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

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ABSTRACT

We apply statistical model-based approaches to address temporal and spatial observation selection challenges in wireless sensor networks. For temporal observation selection, we present an improved version of VoIDP algorithm that is the first optimal algorithms for efficiently selecting the subset of observations on chain graphical models. We validate the improvement in sensor scheduling experiments. For location-based observation selection, we address the challenge of placing vehicle detection sensors designed to optimize traffic signal controls by employing two greedy heuristics, entropy and submodular mutual information, based on Gaussian process models. We demonstrate their performance in a simulated traffic road networking map. Experimental results reveal insights of the two heuristics. We also compare the model-based approaches for sensor observation selection, and our experimental results show that the graphical model-based approach is more robust and error-tolerant than the Gaussian process model-based approach. Finally We also apply the submodular mutual information-based selection method to feature selection for classification problems. We compare the proposed method with existing state-of-the-art attribute selection methods through extensive experiments, and show that the proposed mutual information-based method perform comparably with, or even better than, other feature selection methods.