Environmental Engineering and Management Journal

September 2015, Vol.14, No. 9, 2095-2102
http://omicron.ch.tuiasi.ro/EEMJ/

"Gheorghe Asachi" Technical University of Iasi, Romania

DATA SCIENCE AND ENVIRONMENTAL MANAGEMENT IN SMART CITIES

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Abstract

Urban environments present unique opportunities for developing new system architectures and applications aligned with the "Internet of things" paradigm. The data sources are still largely provided by physical sensors and technical devices, albeit a significant role is already played (e.g. in environmental monitoring networks) by virtual or soft sensors provided by simulation models, while a growing role is being played by human data generated thru participatory platforms and specifically social networks. This wider framework provides new challenges to "fuse" data from diverse data streams into coherent information and to design novel applications, to support the management of urban infrastructures. Statistical learning and, more recently, network science play a critical role in the design of the representation models and computational engines needed to turn the data resources into actionable knowledge. This paper draws upon the design experience gained from several EU projects and proposes a software architecture based on a network of services. Key issues are: how people use the city infrastructure (e.g. inferring the demand patterns); how to deal with the diverse, sparse, voluminous and inaccurate data delivered by an increasingly pervasive sensory infrastructure; how to assimilate real time data and develop stream reasoning capabilities; how to develop and incorporate probabilistic frameworks and new tools to model and visualize risk and uncertainty.
This paper draws upon the results of the LENVIS FP7 project and the TAM TAM national project, respectively focused on health and environment and personal mobility.

Key words: big data, data science, health, machine learning, mobility, water management

Received: December, 2014; Revised final: August, 2015; Accepted: September, 2015

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