during normal operation Another strand explores the idea of presenting adversaries with a moving target that unpredictably changes its attack surface thanks to randomization We also cover tandem execution ideas where the compromise of one executing clone causes it to diverge from another thus revealing adversarial activities The main purpose of this book is to provide readers with some of the most influential works on run time exploits and defenses We hope that the material in this book will inspire readers and generate new ideas and paradigms Conversational UX Design Robert J. Moore,Raphael Arar,2019-05-29 With recent advances in natural language understanding techniques and far field microphone arrays natural language interfaces such as voice assistants and chatbots are emerging as a popular new way to interact with computers They have made their way out of the industry research labs and into the pockets desktops cars and living rooms of the general public But although such interfaces recognize bits of natural language and even voice input they generally lack conversational competence or the ability to engage in natural conversation Today s platforms provide sophisticated tools for analyzing language and retrieving knowledge but they fail to provide adequate support for modeling interaction The user experience UX designer or software

developer must figure out how a human conversation is organized usually relying on commonsense rather than on formal knowledge Fortunately practitioners can rely on conversation science This book adapts formal knowledge from the field of Conversation Analysis CA to the design of natural language interfaces It outlines the Natural Conversation Framework NCF developed at IBM Research a systematic framework for designing interfaces that work like natural conversation The NCF consists of four main components 1 an interaction model of expandable sequences 2 a corresponding content format 3 a pattern language with 100 generic UX patterns and 4 a navigation method of six basic user actions The authors introduce UX designers to a new way of thinking about user experience design in the context of conversational interfaces including a new vocabulary new principles and new interaction patterns User experience designers and graduate students in the HCI field as well as developers and conversation analysis students should find this book of interest **An Architecture for Fast and General Data Processing on Large Clusters** Matei Zaharia,2016-05-01 The past few years have seen a major change in computing systems as growing data volumes and stalling processor speeds require more and more applications to scale out to clusters Today a myriad data sources from the Internet to business operations to scientific instruments produce large and valuable data streams However the processing capabilities of single machines have not kept up with the size of data As a result organizations increasingly need to scale out their computations over clusters At the same time the speed and sophistication required of data processing have grown In addition to simple queries complex algorithms like machine learning and graph analysis are becoming common And in addition to batch processing streaming analysis of real time data is required to let organizations take timely action Future computing platforms will need to not only scale out traditional workloads but support these new applications too This book a revised version of the 2014 ACM Dissertation Award winning dissertation proposes an architecture for cluster computing systems that can tackle emerging data processing workloads at scale Whereas early cluster computing systems like MapReduce handled batch processing our architecture also enables streaming and interactive queries while keeping MapReduce s scalability and fault tolerance And whereas most deployed systems only support simple one pass computations e g SQL queries ours also extends to the multi pass algorithms required for complex analytics like machine learning Finally unlike the specialized systems proposed for some of these workloads our architecture allows these computations to be combined enabling rich new applications that intermix for example streaming and batch processing We achieve these results through a simple extension to MapReduce that adds primitives for data sharing called Resilient Distributed Datasets RDDs We show that this is enough to capture a wide range of workloads We implement RDDs in the open source Spark system which we evaluate using synthetic and real workloads Spark matches or exceeds the performance of specialized systems in many domains while offering stronger fault tolerance properties and allowing these workloads to be combined Finally we examine the generality of RDDs from both a theoretical modeling perspective and a systems perspective This version of the dissertation makes corrections throughout the text and adds a new

section on the evolution of Apache Spark in industry since 2014 In addition editing formatting and links for the references have been added

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