Editorial

Introduction to the Special Issue on AI for Disaster Management and Resilience

Yu-Ru Lin
University of Pittsburgh

Carlos Castillo
Universitat Pompeu Fabra

Jie Yin
The University of Sydney

In recent decades, large-scale crises such as natural disasters, armed attacks, and multiple types of security threats of various levels have had major impact on individual lives as well as societal or organizational infrastructures and have caused significant destruction to communities. Communication technologies, including social media and other information systems, have been used during these emergency situations. In particular, during mass emergencies, victims, responders, and volunteers increasingly use social media and mobile devices to provide real-time situation updates, e.g., reports on damage, or requests and offers for help. This has generated vast volumes of crisis data in different forms and from different sources.

There are a number of challenges associated with the goal of timely processing vast volumes of information in a way that makes sense for people directly affected, for volunteer organizations, and for official emergency response agencies and the society at large. These range from processing large-scale crisis data to see the "big picture" of an emergency, detecting and predicting how a disaster could develop, analyzing the impact of disasters and the effect of negative externalities in a cyber-physical society, to assisting in disaster response and resource allocation. There is a vital need for developing new intelligence techniques to address these challenges, to allow better preparation for emergency situations, help save lives and reduce loss, limit economic impact, provide effective disaster relief, and make communities stronger and more resilient.

The aim of this special issue is to provide a forum on the burgeoning topic of artificial intelligence (AI) for disaster management and resilience. We have invited researchers to contribute original research articles that stimulate and advance the ongoing effort that leverage AI to strengthen disaster management and resilience at all levels of society in the new age of mass emergencies. The open call for this special issue attracted 17 submissions covering a wide range of AI technologies and applications in the related area. After two rounds of peer-reviews by a team of experts, three articles were selected to be included in this special issue. The accepted papers showcase some of the recent developments and novel applications under the theme of this special issue.

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The article "Using social media to detect socio-economic disaster recovery," by Yuya Shibuya and Hideyuki Tanaka, contributes to extracting actionable insights from crisis data to support decision making in the recovery phase. This work explored possible first steps in the development of an AI-based method for detecting socio-economic recovery by examining the correlations between public sentiments on social media and the socio-economic recovery activities. The analysis used two social media datasets (Twitter posts and Facebook pages) and considered the differences between the sentiment expressions posted by two groups of people: those who were local to the disaster-stricken area and those who were not. The study compared public sentiment scores and peoples' activities as reflected in used-car market data over two-week periods within six months after the Great East Japan Earthquake and Tsunami of 2011. The study results, showing multiple correlations between the locals' sentiment on social media and socio-economic recovery activities as daily routines restart, interesting suggesting that public sentiment of those not local to the disaster can also be useful to detect socio-economic recovery activities. This study provides a recommendation on what kind of social media communication would be useful to detect and predict recovery activities, which offers insight into developing an AI-based method to improve situational awareness for detecting socio-economic recovery activities.

The article "A data-analytics approach for enterprise resilience," by Donna Xu, Ivor W. Tsang, Eng K. Chew, Cosimo Siclari, and Varun Kaul, contributes to emergency- or disaster-related data mining and knowledge management methodologies to support enterprise resilience. In this domain, the traditional expert-centric approach used to prevent business services from disruptions has difficulty to maintain continued critical business functions as typically, the disasters can only be handled after their occurrence. This work introduced a data-driven analytics approach, which leverages system monitoring data with an intelligent business analytics system to detect the potential disruptions proactively, and to assist the operational team for enterprise resilience enhancement. The challenges of proactive analytics, extreme class imbalance, and noisy ordinal labels imposed by the real enterprise system monitoring dataset were discussed.

The article "Relevancy identification across language and crisis types," by Prashant Khare, Grégoire Burel, and Harith Alani, contributes to harnessing big data from the Web or Social Web to facilitate disaster and risk management. In crisis situations, getting the right information in the right time is vital for more effective decision making and humanitarian missions. The prevailing use of social media during crises raises the challenge of how to quickly determine which information is truly relevant to the crisis, and which should be filtered out. Existing automated machine learning models are usually trained on information about particular types of crises, written in specific languages, thus are not well adaptive to other crises and languages. This article presents an approach to automatically identify which Twitter posts are relevant to crises, and which ones are not. The approach was developed to be agnostic to the type of crises and to the languages of the Tweets. The proposed approach involves combining different techniques, such as using knowledge graphs to enrich the data with semantic information, translating the data using automated machine translation tools, and extracting statistical features to train machine learning classifiers. A comprehensive evaluation study demonstrated the ability of the proposed approach in supporting different types of crises and various languages of the Tweets.

The three articles illustrate the diverse range of AI technologies in the field of disaster management and resilience. We would like to thank the Editor-in-Chief, Professor Venkatramanan Subrahmanian for his great support for this special issue. Our special thanks go to all editorial staff for their valuable and prompt support throughout the preparation and publication of this special issue. We would like to thank all authors for their contributions to this special issue, and all reviewers for their great efforts to ensure the high quality of accepted papers.

Yu-Ru Lin is an Associate Professor with the School of Computing and Information, University of Pittsburgh. She researches on the interaction of computational social science, data mining, and

visualization. She specializes in using networked and text data along with statistical learning tools and social theories to study phenomena spanning societal events and policy, opinion dynamics, anomalous behaviors, and other complex patterns concerning collective attention and actions, as well as human and social dynamics in response to societal risks. Contact her at: http://www.yurulin.com/.

Carlos Castillo is a Distinguished Research Professor with Universitat Pompeu Fabra, Barcelona, where he leads the Web Science and Social Computing research group. He is a web miner with a background on information retrieval, and has been influential in the areas of crisis informatics, web content quality and credibility, and adversarial web search. He is a prolific, highly cited researcher who has coauthored more than 80 publications in top-tier international conferences and journals, receiving a test-of-time award, four best paper awards, and two best student paper awards. His works include a book on big crisis data, as well as monographs on information and influence propagation, and adversarial web search. Contact him at: http://www.chato.cl/research/.

Jie Yin is a Senior Lecturer with the Discipline of Business Analytics, The University of Sydney, Australia. Her research interests include data mining, machine learning, and their applications to text mining, network analytics, health informatics, and decision support systems. She has authored or coauthored more than 60 refereed journal and conference papers and served as the PC of major conferences including KDD, ICDM, CIKM, AAAI, IJCAI, etc., in these areas. She is a Co-Chair of the International Workshop on Social Web for Disaster Management (SWDM 2015, 2016, and 2018). She received the Ph.D. degree in computer science from the Hong Kong University of Science and Technology, Hong Kong. Contact her at: https://business.sydney.edu.au/staff/jie.yin.