STAT 7080

Advance Statistical Inference (CRN: 20825)

Winter 2015

Instructor: Dr. Mohammad Jafari Jozani
Office: 325 Machray Hall,
Phone: 204-272-1563
E-mail: $M\_jafari\_jozani@umanitoba.ca$
Office hours: Wednesday from 9:00 to 10:30 and Tuesday from 14:30 to 16:00, or by appointment.

Course Description and Outline of Covered Topics:

In this course we will cover some selected topics from recent developments in parametric and/or non-parametric statistical inference. It is required to use R-programming for the demonstration of the methodologies introduced in this course. Specific topics that will be covered in this course include (not necessarily in order)

- The Jackknife, the bootstrap and some other resampling techniques
- The influence curve and its role in robust estimation
- Finite mixture modeling and the EM algorithm
- An introduction to statistical learning and cross-validation techniques
- Some nonparametric methods such as kernel smoothing and Spline and Penalized Spline Regression
- K-means clustering and K-nearest neighbour classifiers
- An introduction to Ridge Regression and LASSO
- Bayesian Analysis, MCMC, importance and Gibbs samplings

If time permits, some nonparametric Bayesian estimation and decision theory will also be discussed.

Mark Breakdown

Assignments (At least once every week)	15%
Midterm (120 minutes, time and place to be announced)	30%
Final Examination (120 minutes, time and placed to be announced)	55%

Grade cut-offs

The following are the minimum percentage grades required to receive each of the various letter grades: A+ (90%), A (80%), B+ (75%), B (70%), C+ (65%), C (60%), D (50%).

The midterm and the final examinations:

The Midterm Test will be scheduled for mid to late February, the exact date to be determined later. However, it will be scheduled outside of regular class time (probably in the afternoon) and will be 3 hours in duration. If you miss the midterm test, you will be assigned a mark of zero, unless reasons and acceptable evidence are provided. A make-up test will not be scheduled. The Final Exam will be held on a date to be selected later by the Department of Statistics and will be 3 hours in duration.

Assignments

Assignments will be handed out at a rate of about one or two assignments per week of class. Students are encouraged to discuss and work together on the solutions to the assignments. However, each student must hand in his or her own copy of each assignment with personalized solutions, including comments, discussions and interpretations.

Note that actions will be taken against students who are found guilty of acts of academic dishonesty.

Assignments will be due in class on the day assigned. Late assignments will NOT be accepted. Assignments submitted after the solutions are posted or after the graded assignments are return to students will not be marked and receive a grade of 0. Obviously, exceptions can be made to the above policy if special/exceptional circumstances warrant them (e.g., serious illness).

Your assignments should conform to the following standards:

- Assignments are to be done on 8.5×11 paper, writing on one side only.
- Assignments are to be stapled.
- Write your name at the top of each page.
- Assignments in R should be prepared by R-markdown. I will briefly teach how to do this in the first week of class.
- Revise your assignments so they are reasonably free of grammatical and typographical errors.
- Make sure each step in your solutions is well justified: I mark what is written on paper and should not have to guess what you mean.
- Messy or unreadable assignments will be returned with a mark of zero.
- Assignments that are well presented and properly typesetted in Latex will get up to a 5% bonus.

Recommended Text Books and References

I will have my own notes which are mostly based on papers and articles which will be distributed to students prior to teaching each topic. However, I will recommend the following for further reading. You are not expected to buy a textbook.

- *The elements of Statistical Learning, data mining, inference and prediction* (Hastie, Tibshirani and Friedman, 2009).
- *An introduction to Statistical learning with applications in R* (James, Witten, Hastie and Tibshirani, 2013).
- *An introduction to Bootstrap* (Efron and Tibshirani, 1993).
- *Pattern recognition and Machine learning* (Bishop, 2006).
- *Semiparametric Regression* (Ruppert, Wand and Carroll, 2003).

Academic Dishonesty

It is important that you understand what constitutes academic dishonesty and that you are familiar with the very serious consequences. Links to resources that that describe academic dishonesty (including plagiarism, cheating, inappropriate collaboration and examination impersonation) can be found at:
`http://www.umanitoba.ca/faculties/science/student/webdisciplinedocuments.html`
or through the Faculty of Science home page at:
`http://www.umanitoba.ca/faculties/science`
Typical penalties imposed within the Faculty of Science for academic dishonesty are also described.