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Analysis Techniques for Information Security

Anupam Datta
Somesh Jha
Ninghui Li
David Melski
Tom Reps

*SYNTHESIS LECTURES ON
INFORMATION SECURITY, PRIVACY, AND TRUST*

Ravi Sandhu, *Series Editor*

Analysis Techniques For Information Security Somesh Jha

Vassil Roussev



Analysis Techniques For Information Security Somesh Jha:

Analysis Techniques for Information Security Anupam Datta,Somesh Jha,Ninghui Li,David Melski,Thomas Reps,2022-05-31 Increasingly our critical infrastructures are reliant on computers We see examples of such infrastructures in several domains including medical power telecommunications and finance Although automation has advantages increased reliance on computers exposes our critical infrastructures to a wider variety and higher likelihood of accidental failures and malicious attacks Disruption of services caused by such undesired events can have catastrophic effects such as disruption of essential services and huge financial losses The increased reliance of critical services on our cyberinfrastructure and the dire consequences of security breaches have highlighted the importance of information security Authorization security protocols and software security are three central areas in security in which there have been significant advances in developing systematic foundations and analysis methods that work for practical systems This book provides an introduction to this work covering representative approaches illustrated by examples and providing pointers to additional work in the area Table of Contents Introduction Foundations Detecting Buffer Overruns Using Static Analysis Analyzing Security Policies Analyzing Security Protocols **Enhancing Information Security and Privacy by Combining Biometrics with Cryptography**

Sanjay Kanade,Dijana Petrovska-Delacretaz,Bernadette Dorizzi,2022-05-31 This book deals with crypto biometrics a relatively new and multi disciplinary area of research started in 1998 Combining biometrics and cryptography provides multiple advantages such as revocability template diversity better verification accuracy and generation of cryptographically usable keys that are strongly linked to the user identity In this text a thorough review of the subject is provided and then some of the main categories are illustrated with recently proposed systems by the authors Beginning with the basics this text deals with various aspects of crypto biometrics including review cancelable biometrics cryptographic key generation from biometrics and crypto biometric key sharing protocols Because of the thorough treatment of the topic this text will be highly beneficial to researchers and industry professionals in information security and privacy Table of Contents Introduction Cancelable Biometric System Cryptographic Key Regeneration Using Biometrics Biometrics Based Secure Authentication Protocols Concluding Remarks **Anomaly Detection as a Service** Danfeng (Daphne) Yao,Xiaokui Shu,Long

Cheng,Salvatore J. Stolfo,2022-06-01 Anomaly detection has been a long standing security approach with versatile applications ranging from securing server programs in critical environments to detecting insider threats in enterprises to anti abuse detection for online social networks Despite the seemingly diverse application domains anomaly detection solutions share similar technical challenges such as how to accurately recognize various normal patterns how to reduce false alarms how to adapt to concept drifts and how to minimize performance impact They also share similar detection approaches and evaluation methods such as feature extraction dimension reduction and experimental evaluation The main purpose of this book is to help advance the real world adoption and deployment anomaly detection technologies by systematizing the

body of existing knowledge on anomaly detection This book is focused on data driven anomaly detection for software systems and networks against advanced exploits and attacks but also touches on a number of applications including fraud detection and insider threats We explain the key technical components in anomaly detection workflows give in depth description of the state of the art data driven anomaly based security solutions and more importantly point out promising new research directions This book emphasizes on the need and challenges for deploying service oriented anomaly detection in practice where clients can outsource the detection to dedicated security providers and enjoy the protection without tending to the intricate details

Digital Forensic Science Vassil Roussev,2022-05-31 Digital forensic science or digital forensics is the application of scientific tools and methods to identify collect and analyze digital data artifacts in support of legal proceedings From a more technical perspective it is the process of reconstructing the relevant sequence of events that have led to the currently observable state of a target IT system or digital artifacts Over the last three decades the importance of digital evidence has grown in lockstep with the fast societal adoption of information technology which has resulted in the continuous accumulation of data at an exponential rate Simultaneously there has been a rapid growth in network connectivity and the complexity of IT systems leading to more complex behavior that needs to be investigated The goal of this book is to provide a systematic technical overview of digital forensic techniques primarily from the point of view of computer science This allows us to put the field in the broader perspective of a host of related areas and gain better insight into the computational challenges facing forensics as well as draw inspiration for addressing them This is needed as some of the challenges faced by digital forensics such as cloud computing require qualitatively different approaches the sheer volume of data to be examined also requires new means of processing it

Introduction to Secure Outsourcing Computation Xiaofeng Chen,2022-05-31 With the rapid development of cloud computing the enterprises and individuals can outsource their sensitive data into the cloud server where they can enjoy high quality data storage and computing services in a ubiquitous manner This is known as the outsourcing computation paradigm Recently the problem for securely outsourcing various expensive computations or storage has attracted considerable attention in the academic community In this book we focus on the latest technologies and applications of secure outsourcing computations Specially we introduce the state of the art research for secure outsourcing some specific functions such as scientific computations cryptographic basic operations and verifiable large database with update The constructions for specific functions use various design tricks and thus result in very efficient protocols for real world applications The topic of outsourcing computation is a hot research issue nowadays Thus this book will be beneficial to academic researchers in the field of cloud computing and big data security

