Prof. Hans-Georg Müller

e-mail: hgmuller@ucdavis.edu, Office hour: 4236 Math Sci Bldg (MSB), M 4-5, and by appointment.

Meeting Schedule: Tuesdays 2:10-4pm in 1147 MSB.
First class is Tuesday, April 1, 2014, last class is Tuesday, June 3. Note: There will be no class on 4/15 and 5/13, instead there will be classes scheduled on Monday 4/14, 10-12 and Monday 5/12, 10-12, in MSB 1147.
Meetings of students with clients will be scheduled on other days on an ad hoc basis.

Objectives: Learning statistical consulting by actively engaging in consulting activities, in addition to demonstrations, case studies, discussions, and instruction in general principles of consulting and statistical practice. Students will consult in and out of class under the supervision of the instructor.

Prerequisites: Students must be enrolled in the graduate program in either Statistics or Biostatistics. Knowledge of applied linear models (at the level of STA 106 and 108) is a minimum requirement. Knowledge of linear models and random effects models (STA 232AB) and of a statistical package (e.g., SAS or R) is helpful.

Grading: Pass/No Pass.

Requirements: 
Attend all class sessions. You are allowed to miss at most one class session during the quarter. You are not allowed to work on your homework or other assignments during class.
Successful completion of projects. A project is typically a consulting case that consists of: (1) initial consultation with a client in or out of class, (2) reporting on the initial consultation in class, (3) follow-up consulting sessions as needed, usually two or three, and sometimes more, (4) computing (usually with packages, occasionally requiring writing a special program), as needed for the project, (5) a final report delivered orally in class and in writing (one page), and (6) communicating the revised final report and all recommendations to the client. In order to receive a pass, you must successfully complete one or more assigned consulting projects.
Students will typically complete each project as member of a consulting team to which they are assigned. A consulting team may consist of two or more students. Each team is jointly responsible for all activities and reports, and all team members are required to be involved in all consulting cases handled by the team and need to attend all meetings with the client.
Consulting Projects:

After the first meeting with the client, an oral report of the meeting will be given in class, where we will discuss the nature of the problem and strategies for addressing the questions of the client and data analysis. We will also discuss how to provide advice in the subsequent meetings with the client. Usually we will not give specific advice in the initial meeting with the client, unless the problem/question is very obvious and can be answered immediately (example: what is the difference between one- and two-sided alternatives in hypothesis testing). The initial consulting session primarily serves to gain an understanding of the client’s problem and needs, and it is important to listen carefully and get sufficient information about the problem to be addressed. This information will then be conveyed orally to the class by the consulting team.

After the last follow-up meeting with the client, a second and final consulting report is due, which will be presented orally in class, along with a written version (1-2 pages). The oral reports which are due after the first and last consulting for each client normally will be scheduled within one week of the activity that is being reported.

The written part of the final report is limited to approximately 1-2 pages, with a hard copy provided for all class participants. Summarize the problem in one paragraph, along with the name and department of the client, and then proceed to describe the recommended model, method and analysis. Use formulas for the models and methods (not R code notation) and explain their components. Make sure that English style and grammar are in good shape. Based on feedback received in class, the consulting team will then prepare a revised and final version of the report that will be forwarded to the client (typically, various changes will need to be made on the draft version in order to create the final version of the written report). The final report will be conveyed to the client in a meeting or via e-mail. The client should be given the opportunity to ask further questions (clarifications, details, interpretation of the advice).

Some projects will require additional computing or data analysis for the project of a client, or background research in statistics or methodology or applications to address a specific consulting problem.

References:

There is no textbook for this class. A number of relevant articles and a useful reference text by Cabrera and McDougall are as follows (ordered by year):


Here is an outline of the issues which you usually will try to ascertain during an initial consulting session. Your final report will touch upon many of the points listed below. It is recommended that you have a copy of the list below with you when you consult with a client, as this will help you to go over the important items with the client and will give you some guideline how to proceed smoothly during the initial consulting session.

The goal of the consulting report is to summarize the relevant issues. The report should contain enough information to characterize the main question the client has, to clarify your thoughts about the client’s problem, and to make sure you have covered the essential points with the client. When you interact with the client, you may keep in mind the main items which are needed for the report so you do not forget to cover them. Whenever you do not know how to continue the interaction with a client, you may either go over the parts you already wrote down, confirming with the client that your understanding of the client’s problem is correct, or you may continue with the additional items needed for your report. It is a good idea to always convey to the client your understanding of the problem and ask for corrections or additions as needed so that you have a full understanding of the relevant points (typical question addressed to the client would be: “Did I understand you correctly if I assume that you...”). Your reports should be as concise as possible, but without omitting important information or compromising important features of the problem. We need to listen carefully and actively (i.e., asking questions about our understanding) to the client in the initial session and also later in order to avoid misunderstandings or crucial omissions which can derail the consulting process. Ultimately, it is our responsibility as consultants to get an accurate and complete picture of the problem the client is addressing.

The report format, as detailed below, is primarily intended for information gathering in an initial consulting session and serves as a guide for you how to conduct and structure this initial session. As you get more experienced, you will need to follow the report format less and less.

The final report that needs to be submitted in writing will cover only the information that is essential for an understanding of the problem and for the formulation of the statistical advice that you are giving to the client. Besides a succinct description of the problem of the client, the final report will typically include a description of the model or formula that is suggested for addressing the client’s problem, including assumptions, interpretation of the model, as well as advice for data cleaning, initial descriptive data analysis and data checking, and a recommendation on software packages to run the analysis whenever applicable; sometimes also results of data analysis and their interpretation. The report will include any relevant references, textbooks and research or review articles about the statistical methods that are proposed.
INFORMATION GATHERING FOR CONSULTING REPORT

1. Client information
   Name, department, e-mail and phone no. of the client.

2. Problem to be addressed
   (a) Scientific background (field, subfield, topic)
   (b) Main question to be addressed from client’s perspective (write as one sentence or short paragraph)
   (c) Related previous studies by same investigator or other investigators in the same field
   (d) If applicable, obtain copies of papers, especially with examples of previous data analyses, and always ask the client which statistical methods were used before for the analysis of similar problems.

3. Design
   (a) No. of independent cases or units (power calculation)
   (b) Experimental or observational study?
   (d) Special designs (ANOVA, Split plot, Case-Control, Sequential, Equivalence study etc.)
   (e) Planned or unplanned design
   (f) Check with client for (often hidden) biases or dependencies in the data or measurements

4. Measurements and Variables
   (a) Which/how many measurements were made per subject/unit?
   (b) Types of variables, physical units and statistical distributions
   (c) Variation of measurements, measurement process, possible transformations
   (d) Predictor and response variables

5. Preliminary Analysis
   (a) What kind of analysis has the client done, if any?
   (b) Exploratory data analysis, basic plots, data cleaning
   (c) Has the client specific procedures in mind? Are they adequate?
   (d) Have similar data been analyzed by the client or others? References?
Note: The following sections on recommendations and conclusions will usually be the major items in a report on a follow-up consulting session, but often will not figure prominently in an initial consulting session.

6. Recommendations

(a) Data checking and assessing data quality
(b) Data exploration (histograms, box plots, scatter plots, simple linear regressions)
(c) Preprocessing: Outlier removal, transformations, data cleaning
(d) Statistical model, hypothesis test, confidence regions
(e) Diagnostics and residual analysis
(f) Computational implementation and software
(g) Possible interpretation of results

7. Conclusions

(a) Additional consulting schedule if applicable
(b) Who will do what?
(c) Computing issues