Meta-Topics in Statistics for Behavioral Data and Modeling Behavioral Data

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CRN 46232 COGS-6965-01

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Individual Session with Instructor: tbd
Reading Group Session: Fri 12-15:45
Classroom: 1w01 (The Bray room) in the Jonsson-Rowland Science Center

This is a graduate level course.

1 Description— (A superset of the papers we will read and discuss)

Describing what this course is not is easier to do than describing what it is. It is not a course on probability theory, it is not a course that will teach statistical methods or techniques. It is a course about issues confronting researchers who collect and analyze behavioral data.

We will start the seminar in week 1 with a lecture on Damaged Merchandise? (Gray & Salzman, 1998). In weeks 2-4 we will read and discuss Abelson’s (1995) famous book, Statistics as Principled Argument. From there we will intellectually meander around topics such as in the long list that follows. We definitely will cover the topics (if not all of the papers) in topics 1-3. After that we may sample from some of the remaining topics (4-12) depending on class interest and the time we have available.

2 Readings

2.1 Damaged Merchandise??!!
Week 01

- Gray and Salzman (1998)

2.2 Statistics as Principled Argument
Week 02 – 03

- Abelson (1995)
2.3 History - optional reading
Analysis of Variance in Human Research (Rucci & Tweney, 1980)

2.4 Null Hypothesis Significance Testing (NHST)
2.4.1 Critiques

Week 04

- An early salvo!! An early debate:
  - *The Earth is Round* (p < .05) (Cohen, 1994)

- Commentators
  - (Hubbard, 1995)
  - (Baril & Cannon, 1995)
  - (McGraw, 1995)
  - (Svyantek & Ekeberg, 1995)
  - (Parker, 1995)
  - (R. W. Frick, 1995)

- The Reply: (Cohen, 1995)

2.4.2 After Shocks

Week 05: Sept 27th

- The *Dance of the P Values*: [http://www.youtube.com/watch?v=ez4DgdurRPg](http://www.youtube.com/watch?v=ez4DgdurRPg)
- Youtube video on the BIC
- Another Youtube video on BIC
- Confidence Intervals as the answer: Hoekstra, Morey, Rouder, and Wagenmakers (2013)!

Week 06: Oct 4th – On the other hand, . . .

- But . . . if you know what you are doing, you can do it well . . . Nickerson (2000)!!

- Optional Readings
  - Significance testing dies hard! Falk and Greenbaum (1995)
  - Friends of NHST!! R. Frick (1996)

Week 07: Oct 11th – Alternatives to NHST?

- Rest of Nickerson (2000)

- Optional Readings: Updates on NHST and Official Policy
2.5 A Few Alternatives . . .

Week 08: Oct 18th – Where are we now??

- The Likelihood Ratios alternative: Glover and Dixon (2004), lecture by R. Hope with a how to do . . . walkthrough of R code.

2.6 Replicability: The Pashler and Wagenmakers Discussion

Week 09: Oct 25th

- Editor’s Intro: (Pashler & Wagenmakers, 2012)
- Diagnosis: Pashler and Harris, 2012; Makel, Plucker, and Hegarty, 2012; Bakker, van Dijk, and Wicherts, 2012; Ferguson and Heene, 2012; Giner-Sorolla, 2012; Klein et al., 2012; Francis, 2012; Galak and Meyvis, 2012; Simonsohn, 2012
- Commentary: Ioannidis, 2012

2.7 From Fixed-Effects to Mixed-Effects

Week 10: Nov 1st – There at the Beginning

- The first salvo! Clark (1973): Language As Fixed-Effect Fallacy - Critique Of Language Statistics In Psychological Research
- Counterattack! Wike and Church (1976): Comments

Week 11: Nov 8th: Mixed-Effects

- Background reading on random effects modeling – Keppel (1991, 485-487 and Appendix C)
- Baayen, Davidson, and Bates (2008)

2.8 Everyday Statistical Illiteracy

Week 12: Nov 15th – This is really scary!

2.9 The Influence of a Pretty (Brain) Image
Week 13: Nov 21st: Glowing brains – Is one pretty picture worth a thousand serious thoughts?

- McCabe and Castel (2008)
- Maybe not so persuasive after all?? (Michael, Newman, Vuorre, Cumming, & Garry, 2013).

