



Data Mining and Machine Learning in Cybersecurity

By Sumeet Dua, Sumeet

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With the rapid advancement of information discovery techniques, machine learning and data mining continue to play a significant role in cybersecurity. Although several conferences, workshops, and journals focus on the fragmented research topics in this area, there has been no single interdisciplinary resource on past and current works and possible paths for future research in this area. This book fills this need.

From basic concepts in machine learning and data mining to advanced problems in the machine learning domain, **Data Mining and Machine Learning in Cybersecurity** provides a unified reference for specific machine learning solutions to cybersecurity problems. It supplies a foundation in cybersecurity fundamentals and surveys contemporary challenges—detailing cutting-edge machine learning and data mining techniques. It also:

- Unveils cutting-edge techniques for detecting?new attacks
- Contains in-depth discussions of machine learning solutions to detection problems
- Categorizes methods for detecting, scanning, and profiling intrusions and anomalies
- Surveys contemporary cybersecurity problems and unveils state-of-the-art machine learning and data mining solutions
- Details privacy-preserving data mining methods

This interdisciplinary resource includes technique review tables that allow for speedy access to common cybersecurity problems and associated data mining methods. Numerous illustrative figures help readers visualize the workflow of complex techniques and more than forty case studies provide a clear understanding of the design and application of data mining and machine learning techniques in cybersecurity.

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Data Mining and Machine Learning in Cybersecurity By Sumeet Dua, Sumeet Bibliography

- Rank: #637703 in eBooks

- Published on: 2011-12-19
- Released on: 2011-12-19
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Editorial Review

About the Author

Dr. Sumeet Dua is currently an upchurch endowed associate professor and the coordinator of IT research at Louisiana Tech University, Ruston, USA. He received his PhD in computer science from Louisiana State University, Baton Rouge, Louisiana.

His areas of expertise include data mining, image processing and computational decision support, pattern recognition, data warehousing, biomedical informatics, and heterogeneous distributed data integration. The National Science Foundation (NSF), the National Institutes of Health (NIH), the Air Force Research Laboratory (AFRL), the Air Force Office of Sponsored Research (AFOSR), the National Aeronautics and Space Administration (NASA), and the Louisiana Board of Regents (LA-BoR) have funded his research with over \$2.8 million. He frequently serves as a study section member (expert panelist) for the National Institutes of Health (NIH) and panelist for the National Science Foundation (NSF)/CISE Directorate. Dr. Dua has chaired several conference sessions in the area of data mining and is the program chair for the *Fifth International Conference on Information Systems, Technology, and Management* (ICISTM-2011). He has given more than 26 invited talks on data mining and its applications at international academic and industry arenas, has advised more than 25 graduate theses, and currently advises several graduate students in the discipline. Dr. Dua is a coinventor of two issued U.S. patents, has (co-)authored more than 50 publications and book chapters, and has authored or edited four books. Dr. Dua has received the Engineering and Science Foundation Award for Faculty Excellence (2006) and the Faculty Research Recognition Award (2007), has been recognized as a distinguished researcher (2004–2010) by the Louisiana Biomedical Research Network (NIH-sponsored), and has won the Outstanding Poster Award at the NIH/NCI caBIG—NCRI Informatics Joint Conference; Biomedical Informatics without Borders: From Collaboration to Implementation. Dr. Dua is a senior member of the IEEE Computer Society, a senior member of the ACM, and a member of SPIE and the American Association for Advancement of Science.

Dr. Xian Du is a research associate and postdoctoral fellow at Louisiana Tech University, Ruston, USA. He worked as a postdoctoral researcher at the Centre National de la Recherche Scientifique (CNRS) in the CREATIS Lab, Lyon, France, from 2007 to 2008 and served as a software engineer in Kikuze Solutions Pte. Ltd., Singapore, in 2006. He received his PhD from the Singapore–MIT Alliance (SMA) Programme at the National University of Singapore in 2006.

Dr. Xian Du's current research focus is on high-performance computing using machine-learning and data-mining technologies, data-mining applications for cybersecurity, software in multiple computer operational environments, and clustering theoretical research. He has broad experience in machine-learning applications in industry and academic research at high-level research institutes. During his work in the CREATIS Lab in France, he developed a 3D smooth active contour technology for knee cartilage MRI image segmentation. He led a small research and development group to develop color control plug-ins for an RGB color printer to connect to the Windows system through image processing GDI functions for Kikuze Solutions.

He helped to build an intelligent e-diagnostics system for reducing mean time to repair wire-bonding machines at National Semiconductor Ltd., Singapore (NSC). During his PhD dissertation research at the SMA, he developed an intelligent color print process control system for color printers. Dr. Du's major

research interests are machine-learning and data-mining applications, heterogeneous data integration and visualization, cybersecurity, and clustering theoretical research.

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