Pervasive Analytics and Citizen Science

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Data is all around us—thanks to sensors in everything from personal mobile devices to smart buildings and vehicles to the environment and its infrastructure. In recent years, we've seen growing interest in gathering and analyzing data from a wide range of devices. The novelty of this effort lies in the sheer quantity and fidelity of data that can be gathered, as well as the range of disciplines such data can affect—including social science, urban planning, civil engineering, healthcare, government services, and environmental science.

Exploring Pervasive Analytics

While these data collection and analysis methods are rapidly emerging in our computing culture, significant open research questions remain. What data should be collected and for whom? Through what sensors or user actions? How will we use and act on this data—as individuals and communities? What role will social media play in coordinating our relationship with this data? How will we interact with and experience this data—personally and collectively?

New technologies, novel data feeds, and citizen measurements could greatly influence urban planning, environmental monitoring, transportation, human mobility, traffic, economic disparities, energy consumption, and civic government. It's also important to consider how such technology and its data can promote civic engagement, activism, grassroots campaigns, social relationships, and a deeper sense of community.

The aim of this special issue is to explore critical elements of the overall design, user experience, and resulting solutions related to using pervasive computing technologies to inform our understanding of the dynamics of ourselves and our ecosystem, community, and urban landscapes. This issue not only explores these technologies but also reviews practical solutions for improving citizens' health, wellbeing, and everyday lives. Careful attention is also paid to the interplay of social media within this landscape of pervasive analytics and citizen science.

In this Issue

In "Taking Participatory Citizen Science to Extremes," Matthias Stevens, Michalis Vitos, Julia Altenbuchner, Gillian Conquest, Jerome Lewis, and Muki Haklay introduce us to the Extreme Citizen Science (ExCiteS) group, which is exploring data gathering, analysis, and actions based on that analysis. In particular, their work focuses on developing countries, where no other formal debates about sustainability or other pressing community issues are taking place. ExCiteS has explored Android-based recording systems to let indigenous people track logging and poaching activities on their land and plan coordinated responses to those activities.

In "Mining Urban Deprivation from Foursquare: Implicit Crowdsourcing of City Land Use," Daniele Quercia and Diego Saez show that location-based social media data can be used to infer the level of deprivation of different parts of a city. Coded locations in the city data, such as "burger joints" and "tea rooms," are strongly related with levels of deprivation, and predictions with data that users typically provide are shown to have similar accuracy to professionally generated maps. This method was used in a major city where high-quality maps are available but opens the door to mapping neighborhood deprivation in poorer countries, where this information could have a high impact for urban planning and emergency resources.

In "Mining Private Information from Public Data: The Transantiago Case," Jorge Bahamonde, Alejandro Hevia, Giselle Font, Javier Bustos-Jiménez, and Camila Montero study what kinds of private information can be inferred from simple smart cards—that is, the "Bip" cards used for public transportation in Santiago, Chile. They show that the transit histories on these cards, along with some clever inference methods, can be used to guess a user's home address about half the time. This article shows that even "low-tech" pervasive computing introduces new and unexpected privacy risks.

In "Public Goods: Using Pervasive Computing to Inspire Grassroots Activism," Alice Angus, Giles Lane, and George Roussos chronicle the works of the Proboscis Art Studio, where critical and reflective technologies are created in collaboration with local citizens. These technologies are intended as a shared public good (such as a communal memory) and often involve the collection of data about pollution and inequities in economic development. The studio also creates "codiscovery experiences" in towns and villages, making environmental topics more visible as the subject of open-ended activities and discussions.

We hope you enjoy the articles in this special issue! [P]

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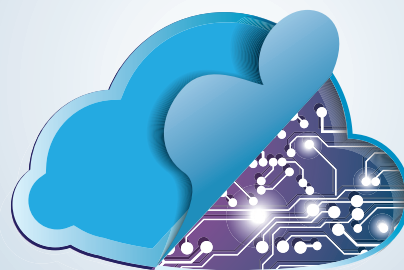
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