Public Abstract

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Title:STATISTICAL MODEL-BASED METHODS FOR OBSERVATION SELECTION IN WIRELESS SENSOR NETWORKS AND FOR FEATURE SELECTION IN CLASSIFICATION

Wireless sensor networks have been deployed in real world applications ranging from environmental surveillance to ambient intelligence. Most of sensors are still powered by batteries nowadays, which makes changing batteries for a large scale of deployment infeasible. Some type of sensors such as vehicle detection sensors are also expensive to install and maintain, which imposes constraints on budget spending. These restrictions become hurdles for a sustainable and scalable deployment of wireless sensor networks. Sensor observation selection, which means to decide when or where sensors should be turned on or placed for sensing, is one of the keys to solve the scalability issue.

In the dissertation, we apply statistical model-based approaches to address the temporal and spatial sensor observation selection challenges. We improve existing best temporal observation selection method based on graphical models. We also introduce cutting edge approaches of finding out best locations to deploy vehicle detection sensor that help improve traffic signal controllers. It aims for reducing traffic jam that has big impacts on economy. We also gain insight of statistical model-based methods for sensor observation selection by studying and comparing their performance. Finally We apply these methods in feature selection for classification problems. It has promising applications in reality. For example, our results show that by selecting the most important attributes we can save diagnosis costs for diabetes by half and still achieve the same diagnosis accuracy or even better.