

ARTSSCI 2R03: Applied Statistical Inference

McMaster University

Term 2, 2016-17

Course Objectives:

By the end of the course the students will be able to:

- Identify and quantify probabilistic uncertainty in a variety of experimental settings.
- Summarize graphically a data set using pie charts, histograms, boxplots and scatterplots; and interpret them.
- Summarize a data set through sample measures such as mean, median, variance and standard deviation; and interpret them.
- Calculate and interpret confidence intervals for population means and proportions.
- Carry out and interpret tests of significance for population means and proportions.
- Carry out regression analyses of data for linear statistical relationships, and predictions.

Course Webpage: We will use **Avenue To Learn** (<http://avenue.mcmaster.ca/>) as the main site for posting course-related material. In Avenue we will post assignments, midterms, solutions, R code, marks and other relevant information.

Instructor: Dr. Román Viveros-Aguilera, HH/212, ext. 23425, rviveros@ms.mcmaster.ca.

Office Hours: Tuesday and Thursday, 2:00--3:00 pm.

Lectures: Tuesday, Thursday & Friday, 11:30-12:20 pm, ABB/271.

Tutorials:

T01: Thursdays, 3:30–4:20 pm, BSB/B155, Tutor: Andrew Lonsdale, lonsdaa@mcmaster.ca.

T02: Thursdays, 4:30–5:20 pm, BSB/B155, Tutor: Elliott Yee, yeeek@mcmaster.ca.

Software: The computing work will be done in R, a freeware statistical software downloadable for Windows and Macintosh platforms from **The R Project for Statistical Computing**, webpage at <http://www.r-project.org/>. You are strongly advised to download the software at your earliest convenience.

Textbook: *The Basic Practice of Statistics*, 7th edition. By David S. Moore, William I. Notz & Michael A. Fligner, 2015.

Assignments: There will be six assignments in the course. Make sure you write your complete name and student number on each page of every assignment. You are required to write well-organized and readable solutions. After marking, your assignments will be returned to you, approximately one week after the due date. Solutions to the assignments will be posted in

the course webpage. To be fair to all, no late assignments will be accepted. Assignment due dates:

Assignment #1: Friday January 20, 3:30 pm.

Assignment #2: Friday February 3, 3:30 pm.

Assignment #3: Friday February 17, 3:30 pm.

Assignment #4: Friday March 10, 3:30 pm.

Assignment #5: Friday March 24, 3:30 pm.

Assignment #6: Thursday April 6, 3:30 pm.

The assignment questions will be posted in the course webpage one week prior to the deadline.

Penalty for Late Assignments: To be fair to all, no late assignments will be accepted. However, the assignment with the lowest score will be dropped in calculating the term assignment average.

Tests: There will be two midterm tests and a 2.5-hour final exam in the April examinations. The midterms are as follows:

Test #1: Friday February 10, class hour, 50 minutes, location: ABB/102.

Test #2: Friday March 17, class, 50 minutes, location: ABB/102.

Solutions to the midterm tests will be posted in the course webpage.

Final Exam: In April, 2.5 hours, scheduled by the Registrar's Office. The final exam period runs from Tuesday April 11 to Thursday April 27. The final exam will be based on all the material covered in the course. Only the McMaster standard calculator Casio fx-991 will be allowed. Solutions to the midterm tests will be posted in the course webpage.

Practical Project: Working in groups of 2 to 3 students, a required project will be conducted. The minimum requirements:

- (i) At least 50 cases of real data.
- (ii) At least 2 variables measured on each case.
- (iii) At least 2 plots.
- (iv) At least two statistical methodologies involved in the analysis.
- (v) At least 10 pages in the report.

The deadline to submit the project proposal is **3:30 pm on Friday March 3**, and for the submission of the final report is **3:30 pm on Thursday March 30**.

