Professor Deborah G. Mayo
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Office Hours: Tuesdays 3-4; Wednesdays 1:30-2:30

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PHIL 6014 (crn: 20919): Spring 2023
Philosophy of Inductive-Statistical Inference
Wed 4:00-6:30 pm, McBryde 223

Syllabus: Second Installment

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D. Mayo (2018) ***Statistical Inference as Severe Testing: How to Get Beyond the Statistics Wars*** (SIST*)* CUP, 2018: *SIST* (electronic and paper provided to those taking the class; proofs are at errorstatistics.com, see below).

Supplementary text: Hacking, I. (2001). *An introduction to probability and inductive logic*. Cambridge University Press. Articles from the Captain's Bibliography (links to new articles will be provided). Other useful information can be found on the SIST Abstracts & Keywords and this post with SIST Excerpts & Mementos)

Date	Themes/readings
1. 1/18	**Introduction to the Course:** **How to tell what's true about statistical inference (1/18/23 SLIDES here)** ***Reading:*** *Statistical Inference as Severe Testing: How to Get Beyond the Statistics Wars* (SIST): Preface, Excursion 1 Tour I 1.1-1.3, 9-29 *MISC:* Souvenir A; SIST Abstracts & Keywords for all excursions and tours

2. 1/25	**Error Probing Tools vs Comparative Evidence: Likelihood & Probability**
	 What counts as cheating? Intro to Logic: arguments validity & soundness (**1/25/23 SLIDES** here)
	       Reading: SIST: Excursion 1 Tour II 1.4-1.5, 30-55
	       Session #2 Questions: (PDF**)**
	 MISC: NOTES on Excursion 1, SIST: Souvenirs B, C & D, **Logic Primer** (PDF)

3. 2/1	**Induction and Confirmation: PhilStat & Formal Epistemology**
	 The Traditional Problem of Induction; Is Probability a Good Measure of Confirmation? Tacking Paradox (**2/1/23 SLIDES** here)
	       Reading: SIST: Excursion 2, Tour I: 2.1-2.2, 59-74; Hacking "The Basic Rules of Probability" Hand Out (PDF)
	       UPDATED: Session #3 Questions: (PDF**)**
	 MISC: Excursion 2 Tour I Blurb & notes

4. 2/8 & 5. 2/15
 	
 Assign 1: 2/15
	Falsification, Science vs Pseudoscience, Induction/Statistical Crises of Replication in Psychology & other sciences
	 Popper, severity and novelty, array of problems and models
	 Fallacies of rejection, Duhem's problem; solving induction now (**2/8/23 SLIDES here**)
	       Reading for 2/8*:* Popper, Ch 1 from *Conjectures and Refutations* **up to p. 59.** (PDF),
	       This class overlaps with the next, so if you have time read **Excursion 2, Tour II:** (p. 75-82); Exhibit vi. (p. 82); and p. 108
	       (2/15/23 SLIDES here**¹ Session #4 Questions: (**PDF**)**
	 MISC **(2/8):** Self-quiz on Popper for Fun! (PDF); Cartoon Guide to Statistics (Link to VT Library link is here)
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	       Reading for **2/15**: SIST: Excursion 2, Tour II¹. Optional for 2/15: Gelman & Loken (2014)
	       ASSIGNMENT 1 (due 2/15) (PDF)
	 MISC (2/15): SIST Souvenirs (E), (F), (G), (H); Excursion 2 Tour II Blurb & notes

