



Social media mining for smart cities and smart villages research

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Abstract

The imperative of well-being and improved quality of life in smart cities context can only be attained if the smart services, so central to the concept of smart cities, correspond with the needs, expectations and skills of cities' inhabitants. Considering that social media generate and/or open real-time entry points to vast amounts of data pertinent to well-being and quality of life, such as citizens' expectations, opinions, as well as to recent developments related to regulatory frameworks, debates, political decisions and policymaking, the big question is how to exploit the potential inherent in social media and use it to enhance the value added smart cities generate. Social mining is traditionally understood as the process of representing, analyzing, and extracting actionable patterns and trends from raw social media data. In the context of smart cities, this special issue focuses on how social media data, also potentially combined with other data, can be used to optimize the efficiency of city operations and services, and thereby contribute more efficiently to citizens' well-being and quality of life.

Keywords Soft computing · Smart cities · Smart villages · Social media mining · Well-being · Quality of life

1 Introduction

Research on smart cities is maturing, and new interdisciplinary approaches to the study of smart cities are being proposed (Visvizi and Lytras 2018). Social mining in smart cities and smart villages research is a one such new emerging research area. This special issue covers social mining in smart cities and smart villages from various perspectives.

The objective of this special issue is to shed light on recent advances in social mining and, considering, the growing dynamics of social media interaction, to seize the opportunity and to tap to the potential inherent in social

media. By so doing, the Editors of this Special Issue seek to encourage out-of-the box debate on how to make smart cities 'smarter,' i.e., more responsive to the needs and expectations of cities' inhabitants and more usable by them. As regulatory frameworks and policymaking strategies are key to the development of the context in which smart cities' can become 'smarter,' this Special Issue seeks also interdisciplinary approaches that bring together soft computing, smart cities research and regulatory/policy-making considerations.

Soft computing refers to a way of solving problems in a similar way to humans that are often imprecise but more effective than precise approaches, such as, conventional hard computing. Soft computing developed to complement precise and accurate hard computing approaches (Zadeh 1998). In contrast to hard computing, soft computing is tolerant of imprecision, uncertainty and partial truth (Zadeh 1994). However, Zadeh (1998) also points out that soft computing should be considered complementary and symbiotic rather than competitive and exclusive to hard computing approaches. The primary purpose of soft computing is to offer construct for modeling of imprecise and uncertain information by using approximate reasoning techniques to provide efficient and low-cost solutions (Mitra et al. 2002).

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Soft computing methodologies include fuzzy logic, neurocomputing, evolutionary computing and probabilistic computing (Zadeh 1998). Chaos theory tools and methodologies (Azar and Vaidyanathan 2016) overlap soft computing methodologies, and some authors (e.g., Gupta et al. 2020) also include them under the umbrella of soft computing. Fuzzy sets (Zadeh 1965) offer capabilities to deal with uncertain information, whereas rough sets (Pawlak 2012) and neural networks (Hornik et al. 1989) are used for extracting rules from the data and for classification tasks. Evolutionary computing refers to a family of algorithms that are inspired by biological evolution, such as genetic algorithms (Holland 1975), self-organizing maps (Kohonen 1997), swarm intelligence (Christian and Daniel 2008), etc. Evolutionary computing approaches are primarily used in optimization, for instance, genetic algorithms (Flockhart et al. 1996) are used in optimization tasks like query optimization and template selection (Mitra et al. 2002).

Soft computing methodologies, especially fuzzy logic, neural networks and genetic algorithms can be seen already quite established in many disciplines (Zadeh 1996; Lotfi and Garibaldi 2013); however, their application in social mining is relatively recent research area with still very few studies. Fuzzy granular theory has been used, for instance, for identifying fuzzy-rough communities (Pal et al. 2014; Kundu and Pal 2015a, b). Fuzzy social network analysis has been explored in Nair and Sarasamma (2007). In addition, fuzzy logic has also been explored for opinion mining (Bing and Chan 2014), for handling the uncertainty in sentiment analysis of big social data (Mukkamala et al. 2013; Mukkamala et al. 2014) and social set analysis of corporate social media crises on Facebook (Mukkamala et al. 2015; Jussila et al. 2017).