Marking Scheme: The final mark will be the highest between **Option 1** and **Option 2** below:

Assignments (6, due-dates: Jan. 20, Feb. 3, 10% Feb. 17, Mar. 10, Mar. 24, Apr. 6)	10%
Midterms (2, dates: Feb. 10, Mar. 17) 20%	30%
Project (deadlines – proposal: Mar. 3, 10% report: Mar. 30)	10%
Final Exam 60%	50%
TOTAL 100%	100%

Expectations:

- (a) **Come to class.** I know you will think that this is an obvious one but it is important nonetheless. Learning statistics is a cumulative experience; what we learn in one class builds upon what was covered in previous sessions. Missing class creates gaps in your knowledge base that will make hard to build on, and the degree of difficulty will increase rapidly.
- (b) **Complete all assignments.** Much like the practice required in learning a foreign language, you will have to practice the techniques we learn in each class to get them to take hold and the homework is a good way to accomplish that. These exercises also will help you familiarize yourself with the software necessary to perform efficiently even simple analyses.
- (c) **Ask questions.** Office and tutorial hours provide a great opportunity to ask for clarifications of the material and questions about your own attempts to solve a problem. When you are stuck, try to explain someone else (classmate friend, tutor, instructor) what you are trying to do. This can often help you identify for yourself the problem you are having. Often the step we are missing is readily obvious to someone who is not trying to solve the problem.
- (d) **Be respectful of others.** Show your respect to your classmates by keeping a quiet and pleasant atmosphere in the classroom so that everyone focus their attention on the presentations and discussions.

These are my secrets for success about learning statistics, they come from my own personal experience as a student and as a teacher of the subject for over 25 years.

McMaster Policy on Academic Integrity. You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences—e.g., the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university. It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty, please refer to the Academic Integrity Policy, located at: <http://www.mcmaster.ca/academicintegrity>.

The following illustrates only three forms of academic dishonesty: 1) Plagiarism—e.g., the submission of work that is not one’s own or for which other credit has been obtained. 2)

Improper collaboration in group work. 3) Copying or using unauthorized aids in tests and examinations.

McMaster Student Absence Form (MSAF). In the event of an absence, students should review and follow the Academic Regulations in the Undergraduate Calendar “Requests for Relief for Missed Academic Term Work.” Please consult the MSAF statement on our website (<https://artsci.mcmaster.ca/forms-requests/>) and direct any questions or concerns to Shelley Anderson or Rebecca Bishop in the Arts & Science Program Office as appropriate.

Academic Accommodation of Students with Disabilities. Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or email sas@mcmaster.ca. For further information, consult McMaster University’s Policy for Academic Accommodation of Students with Disabilities.

Email Contact and Student Responsibility Statement. The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of students to check **their McMaster email** and course websites weekly during the term and to note any changes. Announcements will be made in class and by using the course email distribution list.

Course Schedule

Week 1: Jan. 5, 6	Visualizing data through graphs (Ch. 1)
Week 2: Jan. 10, 12, 13	Summarizing data through measures (Ch. 2), Introduction to R
Week 3: Jan. 17, 19, 20	Normal distribution (Ch. 3); scatterplot plot of data and correlation analysis (Ch. 5) Assignment 1 – Due Jan. 20
Week 4: Jan. 24, 26, 27	Regression analysis (Ch. 5)
Week 5: Jan.31; Feb. 2,3	Producing data: sampling and experimentation (Chs. 8-9) Assignment 2 – Due Feb. 3
Week 6: Feb. 7, 9, 10	An introduction to probability (Ch. 12) Midterm 1 – Feb. 10 (Room ABB/102, class time)
Week 7: Feb. 14, 16, 17	The rules of probability (Ch. 13) Assignment 3 – Due Feb. 17

Mid-term Recess – Feb. 20-26

Week 8: Feb. 28; Mar. 2, 3	The family of binomial distributions (Ch. 14) Project proposal – Due Mar. 3
Week 9: Mar. 7, 9, 10	Sampling distributions and confidence intervals (Chs. 15, 16) Assignment 4 – Due Mar. 10
Week 10: Mar. 14, 16, 17	Tests of significance (Ch. 17) Midterm 2 – Feb. 10 (Room ABB/102, class time)
Week 11: Mar. 21, 23, 24	Inference in action (Ch. 18) Assignment 5 – Due Mar. 24
Week. 12: Mar. 28, 30, 31	Inference about population means and proportions (Ch. 20) Project report – Due Mar. 30
Week 13: Apr. 4, 6	Review Assignment 6 – Due Apr. 6