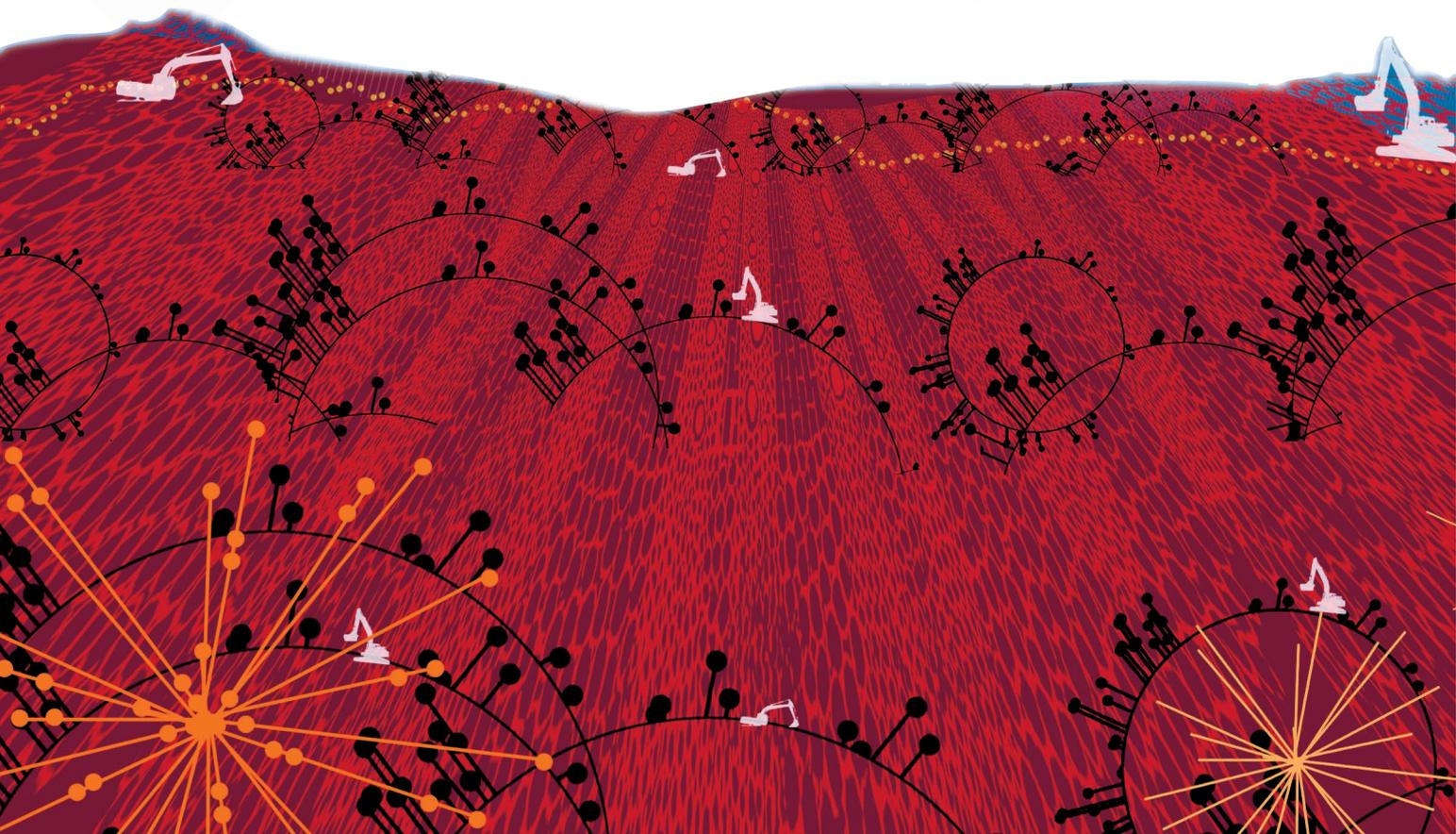# Agents and Data Mining

Longbing Cao, *University of Technology, Sydney*

Vladimir Gorodetsky, *St. Petersburg Institute for Informatics and Automation*

Pericles A. Mitkas, *Aristotle University of Thessaloniki*

Agent mining has emerged as a very promising field due to its unique contributions to complementary and innovative methodologies, techniques, and applications for complex problem-solving.

