AMS 132/206: Classical and Bayesian Inference

Description
This course is an introduction to Statistical Inference at a calculus-based level. The topics covered are: Bayesian Inference; maximum likelihood estimation; sufficient statistics; distribution of estimators; confidence intervals; hypothesis testing.

General Class Information
Lecture times:
TUESDAY AND THURSDAY from 4:00 pm to 5:45 pm at Porter Acad 148.
Instructor:
Name: Lelys Bravo, lbravo at soe dot ucsc dot edu
Office: Jack Baskin Engineering, 357B
Teaching Assistant
Maria Deyoreo, mdeyoreo at soe dot ucsc dot edu
Instructor Office Hours:
Tuesdays and Thursdays from 10:00 am to 11:00 am
TA Office Hours:
Mondays 9:00 am to 10:00 am; Thursdays 11:00 am to 12:00 m

Bibliography

Evaluation
Homeworks:
- AMS 132: Five homeworks: 20% total. Solutions will be posted as deadlines come into effect.
- AMS 206: Four homeworks and a final project: 20%. These will be assigned and due on the same time schedule.

Quizzes:
Two quizzes worth 20% (10% each).
Tuesday, January 24 during regular class hours (10%), covers the material in HW 1.
Thursday, February 23 during regular class hours (10%), covers the material in HW 3.

Midterm:
Tuesday, February 14 during regular class hours (30%), covers the material in HW 1 and HW 2.

Final:
Thursday, March 22 from 12:00 m-3:00 pm (30%), covers all the material taught in the class. If you get a better grade in your final exam than in your midterm, the final exam will be worth 60% of your total grade.

Students can bring one single sheet of paper with most useful formulae to the quizzes and exams.

Note: AMS 206 will receive extra questions on the homework assignments/tests that cover the graduate material.

Make-up and late homework policy
Late homework will not be accepted. There will be no make-up for missed quizzes or exams, for any personal reason. If you become sick, you will need to provide the appropriate documentation from student health services. These policies will be strictly enforced.
Tentative class schedule

Tu 01/10 – Introduction to statistical inference (DGS 7.1).
Th 01/12 – Maximum likelihood estimation in one-parameter problems (DGS 7.5).

Tu 01/17 – Sufficient statistics. Maximum likelihood estimation in multi-parameter problems (DGS 7.6-7.7).
Th 01/19 – Repeated sampling distributions of estimators (DGS 8.1-8.2).

Tu 01/24 – Confidence intervals (DGS 8.4-8.5). HW1 due. Quiz 1 (10%)
Th 01/26 – Classical hypothesis testing (DGS 9.1).

Tu 01/31 – Classical hypothesis testing (Cont.) (DGS 9.2, 9.5).
Th 02/02 – Comparison with interval estimates (DGS 9.9).

Tu 02/07 – Introduction to Bayesian methods for inference and prediction. Prior distributions. Likelihood and posterior distributions (DGS 7.2).
Th 02/09 – Predictive distribution; briefing on Bayesian decision theory (DGS 7.4). HW2 due.

Tu 02/14 – Midterm (30%).
Th 02/16 – Exchangeability (GCSR 5.1-5.2).

Tu 02/21 – Logical consistency and calibration (GCSR 6.1-6.3).
Th 02/23 – Conjugate analysis (DGS 7.3). HW3 due. Quiz 2 (10%).

Tu 02/28 – Markov Chain Monte Carlo methods for simulation-based computation (DGS 12.5)
Th 03/01 – Markov Chain Monte Carlo methods for simulation-based computation (Cont.) (DGS 12.5).

Tu 03/06 – Introduction to hierarchical modeling (GCSR 5.3).
Th 03/08 – Introduction to hierarchical modeling (GCSR 5.4). HW4 due.

Tu 03/13 – Bayesian model diagnostics (GCSR 6.4-6.5).
Th 03/15 – Model selection and sensitivity analysis (GCSR 6.6-6.7). AMS 132: HW5 due. AMS 206: Final project due

Th 03/22 - Final exam (30%) between 12:00 m and 3:00 pm

Accommodations for students with disabilities

Every effort will be made to accommodate students with special needs. If you qualify for classroom accommodations because of a disability, please get an Accommodation Authorization from the Disability Resource Center (DRC) and submit it to me in person outside of class (e.g., office hours) within the first two weeks of the quarter. Contact DRC at 459-2089 (voice), 459-4806 (TTY), or http://drc.ucsc.edu for more information on the requirements and/or process.

Academic integrity

All work you submit for this class must be your own, and a strict code of honor will be enforced. Please check the UCSC student code of conduct
at http://www2.ucsc.edu/judicial/student-conduct07.pdf.