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Inverse Problems for Time Dependent PDEs

An Online Parameter Identification Method for time-dependent problems

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Abstract:
Dynamical systems like ordinary differential equations or time-dependent partial differential equations play an important role for modeling instationary processes in science and technology. Such models often contain parameters that cannot be accessed directly and therefore must be determined from measurements, which leads to inverse problems. In case of time-dependent problems the established Thikonov regularization is not efficient due to the loss of time causality. To avoid this drawback, we use online strategies. In this talk we consider the initial value problem

$$u_t + C(q, u) = f, \quad u(0) = u_0.$$

The inverse problem we are interested in is to identify q from measurements Gu over time, with an observation operator G. In reality, these observations are hardly ever full state measurements. Hence our aim is to design an online method, that is also applicable for partial observations. For this method we were able to prove conditional convergence, where a key condition for parameter convergence is a so-called persistence of excitation assumption. The performance of our approach will be illustrated with some numerical experiments.