2.10 Next???
Week 14: Dec 6th Student’s Choice??!!!

2.10.1 Once more unto the breach!! (Wm. Shakespeare)
What does a distinguished set of cognitive researchers have in common with Shakespeare’s play “King Henry V”?
Well, clearly Shakespeare’s line is a not so subtle metaphor for the recurrent interest of 20th science on the entire significance testing thing (how did he know??). Let’s talk during our next class (Nov. 22nd) about whether we want to read this newest (not yet published and maybe will never be) take on the subject: The $p < .05$ Rule and the Hidden Costs of the Free Lunch in Inference.

3 Reference Material
Combination of citations from some of the above and other citations that seem possibly relevant to the course topic.

3.1 Catch Up!
Rodgers revisited

- Robinson and Levin (2010)
- Rodgers (2010)
- Harlow (2010)

3.2 How Many Subjects?
Is one enough?

- Ericsson, Chase, and Faloon (1980)
- Anzai and Simon (1979)
- Ebbinghaus (1885/1913)

3.3 Methodological Thought
Pre-WWII German and Austria vs pre-war American

- Watson (1934)
- Toomela (2007)
- Ohlsson (2007)
3.4 Measurement and Method!! Validity begins here: Measurement-as-theory, measurement as misconception?


- Response Time
  - Effective analysis of reaction time data (Whelan, 2008)
  - Mental chronometry and individual differences: Modeling reliabilities and correlations of reaction time means and effect sizes (Miller & Ulrich, 2013)
  - On the linear relation between the mean and the standard deviation of a response time distribution (Wagenmakers & Brown, 2007).


- Moving beyond the mean in mental chronometry (e.g., Balota & Yap, 2011; Newell & Hancock, 1984); Forgotten Moments - A Note On Skewness And Kurtosis As Influential Factors In Inferences Extrapolated From Response Distributions

- Good News for Bad Clocks (e.g., Ulrich & Giray, 1989)

- Method or Theory? Where’s the Beef?? (Greenwald, 2012)

3.5 Statistics as Cognitive Theory

- Interlude – Taking our statistics too seriously? Statistics as Cognitive Theory - Stats into Theory? Theory interpreted Stats? (e.g., Gigerenzer, 1991; Glassman, 2012)

4 Logistics, Requirements, etc.

4.1 Participation

The class will be run as a graduate seminar. On week one, the instructor will lecture, but on following weeks, all students will be expected to read one or more of the readings and be prepared to lecture and discuss on all or part of that reading. *Lecture and leading a discussion* entails preparing a visual, slide-based presentation that supports your verbal presentation.

On other weeks, different students will read and present different papers. (On those weeks, it will not be expected that each student reads all papers but it will be expected that each student’s presentation will be support by slides.)

All students will be expected to comment and discuss the readings based on *how the author frames and presents his or her work*. That is, all of our grad students are capable of free-associating and generating, at times, interesting ideas without reading the material. However, that is not acceptable. If you have not done the work expected for that week’s class, do not come to class.

4.2 PreRequisites

Permission of the instructor. This is a graduate research seminar. However, interested undergraduates are encouraged to contact the instructor to discuss their participation in the seminar.
Responsibilities and assignments for undergraduates will be discussed and agreed on, in writing, by the student and the instructor.

4.3 About the Instructor

Professor Gray has been a member of the Cognitive Science Department at RPI since the Fall of 2002. For details on his research interests and activities see his homepage.

5 Honors Policy

My expectation is that all of the work you do for me in this class will be the work of one individual. Exceptions to this rule will be broadcast to the class by email.

As you will all find out, I explicitly encourage you to engage in public (using email and other media to broadcast a message to the entire) or private (one-to-one) discourse regarding the readings and topics raised in this class. Study groups are encouraged.

If any of you have any questions regarding current situations or future situations, remember that I am your first contact on this. Please come and see me.

6 Grading Policy

6.1 Examinations

There are no examinations

6.2 Active Participation

65% For reading papers and for active participation in all discussions on all weeks in which the seminar is held. Exceptions due to professional travel or other activities need to be discussed with the instructor ahead of time.

45% Formal presentations based on assigned readings.

In general, 1-2 students will be assigned the discussion leaders for each week’s readings. The discussion leaders will prepare slides to organize and structure the discussion of their paper. All students are expected to join in the active discussion.

7 References

Please note that this listing includes both misses and false alarms! That is, it excludes some papers that will be read and discussed and includes some that will not be read and discussed. Please consider this list as representative of the types of papers that will be read and discussed.


