PLENARY TALK

Design of Experiments for Learning Dynamic Models

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Abstract:

Optimal experimental designs were discussed first in the statistical literatures as allocation problem of points in classical regression problems. This was soon followed by designing optimal input or excitation signals under special constraints to get a kind of best estimation of parametrized models from measured data. These procedures were very useful to get the minimal number of experiments to achieve a certain quality of the estimated parameters or frequency response

Optimality of the designs were formulated both in time and in the frequency domain and various off – line and sequential algorithms were developed.

Optimal experiment design (OED) approaches were applied not only in medical experiments, control of industrial processes, identification and control of vehicle dynamics and recently there is an interest in applying in it in classification and in other Machine Learning (ML, like Active ML) problems.

This talk will survey the basic problems in regression experimental design with an extension to obtaining linear and nonlinear models for dynamic systems. Some recent results on frequency domain multi-sine design will be shown, too, that leads to a sparse estimation of the number of multi-sine frequencies necessary to get optimal identification of a model. Similar tools were used successfully to get approximate dynamics of vehicles and space structures.