Probability Theory, ST701A, advanced level, 7.5 ECTS credits

Teaching plan

Home page

Home page of course is in http://gauss.stat.su.se/master/slht.shtml and will be updated regularly. Additional information about the Department of Statistics can be found in http://www.statistics.su.se/.

Teacher (lectures and computer exercises)

Tatjana Pavlenko, B:742,   tel. 08-16 25 78,   e-mail: tatjana.pavlenko@stat.su.se.

Course expedition/Student office

Hedda Werner Åström.
The secretary's office is B:724 at the building B, floor 7.
Office is open Mon-Tue $9^{00} - 11^{00}$, $13^{00} - 14^{00}$ (during the term) and Thurs $14^{00} - 16^{00}$ (during the term), tel. 08-16 29 95, e-mail: expedition@stat.su.se

Student councellor

Pär Stockhammar, B:777 at the building B, floor 7. Tel. 08-16 29 81, e-mail: par.stockhammar@stat.su.se

Lectures, theoretical and computer exercises

See the last page for the schedule.

Computer exercises

Two **compulsory** computer laboratory exercises are planed in the course. The main goal of these exercises is to give students the basic knowledge on how to use the Statistics Toolbox of Matlab. The toolbox provides a comprehensive set of techniques to assess and understand data, and offers a rich set of statistical plot types and interactive graphics. All toolbox functions are written in the open Matlab language so that you can check the algorithms, modify the source code, and create your own custom functions.
It is recommended that all the students participate in the computer exercises in the scheduled time. Those who miss a session will need to perform the planned exercises themselves and return a written report for that session.

Literature

Casella G. & Berger R. L. *Statistical Inference.* Second Edition, Duxbury Press (Thomson Learning Academic Resource Center), 2007.

Other literature references

These books are recommended as a general reference for probability theory and statistics in an intermediate level.

A. Gut *An Intermediate Course in Probability Theory*, Second Edition, Dordrecht Springer-Verlag, 2009.
J. A. Rise *Mathematical Statistics and Data Analysis*, Second Edition, Duxbury Press (An Imprint of Wadsworth Publishing Company), 1996.

Exam

Written exam: Wednesday, 12th of January. Time: $9^{00} - 14^{00}$. Place: Brunnsvikssalen.
Next written exam: Wednesday, 9th of February. Time: $9^{00} - 14^{00}$. Place: Värtasalen.

Allowed aids in the exames

Table of common distributions; see the book by Casella & Berger, p. 620-627 (will be attached to the exam).
Calculator.
Dictionaries for translation.

Schedule of what will be covered on which classes, including lists of problems

In the following **L** and **C** stand for **L**ectures and theoretical exercises and **C**omputer laborations, respectively.

Week/Date	Time/Place	Topic	Reading	Assignment
W1 (3/11): **L1**	09.00-12.00 **B3**	Basics of probability theory: the Kolmogorov axioms, counting probability, conditional probability and independent events, random variables and distribution functions.	1.1-1.4	1.4, 1.7, 1.12, 1.18, 1.29, 1.30, 1.34, 1.39, 1.44
W2 (10/11): **L2**	09.00-12.00 **B3**	Random variables and distribution functions (cont), density and mass functions.	1.5-1.6	1.47, 1.51, 1.53, 1.54
W3 (17/11): **L3**	09.00-12.00 **B3**	Functions of a random variable, expected values, variances, moments and moment generating functions.	2.1-2.2	2.2, 2.3, 2.8, 2.11, 2.14(a), 2.23, 2.24, 2.19, 2.30, 2.33, 2.36, 2.39
W4 (22/11): **L4**	13.30-16.30 **B3**	Exponential families, location and scale families.	3.3-3.5	3.3, 3.8, 3.9, 3.13, 3.28, 3.33(i), 3.40
W4 (24/11): **L5**	09.00-12.00 **B3**	Joint and marginal distributions, conditional distributions and independence.	4.1-4.2	4.1, 4.5, 4.10, 4.15, 4.16(a)
W5 (1/12): **L6**	09.00-12.00 **B3**	Bivariate transformations. Hierarchical models.	4.3-4.4	4.19, 4.20, 4.27
W6 (8/12): **L7**	09.00-12.00 **B3**	Hierarchical models (cont.) and mixture distributions.	4.3-4.4	4.31, 4.32(b), 4.34(a)
W7 (15/12): **L8**	09.00-12.00 **B3**	Covariance and correlation. Multiple random variables and multivariate distributions. Inequalities.	4.5, 4.7	4.30, 4.55, 4.63
W8 (20/12): **L9**	13.30-16.30 **B3**	A random sample and its properties. Sums of random variables from a random sample.	5.1-5.2	
W8 (22/12): **L10**	09.00-12.00 **B3**	Sampling from the normal distribution. Various types of convergence. Central limit theorem.	5.3, 5.5	5.17, 5.18, 5.29, 5.30, 5.31, 5.34
W3 (3/12): **C1, Gr A**	09.00-12.00 **B319**	Exploring probability distributions with Matlab.	1.5, 2.1, 3.2-3.3	See prep ex for Lab 1
W4 (7/12): **C1, Gr B**	09.00-12.00 **B319**	Exploring probability distributions with Matlab.	1.5, 2.1, 3.2-3.3	See prep ex for Lab 1
W9 (4/01): **C2, Gr A**	09.00-12.00 **B319**	The Bootstrap technique and Bayesian methodology.	4.4, 5.6	See prep ex for Lab 2
W9 (5/01): **C2, Gr B**	09.00-12.00 **B319**	The Bootstrap technique and Bayesian methodology.	4.4, 5.6	See prep ex for Lab 2
W10 (10/01): R	13.30-16.30 **B3**	Subjective probability and Bayesian methodology, this lecture will be given by Prof. Daniel Thorburn		