Modulbeschreibung für Vertiefungsmodule des Wahlpflichtbereiches

Titel des Moduls	Statistische Sequentielle Analysis in Stochastischen Modellen Stetiger Zeit
in englischer Sprache	

R	
A	x

	Vorlesung	Übung
Umfang	2 SWS	

Inhalt

Sequential hypothesis testing and disorder detection problems form an important class of optimal stopping problems with partial information. The problem of sequential testing of two simple hypotheses about the dynamics of an observed stochastic process is to determine the time when the observations should be stopped and one of the hypotheses should be accepted. This time is sought to be optimal in the sense of minimal error probabilities and average observation time. The problem of disorder or on-line change-point detection is to find a time of alarm that should be sounded to indicate a change in probability characteristics of the observed process. This time is sought to be as close as possible to the unknown and unobservable (random) time of change in the sense of minimal probability of a false alarm and average time delay. It is shown that the optimal stopping times in these problems are the first times when the related *sufficient statistic* processes (weighted likelihood ratios) leave certain continuation regions restricted by the *stopping boundaries*. The explicit expressions for the corresponding *risk functions* and the boundaries are derived by means of reducing the initial optimal stopping problems to the equivalent *free-boundary problems* and then verifying the candidate solutions using martingale methods. In the lecture, the sequential hypotheses testing and disorder detection problems will be considered for observed jump-diffusion processes in the Bayesian, variational and minimax formulations. The comparison of the resulting sequential detection methods will be discussed.

The lecture course will be organized as follows: Bayesian and variational sequential hypotheses testing problems – Bayesian and variational disorder detection problems with linear and exponential delay penalties – minimax disorder detection problems – multiple disorders detection problems – comparison of the resulting sequential detection methods.

The course will also contain some elements of stochastic analysis (Brownian motion, compound Poisson process, change-of-measure, filtering) and mathematical statistics (hypotheses testing). Moreover, essentials of the theory of Markov processes (jump-diffusions and their infinitesimal generators) and basic concepts of optimal stopping problems and their relationships to the free-boundary problems for parabolic-type and integro-differential operators will be covered.

Voraussetzungen	Stochastik I, II

Regelsemester	5

Abschluss	Prüfung

Prüfungszulassungsvoraussetzung	keine

Studienpunkte	4

R = Reine Mathematik
A = Angewandte Mathematik