Parameter Estimation Applied to Medical and Biological Sciences

Course Code	X_432631
Credits	6.00
Period	P4
Course Level	500
Language Of Tuition	English
Faculty	Faculteit der Bètawetenschappen
Course Coordinator	dr. I.H.M. van Stokkum
Examiner	dr. I.H.M. van Stokkum
Teaching Staff	dr. I.H.M. van Stokkum
Teaching method(s)	Lecture, Practical

Course Objective

In this course the student learns how to estimate the parameters of a mathematical model that describes the measurements. The statistical theory is illustrated by simulations of parametric models, and practised by solving inverse problems. The goal of the course is to provide insight into the theory of parameter estimation and to develop a critical attitude towards its application and interpretation in order to avoid inconsistent and improper use of the theory.

Course Content

Case studies are taken from medical and biological sciences, in particular describing the dynamics of molecular systems with the help of time-resolved spectroscopy and brain imaging kinetics. Linear and non-linear regression analysis are treated, as well as confidence intervals and significance testing. Topics are Occam's razor, the maximum likelihood principle, linear and non-linear models with single or multiple responses, experimental design, orthogonal polynomials, separable nonlinear least squares, and the Singular Value Decomposition.

Teaching Methods

Lecture and exercises with RStudio.

Method of Assessment

Homework exercises (25%) and report of practical exam (75%).

Entry Requirements

Statistics, linear algebra and calculus on BSc level.

Literature

A syllabus will be provided by the lecturer.

Target Audience

mBMTP, mPhysics and Astronomy, mComputationalScience