Topics of interest of the Special Issue include but not limited to:

- The use of soft computing approaches to extract actionable patterns and trends from social media to improve services and services' delivery to citizens
- Soft computing supporting crowdsourcing,
- Soft computing supporting civic engagement
- Soft computing in detecting trends in infrastructure and asset utilization and failures
- Novel methods for supporting smart city planning, design and construction
- Leveraging social media and internet of things (IoT) data to solve challenges specific to cities and urban areas
- Soft computing approaches to improve sustainability of smart cities
- Regulatory frameworks and social mining in the smart cities context
- Best practices

2 Overview of the special issue

The emerging domain of social computing for smart cities research is a dynamic multi-disciplinary area for theoretical and applied research. Disciplines including computer science and social sciences as well as sophisticated information processing capabilities provide a variety of innovative propositions for value adding services and platforms. In the wide range of theoretical considerations and computational intelligence, the following are some of the key aspects that were covered in our special issue:

2.1 Concepts and ideas explored

- Soft computing methods and algorithms
- Relation extraction of named entities in social media
- Cyberbullying and Violence detection over social media
- Question and Answering platforms
- Social media dynamics and User Similarities
- Social Trust
- Cultural identity
- Public sentiment and political situation analysis

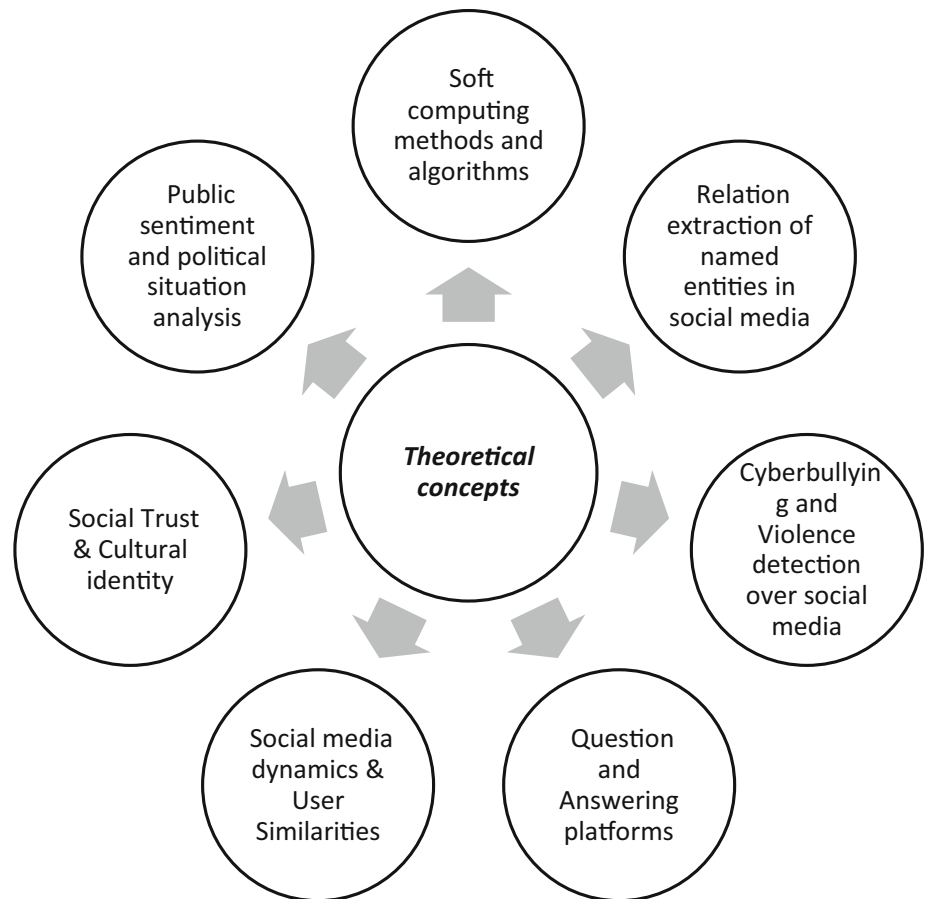
The previous list is not exhaustive. Many other ideas and concepts are included in the theoretical domain of social mining for smart cities research. The recent pandemic for example of covid-19 is a good example on how the social mining can guide significant advanced data mining for high social value impact. The capacity of social mining to design and implement big data information processing provides a new fertile ground for sophisticated decision making. In a recent paper, AI-Youbi et al. (2020) analyze the impact of social mining for pandemic framework (Fig. 1).

2.2 Computational intelligence and services

The applied social mining research for smart cities and smart villages integrates multiple computational methods, including machine learning, semantic web and ontologies, soft computing methods, fuzzy logic, neural networks and advanced big data and analytics approaches. The following is an indicative and not exhaustive list.

- Soft computing methods and algorithms
- Simulation environments
- Formal modelling of OWL ontologies
- Artificial Intelligence innovations
- Altmetrics, Analytics and Key performance indicators for Social Computing
- Deep graph convolutional networks
- Machine learning algorithms

Fig. 1 Theoretical concepts and ideas explored



In Fig. 2, below, we provide a very abstract visualization for this context. It is our belief that in the near future social computing, and mining will evolve further as a key pillar for sustainability through data science.

