

HOTPLANET 2013 Keynote Talk

Smartphones, Crowds, and the Cloud: Population Guided Sensing Systems

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ABSTRACT

Sensor-enabled smartphones are creating new application domains and transforming existing ones -- from mobile health to quantified-self, mobile sensing is radically changing the way we collect and mine information about people's activities, contexts, and social networks. A number of challenges stand in the way of delivering mobile sensing to the masses. For example, how do we develop mobile sensing systems that are capable of dealing with population diversity at scale; more specifically, how can conventional approaches to classifying high-level human behavior cope with the level of diversity among users (e.g., demographics, behavioral patterns, and lifestyle) and contexts found in large-scale systems.

Over the last few years I have been spearheading the development of population guided sensing systems. These systems are designed to have a deep understanding of both individual and group behaviors and utilize this information to create symbiotic relationships between users and systems. In this talk, I will present two key ideas that can help scale mobile sensing systems from 100s of people to potentially 100s of millions based on population guided sensing. The first idea, Community Similarity Networks (CSN), is an activity recognition framework that incorporates inter-person similarity measurements into the classifier training process. CSN exploits crowdsourced sensor data to personalize classifiers with data contributed from other similar users. Second, I will discuss CrowdSense@Place (CSP), which combines crowd labeling and data collection with a series of multi-modal classifiers to link place visits to place categories (e.g., shopping, gym, and restaurant). These techniques combine to move mobile sensing forward: nailing it before we scale it.

Categories and Subject Descriptors

I.2.11 [ARTIFICIAL INTELLIGENCE]: Distributed Artificial Intelligence

Keywords

Smartphones, Cloud, Sensing.

1. Bio

Nic Lane is a researcher at Microsoft Research Asia (MSRA) working in the mobile and sensing systems group (MASS). Nic received his Ph.D. from Dartmouth College (2011) where he worked with his co-advisors Andrew Campbell and Tanzeem Choudhury at the intersection of machine learning and mobile sensing. His dissertation helped pioneer community-guided techniques for learning models of human behavior that enable mobile sensing systems to better cope with diverse user populations encountered in the real-world. Nic is an experimental computer scientist who builds novel mobile sensing applications and systems based on well-founded computational models. His work has received a number of awards including best paper awards from Ubicomp '12, Mobicase '12 and PhoneSense '11, and a best paper nomination from Ubicomp '11. Nic currently serves as member of the TPC of Mobisys, Ubicomp and Sensys.

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