UHON 302
How to Lie with Statistics: Uses and Misuses of Numbers in Argument
Spring 2013

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Office Hours:	T/Th 3:30 - 5:00, Farris Engineering (FEC) 331, and by appointment
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Course Webpage:	http://www.cs.unm.edu/~doyen Click Courses->How to Lie with Statistics

Description

People often declare that numbers speak for themselves. It's expected that most claims in today's information age are backed up by data and quantitative analysis. We, as humans, ask big, broad ranging questions: Are students learning? Why is the rate of autism increasing? Who will be the next president? Lobbyists and policymakers stockpile arsenals of numbers to bolster their positions. Everyday personal decisions, such as what to eat, are now weighed against statistical claims from medical data. Predictions about the future, such as elections, are based on a small sample of observations in the present.

Statistics tackles questions of uncertainty. The math behind the statistics can be daunting, but students in this class do not need to have taken statistics before. Students will learn how to calculate simple statistics and make intuitive pictures that show the uncertainty in data. Complex issues arise in the types of questions and analyses that can be covered; providing fertile grounds for debate: by social scientists; educators; humanitarians; scientists; doctors; policymakers; anyone that ever wants to make an informed decision. The field of statistics is a relatively young branch of mathematics, therefore, many of the same people who strive for statistical fact lack the experience to judge how numbers are generated and statistics are employed. This course is an opportunity for students to learn how to calculate statistics, to understand why specific statistics are—and aren't—applicable in specific cases, and judge the ways people use them in decision making.

Required Texts

- *The Mismeasure of Man*, Stephen J. Gould
- *Polling and the Public*, Herbert Asher
- Research articles and additional readings, as made available on eReserves
- Current statistics blogs on health and policy studies

Grades

There are a possible 100 points in the class, as follows:

• Attendance	15
• Participation	10
• Written notes	10
• Blog posts	15
• Individual critical assessment	20
• Group oral presentation	15
• Group critical assessment	15

Final grades: A = 90 - 100 points. "Credit" = 70 - 89 points. Fewer points will earn "no credit".

Requirements

Attendance

Honors courses are about discussion and sharing ideas, therefore attendance is required and you are expected to be on time. Unexcused absences will affect your grade. If you miss class and have a valid excuse, you must provide evidence (doctor's notes, etc...) as soon as possible. If you know you will miss class before hand, notify the instructor prior to the absence. Students with three or more unexcused absences will be docked 3 points for each absence.

Participation

In class, we will speak statistics. We will argue statistics. We will do statistics. Argument requires the exchange of ideas, therefore, sharing your thoughts will enhance the educational experience of everyone. Listening and reflecting on others' thoughts is integral to the success of the course. In class, expect to get your hands "dirty". We will work hands-on with statistics: calculating, drawing graphs, and analyzing results. Be prepared to share your calculations, drawings and analysis with your peers. If this were an acting class, we would not simply discuss, critique and watch acting, we would also do acting while learning from each other. If this were a French class, we would not just discuss grammar, you would also speak French... with each other. Similarly, in this course, you will *do* statistics both inside and outside of the classroom as well as *discuss* statistics with each other.

Written Notes on Readings

You are expected to complete assigned reading before each class and be prepared to discuss that reading. For each assigned reading, write about a page of notes for yourself. Keep these organized in a notebook that I will check frequently. Occasionally, I will give you a guided questions to answer for specific readings. These guided questions may include some statistics for you to calculate.

Course Blog Posts

We have a course blog for discussions. Many professional debates over the uses and abuses of statistics occur in the blogosphere. This is an opportunity for you to participate in such written discussions and arguments. You are required to make 2 posts every week on our blog (15 weeks, so at least 30 posts total). You are welcome to make more posts.

Of the 30 posts, you must include:

- At least 3 media blog posts (described below)
- At least 3 topic blog posts (described below)
- 4 responses to specific questions that I will ask to you on the blog
- At least 6 responses (comments) to posts from other students

Media Blog Posts: At least 3 must be original posts written by you that point out something interesting you have found in the media (newspaper article, magazine article, expert blog, or something like that) that relates to something we have discussed in class. For this post, provide a

link to the article, describe how statistics were used including any conclusions drawn from those statistics. Describe whether you think that this was a good use of statistics and/or a reasonable conclusion. Describe how the statistics or conclusion could be improved. These posts should be spread throughout the semester, so I have put deadlines for these posts in the syllabus schedule listed as **Media Blog Post** (1-3). Your first Media Blog Post can be done anytime before the deadline for Media Blog Post 1. If you miss the deadline for Media Blog Post 1, you will not get credit for it, even if you later put up two posts before the Media Blog Post 2 deadline. Media Blog Post 2 must be done after the deadline for Media Blog Post 1 but before the deadline for Media Blog Post 2. Media Blog Post 3 must be done after the deadline for Media Blog Post 2 but before the deadline for Media Blog Post 3. This ensures that they are spread throughout the semester.

Topic Blog Posts: At least 3 of your posts must be original posts relating to something discussed in class. These posts should also be spread throughout the semester, and so I have put deadlines for these posts in the syllabus schedule listed as **Topic Blog Post** (1-3). The deadlines for Topic Blog Posts work the same as for Media Blog Posts. You must make the post before the appropriate deadline, but not before the deadline of the previous post. For example, if you make several posts early in the semester (before the Topic Blog Post 1 deadline) you will only get credit for one of them.

All posts (to earn credit) must contain at least 3-5 substantial sentences and relate to the course. Remember that this is an academic blog and so your writing should be appropriately formal. Check your spelling and grammar. Do not use LOLspeak.

