

# Optimum Experimental Design for Differential Equation Models

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**Abstract:** Together with our cooperation partners, we are interested in the modelling and model validation of complex processes in industry. Typically these are described by non-linear differential equation systems. They have to be calibrated by estimation of unknown model parameters from experimental data. Optimum experimental design means computing experiments the data of which minimize the statistical uncertainty of the estimates, a task which results in intricate nonlinear constrained optimal control problems.

Our numerical solution methods are based on the direct approach of optimal control, Newton-type optimization methods, structure exploiting linear algebra and tailored derivative evaluation. They are being implemented in the software package VPLAN.

Experimental design application strategies comprise robustification, parallel, sequential and online approaches.

In this talk we give a survey on our methods and software and presents several industrial application case studies. Details on methods and applications are presented in further talks of the minisymposium.

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