THE AUTHORS

Longbing Cao is an associate professor in the Faculty of Engineering and Information Technology at the University of Technology, Sydney (UTS), and the director of the Data Sciences & Knowledge Discovery Research Lab at the Centre for Quantum Computation and Intelligent Systems at UTS. He is also the research leader of the data mining program at the Capital Markets Cooperative Research Centre, Australia. His research interests focus on data mining, multiagent systems, behavior informatics, and the integration of agents and data mining. Cao received his PhDs in intelligence sciences and computing sciences from the Chinese Academy of Sciences and the University of Technology, Sydney. He is a senior member of the IEEE Computer Society and the IEEE Systems, Man and Cybernetics Society. Contact him at lbcao@it.uts.edu.au.

Vladimir Gorodetsky is the chief scientist at the Laboratory of Intelligent Systems at the St. Petersburg Institute for Informatics and Automation at the Russian Academy of Sciences. His research interests include multiagent systems, platforms and technology, machine learning and data mining, distributed intelligence, and peer-to-peer and ubiquitous computing. Gorodetsky received his PhD in automation control from St. Petersburg Air Force Engineering Academy. He is a member of the IEEE Computer Society and the International Society on Information Fusion. Contact him at gor@mail.iias.spb.su.

Pericles A. Mitkas is a professor of electrical and computer engineering and director of the Information Processing Laboratory at Aristotle University of Thessaloniki. He is also the associate director of the Informatics and Telematics Institute at the Center for Research and Technology—Hellas. His research interests include databases and knowledge bases, data mining, software agents, enviromatics, and bioinformatics. Mitkas received his PhD in computer engineering from Syracuse University. He is a senior member of the IEEE Computer Society. Contact him at mitkas@eng.auth.gr.

Since the middle of the 1990s, increasing numbers of researchers and research groups have engaged in the interaction and integration of agents and data mining (or simply, agent mining). This special issue describes the latest advances in this synergistic research, including both agent-driven data mining and data-mining-driven agents.

We present an overview of this emergent field in the Expert Opinion department. The article establishes a synergetic framework and discusses theoretical underpinnings, key research issues, applications, and resources for agent-mining research and development. In particular, it outlines current issues in agent-driven distributed data mining, data-mining-driven agents, and mutual issues in agents and data mining.

Three articles in this issue present findings on agent-driven data mining—namely how agents can support data mining goals, tasks, and systems.

Martin Rehák, Michal Pěchouček, Martin Grill, Jan Stiborek, Karel Bartoš, and Pavel Čeleda introduce an adaptive system for detecting attacks against computer networks and connected hosts. Their system uses intrusion detection and ensemble classification for network traffic monitoring. It employs agents to model trust, fuse data, and dynamically select the appropriate result aggregation technique to adapt to network traffic changes and support distributed cooperation by mobile agents.

Yun Xiong, Guangyong Zheng, Qing Yang, and Yangyong Zhu present the TREMAgent system in which agents support sequence-mining collaboration among transcription factors and transcription factor binding sites and provide autonomous mining of transcriptional regulatory elements.

Ning Zhong and Shinichi Motomura propose having agents implement peculiarity-oriented mining to identify unusual data in the human brain. Their approach could help provide a deeper understanding of human information-processing mechanisms.

Two articles employ data mining to enhance agent intelligence. Roger Nkambou, Philippe Fournier-Viger, and Engelbert Mephu Nguifo present an agent-based learning support system that combines sequential pattern mining with association rules to analyze students' behavior. The system then uses the identified knowledge to enhance the tutoring agents' ability to provide tailored hints.

Kyriakos Chatzidimitriou and Andreas Symeonidis designed a system that supports a trading-agent competition—that is, a supply chain management game. The system uses several data mining methods to determine auction prices.

We're grateful to Editor in Chief Emeritus Jim Hendler and current Editor in Chief Fei-Yue Wang for supporting this special issue and supervising the article review. We greatly appreciate the professional assistance of Publications Coordinator Alkenia Winston and Lead Editor Brian Brannon and thank all the authors and reviewers who helped make this special issue possible.∎