Blocks and Chains Aljoshia Judmayer,Nicholas Stifter,Katharina Krombholz,Edgar Weippl,2022-06-01 The new field of cryptographic currencies and consensus ledgers commonly referred to as blockchains is receiving increasing interest from various different communities These communities are very diverse and amongst others include technical enthusiasts activist groups

researchers from various disciplines start ups large enterprises public authorities banks financial regulators business men investors and also criminals The scientific community adapted relatively slowly to this emerging and fast moving field of cryptographic currencies and consensus ledgers This was one reason that for quite a while the only resources available have been the Bitcoin source code blog and forum posts mailing lists and other online publications Also the original Bitcoin paper which initiated the hype was published online without any prior peer review Following the original publication spirit of the Bitcoin paper a lot of innovation in this field has repeatedly come from the community itself in the form of online publications and online conversations instead of established peer reviewed scientific publishing On the one side this spirit of fast free software development combined with the business aspects of cryptographic currencies as well as the interests of today's time to market focused industry produced a flood of publications whitepapers and prototypes On the other side this has led to deficits in systematization and a gap between practice and the theoretical understanding of this new field This book aims to further close this gap and presents a well structured overview of this broad field from a technical viewpoint The archetype for modern cryptographic currencies and consensus ledgers is Bitcoin and its underlying Nakamoto consensus Therefore we describe the inner workings of this protocol in great detail and discuss its relations to other derived systems **Database**

Anonymization Josep Domingo-Ferrer, David Sánchez, Jordi Soria-Comas, 2022-05-31 The current social and economic context increasingly demands open data to improve scientific research and decision making However when published data refer to individual respondents disclosure risk limitation techniques must be implemented to anonymize the data and guarantee by design the fundamental right to privacy of the subjects the data refer to Disclosure risk limitation has a long record in the statistical and computer science research communities who have developed a variety of privacy preserving solutions for data releases This Synthesis Lecture provides a comprehensive overview of the fundamentals of privacy in data releases focusing on the computer science perspective Specifically we detail the privacy models anonymization methods and utility and risk metrics that have been proposed so far in the literature Besides as a more advanced topic we identify and discuss in detail connections between several privacy models i.e. how to accumulate the privacy guarantees they offer to achieve more robust protection and when such guarantees are equivalent or complementary we also explore the links between anonymization methods and privacy models how anonymization methods can be used to enforce privacy models and thereby offer ex ante privacy guarantees These latter topics are relevant to researchers and advanced practitioners who will gain a deeper understanding on the available data anonymization solutions and the privacy guarantees they can offer

Reversible Digital Watermarking Ruchira Naskar, Rajat Subhra Chakraborty, 2022-06-01 Digital Watermarking is the art and science of embedding information in existing digital content for Digital Rights Management DRM and authentication Reversible watermarking is a class of fragile digital watermarking that not only authenticates multimedia data content but also helps to maintain perfect integrity of the original multimedia cover data In non reversible watermarking schemes after

embedding and extraction of the watermark the cover data undergoes some distortions although perceptually negligible in most cases In contrast in reversible watermarking zero distortion of the cover data is achieved that is the cover data is guaranteed to be restored bit by bit Such a feature is desirable when highly sensitive data is watermarked e g in military medical and legal imaging applications This work deals with development analysis and evaluation of state of the art reversible watermarking techniques for digital images In this work we establish the motivation for research on reversible watermarking using a couple of case studies with medical and military images We present a detailed review of the state of the art research in this field We investigate the various subclasses of reversible watermarking algorithms their operating principles and computational complexities Along with this to give the readers an idea about the detailed working of a reversible watermarking scheme we present a prediction based reversible watermarking technique recently published by us We discuss the major issues and challenges behind implementation of reversible watermarking techniques and recently proposed solutions for them Finally we provide an overview of some open problems and scope of work for future researchers in this area

Privacy Risk Analysis Sourya Joyee De, Daniel Le Métayer, 2022-05-31 *Privacy Risk Analysis* fills a gap in the existing literature by providing an introduction to the basic notions requirements and main steps of conducting a privacy risk analysis The deployment of new information technologies can lead to significant privacy risks and a privacy impact assessment should be conducted before designing a product or system that processes personal data However if existing privacy impact assessment frameworks and guidelines provide a good deal of details on organizational aspects including budget allocation resource allocation stakeholder consultation etc they are much vaguer on the technical part in particular on the actual risk assessment task For privacy impact assessments to keep up their promises and really play a decisive role in enhancing privacy protection they should be more precise with regard to these technical aspects This book is an excellent resource for anyone developing and or currently running a risk analysis as it defines the notions of personal data stakeholders risk sources feared events and privacy harms all while showing how these notions are used in the risk analysis process It includes a running smart grids example to illustrate all the notions discussed in the book

Privacy Risk Analysis of Online Social Networks Sourya Joyee De, Abdessamad Imine, 2022-06-01 The social benefit derived from Online Social Networks OSNs can lure users to reveal unprecedented volumes of personal data to an online audience that is much less trustworthy than their offline social circle Even if a user hides his personal data from some users and shares with others privacy settings of OSNs may be bypassed thus leading to various privacy harms such as identity theft stalking or discrimination Therefore users need to be assisted in understanding the privacy risks of their OSN profiles as well as managing their privacy settings so as to keep such risks in check while still deriving the benefits of social network participation This book presents to its readers how privacy risk analysis concepts such as privacy harms and risk sources can be used to develop mechanisms for privacy scoring of user profiles and for supporting users in privacy settings management

in the context of OSNs Privacy scoring helps detect and minimize the risks due to the dissemination and use of personal data
The book also discusses many open problems in this area to encourage further research

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