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Title:STATISTICAL INFERENCE IN WIRELESS SENSOR AND MOBILE NETWORKS

In recent years, wireless sensor networks have emerged as a cost effective alternative to traditional wired sensor systems. Compared to wired sensors, wireless sensors are relatively small in size, operated on batteries, communicate using wireless radios, and can last for years of operations. In the meantime, mobile networks have also gained many momentums. With the popularity of modern smart phones such as the Apple iPhone, we have witnessed a gold rush of mobile applications and services. The two emerging networks share many common features. Firstly, both networks consist of network nodes equipped with sensors that monitor the physical environment. Secondly, they both have short-range wireless communication (e.g., ZigBee, Bluetooth or WiFi). Finally, both network nodes operate on batteries, which requires power efficient programs in order to extend the length of operating time.

In this dissertation, we focus on four important problems in wireless sensor and mobile networks: a) data authentication, b) faulty sensor detection, c) indoor localization and tracking, and d) prediction. We formulate them as spatial/temporal statistical inference problems and develop efficient centralized and decentralized solution methods.