

Measurement Optimization Under Uncertainty Using Deep Reinforcement Learning

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Optimal sensor placement enhances the efficiency of a variety of applications for monitoring dynamical systems. It has been established that deterministic solutions to the sensor placement problem are insufficient due to the many uncertainties in system input and in the parameters that affect system response sensor measurements. Accounting for the uncertainties in such an expensive optimization is challenging due to computational intractability. This study proposes a stochastic environment in the form of Markov Decision Process and a sensor placement agent that aims to maximize the information gain from placing a particular number of sensors within the system. The agent is trained to maximize its reward based on an information-theoretic reward function. To verify the efficacy of the approach, the case of heterogeneous sensors in a shear building model is simulated. This methodology can be used to accommodate the uncertainties in the sensor placement problem in real-world applications.