

NONLINEAR FILTERING

Lecturer:

Pavel Chigansky,
108, Ziskind bld., Department of Mathematics,
The Weizmann Institute of Science, Rehovot, 76100
Tel: 08-934-4214 (w), 067-883-748 (cell)
E-mails: pavel.chigansky@weizmann.ac.il,
pavelm@eng.tau.ac.il
WWW: <http://www.wisdom.weizmann.ac.il/~pavel>

General:

The course is an introduction to nonlinear filtering theory of stochastic processes.

Tentative syllabus:

- Probability preliminaries.
- Optimal filtering in discrete time.
 - * the recursive orthogonal projection and the Kalman filter
 - * the recursive Bayes formula
- Stochastic processes in continuous time
 - * Wiener process and Itô stochastic integral
 - * stochastic differential equations
- Optimal filtering in continuous time.
 - * Optimal linear filtering - Kalman-Bucy filter
 - * Girsanov theorem
 - * Fujisaki-Kallianpur-Kunita filtering equation, Kushner-Stratonovich equation for conditional density

- * Kallianpur-Striebel formula
- * Reference measure approach: Zakai equation
- * Robust form of the nonlinear filter
- * finite dimensional filters: Wonham filter, Liptser-Shiryaev conditionally Gaussian filter, Beneš filter, Makowskii filter for linear Gaussian system with non Gaussian initial condition.

Web:

The course page at <http://www.wisdom.weizmann.ac.il/~pavel> contains

- announcements (e.g. change of room/time, etc.)
- Q&A forum
- home assignments and their solutions
- supplementary material, additional reading

Home assignments:

Each chapter in the course is followed with exercises of different level of complexity. The solution is not obligatory for submission, but is very recommended, since some of the problems are crucial for better understanding of the material.

Final grade:

The final grade is given on the basis of a home exam.