ICE-EM Access Grid Room Project

Subject Information Form

Administration

1. Department and Institution

   Department Mathematics and Statistics
   Institution La Trobe University

2. Subject name and code

   Name Theory of Statistics
   Code STA4TS

3. Handbook entry URL, subject homepage URL, host honours student hand-out URL

   - Handbook entry URL
     http://www.latrobe.edu.au/mathematics-and-statistics/your-study-experience/key-centre-of-statistical-science
   - Subject homepage URL
     http://www.latrobe.edu.au/mathematics-and-statistics/your-study-experience/key-centre-of-statistical-science
   - Host Honours student hand-out URL
     http://www.latrobe.edu.au/mathematics-and-statistics/your-study-experience/key-centre-of-statistical-science

4. **Lecturer** name and contact details

Name:	Associate Professor Paul Kabaila
Phone:	3 9479 2594
Email:	P.Kabaila@latrobe.edu.au
Homepage:	http://www.latrobe.edu.au/scitecheng/about/staff/profile?uname=PVKabaila

5. **Honours coordinator** name and contact details

Name:	Associate Professor Paul Kabaila
Phone:	3 9479 2594
Email:	P.Kabaila@latrobe.edu.au

6. Start date, end date, number of teaching weeks

Start date:	29 July 2013
End date:	1 November 2013
Number of teaching weeks:	13

7. Contact hours per week

   2 hours of lectures + up to half an hour for homework assistance across Access Grid

8. Description of electronic access arrangements for students (for example, Black Board)

   XXXX

Academic

1. Overview of subject content

   This unit covers a selection of topics in classical statistical inference at the fourth year level. It consists of a selection of material from the following chapters of Casella and Berger (2002): Chapter 6 (Principles of Data Reduction), Chapter 7 (Point Estimation), Chapter 8 (Hypothesis Testing), Chapter 9 (Interval Estimation) and Chapter 10 (Asymptotic Evaluations). A knowledge of this material is helpful in almost any statistical endeavour.

   Reference:

   Casella, G. and Berger, R.L. (2002) Statistical Inference, 2nd edition. Duxbury.

2. Detailed syllabus, preferably week by week

   Week 1: Overview of sufficiency (including the factorization theorem) and minimal sufficiency.

   Week 2: Ancillary statistic defined as a statistic whose distribution does not depend on θ. Alternative definition of ancillary statistic via preliminary reduction by minimal sufficiency. The role of ancillary statistics in inference – Cox's mixture of normal distributions example. The practical importance of inference conditional on an ancillary statistic.

   Week 3: Further comments on inference conditional on an ancillary statistic. Introduction to data reduction by equivariance. Review of confidence intervals, including the coverage probability and the confidence coefficient. Properties of the coverage probability function for confidence intervals obtained from count data. Risk functions for confidence intervals.

   Week 4: The effect of preliminary model selection on confidence intervals. Review of the following paper: Freeman, P.R. (1989). The performance of the two-stage analysis of two-treatment, two-period crossover trials. *Statistics in Medicine*, 8, 1421 – 1432.

   Week 5: Revision of the method of moments and maximum likelihood estimation from third year statistical inference. Introduction to two methods of evaluating estimators – (a) comparison after first restricting the class of estimators (e.g. to be unbiased) and (b) comparing the risk functions.

   Week 6: Review of the Cramer-Rao inequality. Proof of this inequality.

   Week 7: The likelihood ratio test. Neyman-Pearson Lemma and its proof.

   Week 8: Definitions of level and size of a hypothesis test. An introduction to Intersection-Union tests. Level and size of these tests.

   Week 9: p-values from an advanced standpoint (Probability Integral Transformation result assumed), including in the presence of nuisance parameters. Confidence sets obtained by inverting a family of hypothesis tests.

   Week 10: Convergence in probability and convergence in distribution.

   Week 11: Slutsky's theorem and the rigorous justification of the Delta Method.

   Week 12: The definition of a consistent estimator and the difference between limiting and asymptotic variances. Introduction to asymptotic optimality of the maximum likelihood estimator.

   Week 13: Review.

3. Detailed breakdown of assumed prerequisite knowledge, including host prerequisite subject URLs

   A third year statistical inference subject.

4. Assessment

   - Exam/assignment/class work breakdown

Exam	60 %
Assignment	40 %
Class work	0 %

   - Assignment due dates

     2 weeks after the assignments are given out

- Approximate exam date
  Mid-November

5. Required student resources

   - Recommended Text:
     Casella, G. and Berger, R.L. (2002) Statistical Inference, 2nd edition.
   - Electronic copies of the lecture slides will be sent to the students by email at least one day before each two-hour lecture.
   - Software (local access)
     None

Institutional Honours Details

1. Weight of subject in total honours assessment at host department
   15/120
2. Thesis/subject split at host department
   45/75
3. Honours grade ranges at host department

H1	=	80-100 %
H2a	=	70-79 %
H2b	=	60-69 %
H3	=	50-59 %