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Guest editorial

Agent-based problem solving methods in Big Data environment

Hao Lan Zhang [a,c] and Hoong Chuin Lau [b]
[a] *Center for SCDM, NIT, Zhejiang University, Ningbo City, China*
E-mail: haolan.zhang@nit.zju.edu.cn
[b] *School of Information Systems, Singapore Management University, Singapore*
E-mail: hclau@smu.edu.sg
[c] *Dept of Computing and Information Systems, The University of Melbourne, Australia*
E-mail: haolan.zhang@unimelb.edu.au

Abstract. This special issue particularly focuses on using agent-based methods to solve the complex computational problems arising in Big Data environments. It covers the recent advances in the areas of distributed problem solving, agent-based data mining, as well as recommendation systems, working with data extracted from both physical and online environments.

Keywords: Agent-based data processing, Big Data, distributed problem solving, social networks

1. Introduction

Big data is a phenomenon that takes central stage in industry and academia arising from the advent of online services and mobile applications. Improving the efficiency of data processing and analysis has become a challenging issue. While a number of methods from different communities have been proposed for solving the "Big Data" problems, AI (in particular Intelligent Systems) offers efficient mechanisms that can significantly reduce the costs of processing large volume of data and improve data processing quality. A number of emerging technologies have been introduced for processing large volume of data through utilizing multi-agent methods, which include agent-based discovery [1], agent mining [2], multi-agent decision support for e-commerce big data [3], etc.

It is difficult to extract value from data with increasing velocity and volume, particularly in distributed systems. According to McKinsey [4], the data generated from e-commerce sites and online social networks is the major source of big data in the modern society. Most of e-commerce sites and online social networks are distributed, which increase the difficulty of decision making in data extraction. The agent-based techniques consist of decision-making tools that can help to solve information overload problems [3]. Current agent-based methods for big data processing are still preliminary. Thus, this special issue is proposed to gather experts and scholars from related fields to present and share their recent research on agent-based data processing, online social networks, big data mining, and the integration of these areas.

We invited contributions from works that were presented in the Tenth Metaheuristics International Conference 2013 special session on Multi-Agent Distributed Problem Solving as well as the IEEE/WIC/ACM International Conference on Intelligent Agent Technology 2012. Out of nine submissions received, we put together a collection of four full-length original research papers after two rounds of rigorous review processes involving at least three referees. We wish to express our sincere appreciation to those who have contributed to the completion of this special issue. In particular, we are indebted to our referees who provided prompt and extensive reviews. We also wish to

thank the Editor-in-Chief Professor Jiming Liu, for his advice and support; and to Professor Yuefeng Li for his help in processing the editorial. Last but not least, we would like to thank the authors who submitted their works to this special issue.

A summary of the four papers in this special issue is given as follows. In "Multi-Agent Orienteering Problem with Time-Dependent Capacity Constraints", Chen, Cheng and Lau [5] formulate and propose what they deem to be the first attempt at an efficient and effective equilibrium-seeking procedure for the Multi-agent Orienteering Problem with Time-dependent Capacity Constraints. In "Scalable Approximating SVD Algorithm for Recommender Systems" paper, Zhou, He, Huang and Zhang [6] present an approximate Singular Value Decomposition algorithm, and show that their approach provides the best prediction quality on the MovieLens and Flixster datasets when compared with existing approaches. In "Detecting Cyberbullying in Social Networks using Multi-Agent System", Nahar, Li, Zhang and Pang [7] introduce a novel multi-agent approach that automatically detects cyberbullying activities on social networks where labeled data is not readily available. Finally, in "Web Usage Mining Based Recommender Systems Using Implicit Heterogeneous Data", Alam, Dobbie, Koh and Riddle [8] present a hierarchical Particle Swarm Optimization (PSO) based clustering approach (HPSO-clustering) for building a recommender system based on implicit web usage data, which mimics multi-agent properties of the particles of a swarm.

The papers in this issue illustrate some of the current research areas pertinent to agent-based data processing and mining, online social network computing; while also amplify the emerging challenges in big data environment, which remain to be addressed.

2. Guest editors

Hao Lan Zhang is currently an Associate Professor at NIT, Zhejiang University in China and the 151 Talented Scholar of Zhejiang Province. He is an adjunct Professor at Hebei Academy of Science, China. Prior to that, he was a Research Fellow at RMIT University, Australia. Dr. Zhang received the Ph.D. in Computer Science from Victoria University, Australia. He has published over fifty papers in refereed journals and conferences. His research interests include Intelligent Information Systems, Multiagent Systems, Health Informatics, Knowledge-based Systems, Data Mining, etc. Dr. Zhang serves as the editorial board member and reviewer of several journals including: Information Sciences, Fundamenta Informaticae, IEEE Transaction on SCM, WWW Journal, Journal of AAMAS. He serves as publicity chair and program committee member of several conferences such as WISE 2013, KSS 2013, MIC 2013, WI-IAT 2012, APWeb 2012, Australian AI Conference 2010/2009, etc.

Dr. Zhang received a number of research awards and grants including: National Nature Science Fund, National Overseas Scholars Fund, Provincial Natural and Social Science Fund, Ningbo Nature Science Fund, etc. He is the Editor-in-Chief of Advances in Information Sciences, Guest editor of Web Intelligence and Agent Systems, Journal of Internet Technology, Journal of Software, etc.

Hoong Chuin LAU is Professor of Information Systems and Deputy Director of the Living Analytics Research Centre at the Singapore Management University. Prior to joining SMU, he was a research scientist at the Institute of Inforcomm Research in Singapore (1997–1999), and assistant professor at the School of Computing, National University of Singapore (2000–2005).

His research in the interface of Artificial Intelligence and Operations Research has been widely applied to decision support and optimization, and has contributed to advances of algorithms and applications to a variety of complex resource planning and scheduling problems in logistics, transportation, tourism and health-care. At SMU, he was awarded the Lee Kwan Yew Research Fellowship for research excellence in 2008. He currently serves on the editorial board of the IEEE Transactions on Automation Science and Engineering.

He has been involved in consulting projects in logistics and transportation, for companies such as DHL, Bax Global, PSA, EADS, ST Dynamics, and various government agencies. He is a chartered member of the Chartered Institute of Logistics and Transportation, and currently serves on the CILT (Singapore) board of directors. For his work with the Singapore Ministry of Defense, he won the National Innovation and Quality

Convention Star Award in 2006, and was nominated for the prestigious Defense Technology Prize (individual category) in 2007. A recipient of two Singapore government scholarships, Hoong Chuin obtained his Doctorate of Engineering degree in Computer Science from the Tokyo Institute of Technology (Japan) in 1996, and BSc and MSc degrees in Computer Science from the University of Minnesota (Minneapolis).

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