Editorial Preface

Living in cities is becoming increasingly attractive for many people around the world. According to the United Nations, more than 3.8 billion or 53.6 % of the world's population were living in urban agglomerations in 2014. Especially from an ecological point of view, cities are a central issue for the future. Cities consume enormous amounts of energy, raw materials, and space, additionally producing tons of waste and hazardous materials, while many places suffer from congestion, traffic jams, crime, etc.

Today's cities are using systems and infrastructure that are partly based on outdated technologies, making them unsustainable, inflexible, inefficient, and difficult to change. In addition, the increasing pace of urbanization and transformation of the cities challenges traditional approaches for urban system forecasting, policy, and decision-making even further. In order to solve these challenges, we have to understand cities as hyper-complex interdependent systems that, with their interconnected layers and subsystems, cannot be efficiently understood separately from one another, but form a complex interdependent system of infrastructural, economic, and social components that require a holistic system model.

On the other hand, modern challenges in complex urban system studies come together with new unprecedented opportunities, such as digital sensing. The technological revolution resulted in the broad penetration of digital technologies in the everyday life of people and cities, creating big data records of human behavior. Also, recent advances in network science allow for deeper interactions between people, companies, and urban infrastructure from the new complex network perspective.

There is already a modern trend in urban planning to use the data that are available to improve quality of life, reduce costs, and objectify planning decisions. This is especially true for many cities — like Chicago or New York — which have begun to roll out urban sensor data for managing the city. Data, analytics, and technology are therefore the keys to making these data not only accessible, but to gain meaningful insights into urban systems to understand the city, allow evidence-based decisions, and create sustainable solutions and innovations improving the quality of urban life.

However, the high complexity of modern urban systems creates a challenge for the data and analytic methods used to study them, calling for newer approaches that are more unified, robust, and efficient.

The goal of this proposed special issue is to delineate important research milestones and challenges of big data-driven studies of the complex urban systems, discussing applicable data sources, methodology, and their current limitations.

This special issue contains 12 papers that contribute in-depth research of the subject. The results of these papers were presented at the symposium Big Data and Technology for Complex Urban Systems held during the 49th Hawaii International Conference in System Sciences on January 5, 2016.

The first contribution is "Brazilians Divided: Political Protests as Told by Twitter" by Souza Carvalho et al. This paper presents two learning algorithms to classify tweets

in Twitter for an exploratory analysis so as to acquire insights of the inner divisions and their dynamics in the pro- and anti-government protests in the Brazilian presidential election campaign in 2014. The results show that there are slightly different behaviors from both sides, in which the pro-government users criticized the opposing arguments prior to the event, whereas the group against the government generated attacks during different times, as a response to supporters of the government.

Next, the second contribution "Sake Selection Support Application for Countryside Tourism" by Iijamai et al. discusses a study to investigate a way of attracting foreign tourists to participate in "Sake Brewery Tours" for the Tokyo Olympic Paralympic Games in 2020. This paper demonstrates a related application to engage foreign tourists who are not originally interested in sake.

The following contribution by Kalisch et al. is "A Holistic Approach to Understand Urban Complexity" and gives an introduction to the interdependent complexity of urban systems, addressing necessity for research in this field. Based on an industry-funded qualitative research project, the paper outlines a holistic approach to understanding urban complexity. The goal of this project was to understand the city in a holistic way, applying the approach of system engineering to the field of urban development, as well as to identify the key factors needed to redesign existing and newly emerging cities in a more sustainable way. The authors describe the approach and share a summary of a case study analysis of New York City.

The contribution entitled "Real-Time Data Collection and Processing of Utility Customer's Power Usage for Improved Demand Response Control," by Shawyun Sariri et al., investigates potential demand response solutions that provide cost-effective alternatives to high priced spinning reserves and energy storage. The context of the study focuses on the implementation of a pilot program, which aids in the understanding of large data collection in dense urban environments. Understanding the power consumption behavior of a consumer is key in implementing efficient demand response programs. Factors affecting large data collection such as infrastructure, data storage, and security are also explored.