In section below, we summarize the accepted papers.

2.3 List of accepted papers

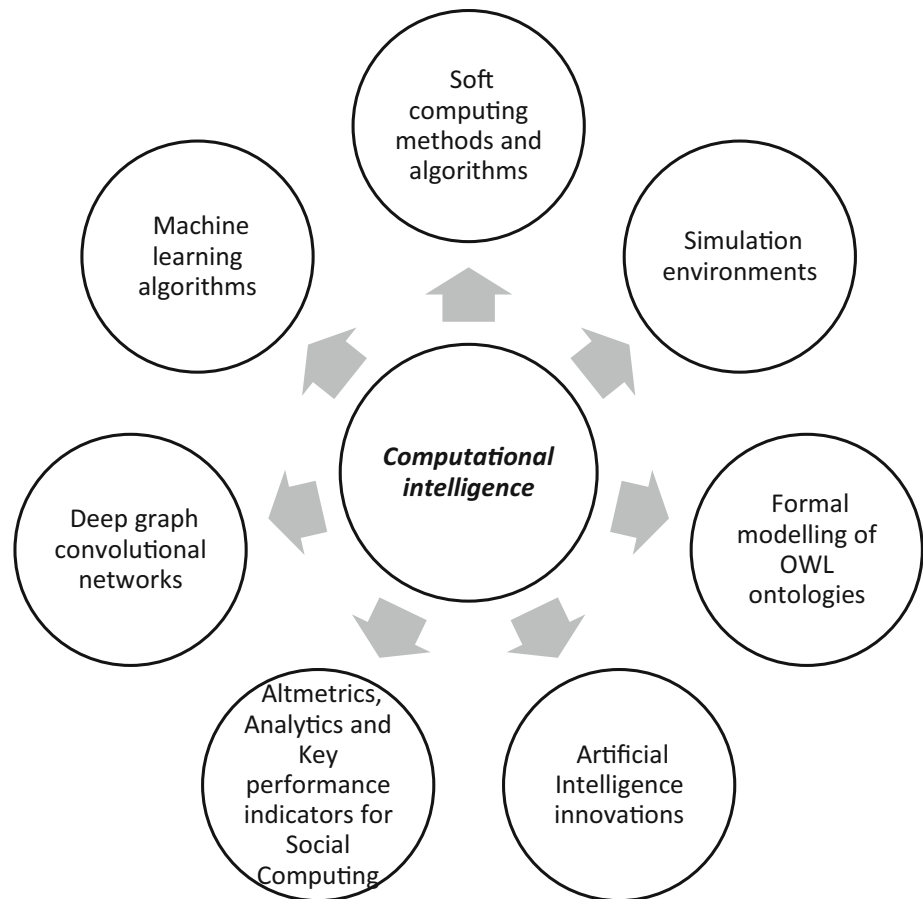
- A soft computing approach to violence detection in social media for smart cities
- Research on relation extraction of named entity on social media in smart cities
- K-OpenAnswer: a simulation environment to analyze the dynamics of massive open online courses in smart cities
- Formal modelling of OWL ontologies-based requirements for the development of safe and secure smart city systems
- Unifying user similarity and social trust to generate powerful recommendations for smart cities using collaborating filtering-based recommender systems
- Towards Cyberbullying-free social media in smart cities: a unified multi-modal approach

- Quantification of cultural identity through artificial intelligence: a case study on the Waorani Amazonian ethnicity
- Bot prediction on social networks of Twitter in altmetrics using deep graph convolutional networks
- Predicting the helpfulness score of online reviews using convolutional neural network
- Predicting stock market trends using machine learning algorithms via public sentiment and political situation analysis

3 Conclusions

The domain of social mining for smart cities and smart villages research is a very dynamic research domain. Soon given the increased contributions of humans and businesses to diverse social media, the social mining ecosystem will increase significantly both in terms of available data and applications. Furthermore, the continuous discussion for the social impact of social impact of big data (Lytras and Visvizi 2019) will lead to more sophisticated social mining platforms for analyzing the social impact of big data applications and services. In this direction, the

Fig. 2 Computational intelligence and services



management of microcontents over social media will require annotation services capable of understanding similarities and identities (Alkmanash et al. (2019), Visvizi et al. (2020)).

On of the key conclusions of this special issue is that Future smart cities research (Lytras et al. 2020) will have a dominant social mining and social computing component.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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