Statistical Inference

Lecture 01a

ANU - RSFAS

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Course Description

This course introduces students to the theory underlying the development and assessment of statistical techniques in the areas of:

- point estimation
- interval estimation
- hypothesis testing

Statistical Inference - the course is roughly broken into the following three sections

- Point estimation
  - Frequentist (maximum likelihood, method of moments, ...)
  - Bayesian
  - Non-Parametric (frequentist)
- Interval estimation
  - Frequentist
  - Bayesian
  - Non-Parametric (frequentist)
- Hypothesis testing
  - Frequentist
  - Bayesian
  - Non-Parametric (frequentist)

Texts I

- Prescribed Texts
  P. Garthwaite, I. Jolliffe, and B. Jones
  Statistical Inference (Second Edition)
  Oxford Science Publications
- Recommended Reading
  1. G. Casella and R. Berger
     Statistical Inference (second edition)
     Brooks/Cole Cengage Learning
  2. Professor Steven Stern's Notes 1-3
     ANU
  3. G. Givens and J. Hoeting
     Computational Statistics (second edition)
     Wiley

Texts II

4. J. Kadane
   Principles of Uncertainty
   http://uncertainty.stat.cmu.edu/wp-content/uploads/2011/05/principles-of-uncertainty.pdf
   CRC Press

5. C. Robert
   The Bayesian Choice (second edition)
   Springer

6. J. Rice
   Mathematical Statistics and Data Analysis (third edition)
   Brooks/Cole Cengage Learning

Texts for Revision

- D. Wackerly, W. Mendenhall, and R. Scheaffer Mathematical Statistics with Applications (seventh edition)
  Duxbury, Thomson, Brooks/Cole (WMS).
- R. Adams and C. Essex
  Calculus: A Complete Course (eigth edition)
  Pearson

Assesments

- Online quiz (0%)
- Final Examination (60% or 80%)
- Mid-Semester Examination (20% or 0%) (redeemable in favour of the final)
- Group Presentation/Project (15%)
- Weekly (most weeks) Tutorial Solutions (5%)

Tutorials

- Before most tutorials (see schedule) you should submit your answers to the tutorial questions online via Wattle.
- These will be graded weekly for "performance" (whether you made a solid attempt on the questions) and not whether you got the answer correct.
- Each week the "performance" will be graded as 0 or 100.
- Students may be asked to present their solutions during tutorial.

Group Presentation/Project I

- In groups of 2-4 (TBD), based on your cohort (STAT3013 or STAT4027/STAT8027), you will read and present an academic/scientific paper.
- In addition you will have to consider some type of "extension". This may be by simplifying the problem and considering another estimator and its properties, extending the inferential method, or even considering other data sets.
- Each presentation will last 15-20 minutes (TBD) and each member of the group must speak.
- You will use the One button Studio in the library to make your presentations https://anulib.anu.edu.au/using-library/one-button-studio

Group Presentation/Project II

- Every presenter in a group will be given the same grade. Your presentation materials must be submitted on Wattle by the beginning of Week 12 (each member in the group should submit the same material).
- All paper choices must be approved by me.

STAT4027/STAT8027

You should choose a paper from a well known statistics journal, for example:

- The Annals of Applied Statistics
- The Annals of Statistics
- Australian & New Zealand Journal of Statistics
- Biometrika
- Canadian Journal of Statistics
- Environmetrics
- Journal of Agricultural, Biological, and Environmental Statistics
- Journal of the American Statistical Association
- Journal of Business & Economic Statistics
- Journal of the Royal Statistical Society (any series)
- Stat
- Statistics in Medicine
- Statistics and Public Policy

I will also consider other well known empirical journals such as:

- Econometrica
- Political Analysis
- Social Networks

I will allow much broader choices that have a strong data analytic and inferential component, so you may also consider:

- Chance
- Significance
  - "Does New York City really have as many rats as people?", Jonathan Auerbach. [pdf]

Examinations

- Mid-semester: Reading time: 15 minutes. Writing time: 90 minutes.
- Final: Reading time: 15 minutes. Writing time: 3 hours.
- Some questions will differ between the STAT3013 & STAT4027/STAT8027 exams.

The permitted material for the mid-semester and final exams will be:

- A4 pages (Two sheets) with notes on both sides
- Paper-based dictionary, no approval required (must be clear of ALL annotations)
- Calculator (non-programmable)