

# Extracting social and community intelligence from digital footprints

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## 1 Introduction

As a result of the recent explosion of sensor-equipped mobile phone market, the phenomenal growth of Internet and social network users, and the large deployment of sensor network in public facilities and outdoor environments, the “digital footprints” left by people while interacting with cyber-physical spaces are accumulating with unprecedented breadth, depth, and scale. The technology trend towards pervasive sensing and large-scale social and community computing is making “social and community intelligence (SCI)” (Zhang et al. 2011), a new research area that aims at mining the “digital footprints” to reveal the patterns of individual/group behaviours, social interactions, and community dynamics (e.g., city hot spots, traffic jams). It is believed that the SCI technology has the potential to revolutionize the field of context-aware computing, will transform the understandings of our lives, organizations and societies, and enable completely innovative services in areas like human health, public safety, city resource management, and environment monitoring.

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The unique characteristics of this new SCI area brings many new research issues, ranging from semantic infrastructure, human-centric sensing (Campbell et al. 2008), heterogeneous data management, social behaviour analysis (Eagle et al. 2007), community mining, big data processing (Reshef et al. 2011), to complex intelligence inference and trust/privacy issues. All these motivate us to organize this special issue.

## 2 Papers in this SI

This special issue strives to foster state-of-the-art research pertaining to SCI, including theoretical studies, practical issues, emerging technologies and innovative applications. Submissions to this special issue come from invited papers, open call for papers, as well as selected papers presented at the First International Symposium on Social and Community Intelligence (SCI-11, in conjunction with UbiComp 2011) held at Beijing, China on September 18, 2011 (Guo et al. 2011). We received a total of 11 submissions, including three invited papers and eight regular submissions. A large number of reviewers assisted us in the review process. In order to ensure high reviewing standards, three to four reviewers evaluated each paper. Six papers (three are regular submissions) were selected after the two-round review process. The six selected papers fall into three main research topics of SCI: three are about social interaction analysis, two about community mining, and one about human activity recognition.

In the opening paper of this special issue, “Inferring User Similarity from Semantic Location History”, Xiangye Xiao et al. propose an approach to measure the similarity between users according to their GPS trajectories collected from GPS-equipped devices. Different from previous

studies that directly match users' physical locations, the new approach models a user's GPS trajectories at the semantic level (from raw GPS coordinates to the semantic meanings, such as shopping malls, restaurants). This approach can estimate the similarity between two users without overlaps in geographic spaces, e.g., people living in different cities. The measured user similarity bridges the gap between the physical world and the virtual world, and enables friend and location recommendation in location-based social networks.

The second paper, "An Enhanced Community-based Mobility Model for Distributed Mobile Social Networks", authored by Nikolaos Vastardis and Kun Yang addresses the problem of validation model design for mobile social networks. Existing community-based mobility models are proved to be unable to capture the characteristics of human mobility. This paper, however, presents the Enhanced Community Mobility Model (ECMM), which introduces several new features lacking in existing models, such as pause periods and group mobility encouragement. The improved model is validated by comparing a number of real traces and the synthetic traces generated by ECMM and other community-based models.

In "Improving Tag-Based Recommendation with the Collaborative Value of Wiki Pages for Knowledge Sharing", Frederico Durao and Peter Dolog investigate the potential of wiki technology as a tool for knowledge sharing in corporate wikis, in the context of tag-based recommendation. The proposed recommendation algorithm emphasizes the collaborative value of wiki pages, which refers to the social interactions among users in wiki editing, commenting, and tagging activities. The experiments with 63 subjects show that the improved recommendation algorithm can enhance the problem solving capacity in organizations. Further experiments with ten professionals from software companies indicate that this method is promising and is capable to boot teamwork.

In the fourth paper, "Effective Social Relationship Measurement Approach based on User Trajectory Analysis", Chao Ma et al. propose a novel approach for measuring social relationship among users. Different from previous studies that mainly predict the existence of social relationships based on cyber interactions, the hierarchical entropy-based relationship measurement approach (HERMA) can additionally measure the strength of social relationships, leveraging user trajectories in the physical world. Two new concepts called user entropy and area entropy are adopted by HERMA to quantify the activeness degree of a user and the openness degree of an area. Evaluation of HERMA are based on simulations. The simulation results reveal that HERMA is capable of effectively measuring the strength of social relationships.

In the fifth paper, "Micro-blog in China: Identify Influential Users and Automatically Classify Posts on Sina Micro-blog", Xinmiao Wu and Jianming Wang make an in-depth study of micro-blogging services in China. Two major contributions are made. First, a new framework is proposed to identify influential users from micro-blogging services. It differs from other existing frameworks in the way that it is more dynamic and stable by considering the user's followers' behavioral characteristics. Second, using Naïve Bayes classifier as the main engine, the authors were able to categorize micro-blog posts into eight groups with high accuracy. Several interesting characteristics of micro-blogging services in China are also identified and analyzed.

The last paper, "High Accuracy with Low Calculation Environmental Background Sounds Recognition for Human Activities Detection", authored by Yi Zhan and Tadahiro Kuroda, addresses human activity recognition using environmental background sounds collected from wearable devices. Sound-based human activity recognition suffers from two major issues: limited computation resources and strict power consumption requirements. In this paper, a novel method for recognizing environmental background sounds on the wearable sensor is proposed, where a Haar-like sound feature is used for sound classification. Experimental results with 22 typical human activities show that the new algorithm can achieve a high recognition accuracy of 96.9 %.

In concluding this overview, we would like to address our special thanks to Prof. Vincenzo Loia, the Editor-in-Chief, for his great support and effort throughout the whole publication process of this special issue. We are also grateful to all the authors for submitting their papers and the reviewers for their professional and timely work in making it possible to publish this special issue. We hope that you, the reader, find this special issue an enjoyable mix and a spotlight on new themes emerging in the area of Social and Community Intelligence.

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