The paper "Development of a Measurement Scale for User Satisfaction with E-Tax Systems in Australia" by A. Alghamdi and M. Rahim explores satisfaction of e-government systems in general and e-tax systems in particular. The paper develops a satisfaction construct of such e-tax systems and evaluates the approach in two steps. The conceptual model construct is being evaluated by an expert panel, and there is also a pilot evaluation of the survey instrument developed based on that model. The authors present the first overview of factors that are important for user satisfaction with e-tax systems.

The next two papers focus on the creation of open government data (OGD) resources. The first OGD contribution, entitled "Data-Driven Governments: Creating Value Through Open Government Data" by Judie Attard et al., explores existing processes of value creation on government data. The paper identifies the dimensions that impact, or are impacted by, value creation and distinguishes between the different value-creating roles and participating stakeholders. The authors propose the use of linked data as an approach to enhance the value creation process and provide a value creation assessment framework to analyze the resulting impact. They also implement the assessment framework to evaluate two government data portals.

The second OGD contribution, entitled "Collaborative Construction of an Open Official Gazette" by Gisele S. Craveiro et al., aims at describing the strategies adopted for preparing the implementation of an open official gazette at the municipal level. The proposed approach is a combination of bibliographical review, documentary research, and direct observation. The paper also describes the strategies and activities put into effect by a public body and an academic group in preparing the implementation of the open official gazette and analyzes the outcomes of these strategies and activities by examining the tool implemented, the traffic, and the reported uses of the open Gazette.

The next contribution, entitled "A Solution to Visualize Open Urban Data for Illegally Parked Bicycles" by Shusaku Egami et al., presents a crowd-powered open data solution for the illegal parking of bicycles in urban areas. This study proposes an ecosystem that generates open urban data in link data format by socially collecting the data, complementing the missing data, and then visualizing the data to facilitate and raise social awareness about the problem.

The contribution, entitled "An Intelligent Hot-Desking Model Based on Occupancy Sensor Data and Its Potential for Social Impact" by Konstantinos Maraslis et al., proposes a model that utilizes occupancy sensor data in a commercial hot-desking environments. The authors show that sensor data can be used to facilitate office resource management with results that outweigh the costs of occupancy detection. The paper shows that the desk utilization can be optimized based on quality occupancy data and also demonstrates the effectiveness of the model by comparing it with a theoretically ideal, but impractical real-life model.

The following contribution, "Characterization of Behavioral Patterns Exploiting Description of Geographical Areas" by Zolzaya Dashdorj et al., investigates relationships existing between human behavior measured through mobile phone data records on one hand, and location context, measured through the presence of points of interest of different categories, on the other. Advanced machine-learning techniques are used to predict a timeline type of communication activity in a given location based on the knowledge of its context, and it is demonstrated that the classification based on point-of-interest data has additional predictive power compared with the official data, such as the land use classification.

The contribution "Analysis of Customers' Spatial Distribution Through Transaction Datasets" by Yuji Yoshimura et al. studies people's consumption behavior and specifically customer mobility between retail stores, using a large-scale anonymized dataset of bank card transactions in Spain. Various spatial patterns of customer behavior are discovered, including spatial distributions of customer activity with respect to the distance from the considered store.

The last contribution, "Case Studies for Data-Driven Emergency Management/Planning in Complex Urban Systems" by Kun Xie et al., considers five related case studies within the New York/New Jersey metropolitan area in order to present a comprehensive overview on how to use big urban data (including traffic operations, incidents, geographical and socio economic characteristics, and evacuee behavior) to obtain innovative solutions for emergency management and planning, in the context of

complex urban systems. Useful insights are obtained from the data for essential tasks of emergency management and planning such as evacuation demand estimation, determination of evacuation zones, evacuation planning, and resilience assessment.

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