

Statistical Practice

36-726

Spring 1999

Course Policies and Syllabus

Instructor:	Joseph B. Kadane	Instructor:	Stephanie Land
Office:	232E Baker Hall	Office:	132C Baker Hall
email:	kadane@stat.cmu.edu	email:	steph@stat.cmu.edu
Phone:	268-8726	Phone:	268-1880

Overview

Most statisticians in industry, government, and academia spend a fair bit of their time providing advice and analyzing data for colleagues whose specialties are in some other field. Often, the contribution of the statistician in a scientific collaboration is to sharpen the focus of an investigation by identifying what may, and what may not, be learned from a particular set of data. It is part of the appeal of our discipline that it is application-oriented, yet in most coursework there is inadequate time to take the applications seriously and discover what they are about. The main purpose of this course is to give students some experience in digging more deeply into scientific problems that involve statistical thinking. It is a course intended to aid you in making the transition from being a student of statistics to being a statistics professional.

Whether collaborating with a researcher who has a problem that could motivate development of new methodologies, or helping someone analyze and interpret their data using conventional techniques, communication skills are essential for success. Through practice and discussion, the class will help you to improve your ability to interact with and understand a client. A practicing statistician must be able to summarize results and advice in a clear and useful manner, both verbally and in writing. Work on projects in this course should help you improve these skills as well. Often, a lasting benefit to the investigator will be the education he or she receives from the statistician. This is another aspect of the process that improves with experience, and which you should be conscious of in your work here.

Objectives

This course aims to help you develop your skills so that you will be able to:

- Determine the nature of an investigator's question, and a good way to formulate it statistically;
- Focus listening and speaking on important statistical issues; and
- Write about statistics for people who will use what you have written.

In addition, we will read and discuss various ethical, practical, and interpersonal aspects of consulting so that you can develop your own sense of values as a practicing statistician.

Class Schedule

By starting the class at the beginning of the Spring semester, we hope that projects and teams will be hooked together quickly near the beginning of the semester, giving you the maximum time to interact with your clients and their data, and produce the most sensible analysis you can.

Format, Projects, Grading

You will work in teams (usually pairs) on problems brought in by our clients (who will be faculty, graduate students and staff from CMU and elsewhere). Each team will work with one client on one project for the term; at the end of the term each team will present its project/results to the class and produce a written research report for the investigator (and the instructors), summarizing the work that they've done.

The course timeline will be as follows. Exact dates will be announced in class, and will be somewhat dependent on when the outside investigators are able to present their problems, and so forth.

- During the first two class meetings, we will discuss and demonstrate consulting techniques.

- The next few class meetings will be devoted to problem presentations by the outside investigators. The investigators will speak to the entire class; each team is expected to write a summary of the presentation to be turned in to us.
- Student teams will arrange one or more meetings with the investigator, as needed, and begin working on the problem.
- Written interim progress reports will be turned in to the instructors approximately two weeks after the team hooks up with a project. These reports should have roughly three sections:

The data: What is the data like? Summarize the data qualitatively, numerically, graphically. If the data is not yet available, explain why not and when it is likely to be available, and what form you have been led to expect it in.

The question: What are the research questions that your client is posing? How important are these questions to your client? How have you been able to help the client specify these questions? How well adapted to the data are the client's questions? What (if any) statistical methods might be appropriate?

The difficulties: What are you unsure about in this project; where could you stand to get more clarity (from the client about the problem; from your understanding of statistics; or . . .)? Are there specific difficulties that you can foresee in completing this project?

Deadlines for the interim reports will vary from team to team, depending on when the team gets hooked up with a project, but all interim report deadlines will be on or before February 25, 1999.

- After enough team projects have been set up, teams will make 10-minute presentations to the class on their initial progress. The presentations can follow the same general outline as the written interim reports above.
- Toward the end of the semester, teams will make final presentations to the entire class. Again, each team is expected to write a summary of each other team's oral presentation.

- Final written reports are due to the instructors and the investigators no later than the last day of classes. We will discuss how these final reports might be organized as the course progresses.

As you can see, most of the class periods will be taken up by presentations by outside investigators or student teams. You are expected to participate actively in class and to interact both in class and outside class with the investigators. In addition to working on projects you will also be doing various reading and writing assignments to hone your skills as a consumer and producer of statistical research.

Readings

When we are not having presentations by investigators or students, we will be discussing various aspects of statistical practice. Some representative readings follow. We will assign readings from this list or elsewhere.

Communication & Writing:

- Hoadley, A. Bruce and Kettenring, J.R. (1990). Communications between statisticians and engineers/physical scientists. (Com: pp. 249-274). *Technometrics*, **32**, 243-247.
- Boen, James R. and Zahn, Douglas, A. (1982). *The Human Side of Statistical Consulting*. Wadsworth, Belmont CA. *out of print*.
- Ehrenberg, A.S.C. (1981). The problem of numeracy. *The American Statistician*, **35**, 67-71.
- (1982). Writing technical papers or reports. *The American Statistician*, **36**, 326-329.
- Gopen, George D. and Swan, Judith A. (1990). The science of scientific writing. *American Scientist*, **78**, 550-558.

Scientific Thinking:

- Chatfield, Christopher (1991). Avoiding statistical pitfalls (with discussion). *Statistical Science*, **6**, 240-268.

- Bolles, Robert C. (1988). Why you should avoid statistics. *Biological Psychiatry*, **23**, 79-85.
- Platt, John R. (1964). Strong Inference. *Science*, **146**.
- Cohen, Jacob (1990) Things I have learned (so far). *American Psychologist*, **45**, 1304-1312.

Ethics:

- Ad Hoc Committee on Professional Ethics, American Statistical Association (1983). Ethical guidelines for statistical practice: report of the Ad Hoc Committee on Professional Ethics (with discussion). *The American Statistician*, **37**, 5-20.
- Ellenberg, Jonas H. (1983). Ethical guidelines for statistical practice; a historical perspective. *The American Statistician*, **37**, 1-4.
- Finney, David J. (1991). Ethical aspects of statistical practice. *Biometrika*, **47**, 331-339.

General:

- Hunter, William G. (1981). The practice of statistics: The real world is an idea whose time has come. *The American Statistician*, **35**, 72-76.
- Joiner, Brian L. (1975, 1979). Some advice to young statisticians; Consultant's check list. Unpublished papers.
- Kirk, Roger E. (1991). Statistical consulting in a university: Dealing with people and other challenges. *The American Statistician*, **45**, 28-34.
- Marquardt, Donald W. (1979). Statistical consulting in industry. *The American Statistician*, **33**, 102-107.