

# Model Identification and Data Fitting

## Full course description

This course is devoted to the various practical and theoretical aspects which involve the estimation (the identification) of a mathematical model within a given model class, starting from a record of observed measurement data (input/output data). First we address distance measures, norms, and criterion functions. Then we discuss the prediction error identification of linear regression models, with special emphasis on the various interpretations of such models (deterministic, stochastic with Gaussian white noise and maximum likelihood estimation, stochastic in a Bayesian estimation context) and on numerical implementation aspects (recursion, numerical complexity, numerical conditioning and square root filtering). Next we study identification within the important class of autoregressive dynamical models, to which the Levinson algorithm applies, which allows for a lattice filter implementation. Other related topics receiving attention are identifiability, model reduction and model approximation. Some techniques for the estimation of linear dynamical i/o-systems are illustrated with the system identification toolbox in Matlab.

## Prerequisites

Linear Algebra, Mathematical Modelling, Probability and Statistics

## Recommended reading

L. Ljung, System Identification: Theory for the User (2nd ed.), Prentice-Hall, 1999.  
T. Soderstrom and P. Stoica, System Identification, Prentice-Hall, 1989.

## Files

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