Individual Critical Assessment

As a mid-term written assignment, you will critically asses a statistical concept that we have covered. Write about the proper use of this statistic, including what conclusions can be drawn from it. Discuss how it has been applied in a topic area that we have covered in class. Discuss whether this is an appropriate application. If not, discuss what is wrong with it, how it could be applied properly or what statistic would be better. More details on this assignment will be given.

Collaborative Critical Project & Oral Presentation

You will find a statistical concept of your choice (not covered in class) to learn about and teach to the class. Your audience in this presentation is the class and so you will be evaluated by the class. Usually, in math or statistics courses, you have to demonstrate your knowledge to an expert (the professor). In this class, your goal is to explain your knowledge to your peers, which can actually be more difficult. You will also produce a written report. This report should include everything you covered in the oral presentation as well as a response to the feedback you received from classmates. More details on this assignment will be given.

Policies

Classroom Behavior

- Respect your classmates and instructor. While you are physically in class, you are also expected to be mentally present. Turn off cell phones before class, do not do non-class activities (reading non-class material, sleeping, emailing, texting, playing games, etc).

- We will be discussing controversial topics in class. You may express any view you like, but discussion must remain focused on the statistics involved in any claim. Our goal is not so much to debate the topics themselves as it is to debate the use of statistics. In an honors course, I expect that all students can separate their personal opinions about a controversial topic from the critical analysis of statistics, not unlike the practice of arguing both pro and con in a debate. Personal attacks or insults during discussion will not be tolerated.

Grades and Written Work

- Assignments are due at the beginning of class. Assignments that are completed electronically are due at 10pm on the due date.

- Late assignments: For each day that an assignment is late, you'll lose 10% of the total points possible.

- Students are expected to act according to the Student Code of Conduct as outlined by the University. Any plagiarism or academic dishonesty will result in a failing grade for that assignment and possibly in the course.

- A major objective of this course is for you to learn to do statistics. When solving math-type problems, I encourage you to use educational aids, such as me, your classmates, the internet or other resources. However, copying answers is cheating. If you were asked the question again a week later, could you answer it yourself without help? Do you know how to answer a similar question even if the exact steps to solving the problem differ? If not, then you have not learned how to answer the question and submitting an answer as though it is your own is considered cheating.

Special Circumstances

- Students who have special needs that may affect their ability to participate in this course are asked to disclose those needs to me as early as possible so appropriate accommodations can be made. For more information consult UNM's Accessibility Resource Center (http://as2.unm.edu/).

- Please talk to me about any other special circumstances or concerns regarding this course.

Syllabus

Readings and assignments are to be **completed** by the date listed. Bring the reading (electronic or paper) with you to class, along with your notes. This schedule is subject to change.

Week 1	Tu 1/15	Introduction and syllabus: Why are we here and what are we doing?
	Th 1/17	Statistical concepts and implications Reading: Kimble, *The Nature of Statistics* (eReserves)
Week 2	Tu 1/22	Argument, inquiry, math and the power of data Reading: Gould, Introduction + Chapter 2
	Th 1/24	Data collection and bias Reading: Gould, Chapter 3
Week 3	Tu 1/29	Descriptive statistics Reading: Gould, Chapter 4
	Th 1/31	Data spread and statistical significance Reading: Gould, Chapter 5
Week 4	Tu 2/5	Assigning implications and drawing conclusions
	Th 2/7	Probability distributions Reading: Gould, Chapter 6 Assignment: Media Blog Post 1
Week 5	Tu 2/12	Parameter estimation for the normal distribution
	Th 2/14	Statistical significance tests Reading: Gould, Chapter 7 Assignment: Topic Blog Post 1
Week 6	Tu 2/19	Measuring intangibles Reading: Asher, Chapters 1 and 2
	Th 2/21	Sampling from a population Reading: Asher, Chapters 3 and 4
Week 7	Tu 2/26	What questions can polls answer? Reading: Asher, Chapters 5 and 6

	Th 2/28	Gathering data versus influencing outcomes Reading: Asher, Chapter 7
Week 8	Tu 3/5	Point estimates Reading: Asher, Chapter 8 Assignment: Individual Critical Assessment due
	Th 3/7	Confidence intervals Reading: Asher, Chapter 9 Assignment: Media Blog Post 2
	3/11 - 3/15	**Spring Break, no class**
Week 9	Tu 3/19	Election forecasting Reading: Nate Silver (online)
	Th 3/21	Assessing which prediction or forecast is best Assignment: Topic Blog Post 2
Week 10	Tu 3/26	Medicine and statistics Reading: Watch Frontline, *The Vaccine War* (online)
	Th 3/28	What is a cause? Reading: Wakefield et al. (eReserves)
Week 11	Tu 4/2	Predictors versus causes Reading: Response to Wakefield (eReserves)
	Th 4/4	Correlation Reading: Cook, *Irreproducible Results* (online)
Week 12	Tu 4/9	Hidden and confounding factors Reading: Potti, et al (eReserves)
	Th 4/11	Hypotheses Reading: Coombes, et al (eReserves) Assignment: Media Blog Post 3
Week 13	Tu 4/16	Hypothesis testing
	Th 4/18	Sensitivity and errors Assignment: Topic Blog Post 3

Week 14	Tu 4/23	Presentations of Critical Projects
	Th 4/25	Presentations of Critical Projects
Week 15	Tu 4/30	Reflect on presentations
	Th 5/2	Write-up reports / reactions to peer-evaluation