	Fisher Birthday: February 17: Celebration of N-F wars
6. & 7. 2/22 Q 6 & 7. 3/1	**Ingenious and Severe Tests: Fisher, Neyman-Pearson, Cox: Concepts of Tests** *Reading for 2/22 from* SIST: Excursion 3 Tour I: 3.1-3.3: read the sections that interest you, choosing to focus on the statistical tests, the history and philosophy of Fisher, Neiman and Pearson, the example of GTR. **Choose 2 from the Triad (they're very short): Fisher (1955), Pearson (1955), Neyman (1956)** **(2/22/23 SLIDES** here) **Session #6 Questions: (**PDF**)** **Optional: The pathological Fisher (fiducial) and Neyman (performance) battle: SIST 388-391** -- ***Reading for 3/1:*** **Sections from SIST skipped last week: Excursion 3 Tour I: (If time, look at the discussion of trade-offs 328-330) If interested in fiducial frequencies, see Neyman's Performance and Fisher's fiducial Section 5.8** **Optional: Excursion 3 Tour II: It's the methods, stupid** *MISC:* Excursion 3 Tour I Blurb & notes; **Souvenirs (I), (J), (K); Morey app including Examples & Instructions (here);**

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¹Read sections that interest you from those not covered last week. You can choose the example in 2.6 (or one from your field) or the discussion of solving induction in 2.7

	Apps for statistical testing (SEV Apps)
	SPRING BREAK Statistical Exercises While Sunning (March 4-12)

The following is very tentative, and will depend on student interests

8. 3/15 Assign 2	Deeper Concepts (2 parts): Stat in the Higg's discovery, and Confidence intervals and their duality with tests **Reading** (for first part): Excursion 3 Tour III, 3.8 Higgs Discovery (See the ASA 6 principles on P-values: Note 4, P. 216, and Live Exhibit (ix) p. 200: Souv. N p. 201 **Reading** (for second part): Excursion 3 Tour III, 3.7: pp. 189-195
9. 3/22	Testing Assumptions of Statistical Models (Guest Speaker: Aris Spanos on misspecification testing in statistics) **Reading:** Excursion 4 Tour IV 4.8
10. 3/29 Mini essay	Who's Exaggerating what? Bayes factors and Bayes/Fisher Disagreement, Jeffreys-Lindley Paradox (Guest Speaker: Richard Morey on Bayes Factors) **Reading**. Excursion 4 Tour II
11. 4/5	Objectivity and Subjectivity in Error Statistics & Bayesian Philosophies **Reading:** Excursion 4 Tour I: 4.1, 4.2; 221-238; Excursion 6, Tour I: 395-423 Peek Ahead: 6.7 Farewell Keepsake: 436-444
12. 4/12 Assign 3	Biasing Selection Effects and Randomization **Reading**: Excursion 4 Tour III (optional 5.7 Statistical Theatre: "Les Miserables Citations": 371-381)
13. 4/19	Power: Pre-data and Post-data **Reading**: Excursion 5 Tour I
14. 4/26	Positive Predictive Value and Probabilistic Instantiation *Controversies about inferring probabilities from frequencies (in law and epistemology* *)* **Reading**: Selection from Section 5.6 (excursion 5 Tour II); C. Howson (1997)
15. 5/3	Current Reforms and Stat Activism: Practicing our skills on some well-known papers
	Final Paper

THIS SYLLABUS IS SUBJECT TO CHANGE AS ANNOUNCED IN CLASS COMMUNICATION
Evaluation (this will be custom-tailored to student's strengths & interests). The following is tentative:
3 assignments (choice of reading questions or exercises) 35; Short essay 20; Participation 10
Class presentation or short write up of an example from your field of interest 5+ extra credit.
Final paper or project 30.

Methodological discussions and advocacy today is directed at being nontechnical or requiring very minimal understanding of technical complexities. However, the discussions are often mired in confusion, and infused with controversial philosophical assumptions. This course will enable you to critically assess these arguments and debates, apply statistical ideas to doing original research in philosophy of science, and across the landscape of fields that involve statistical ideas and controversies.

Reading. An active and interesting class will be the result of your engaging in discussion, which in turn depends on having done the bulk of the readings. I have posted short summaries of each Excursion so you can get an

overview. There are also "souvenirs" (takeaways). Skip whatever sections seem too technical, but ask about them in class. I will generally send questions for the next class, depending on the activity of the day. I expect some guest presentations in the spring. The syllabus will include some catch-up days.

The text distills many years of working through the materials, so the reading isn't heavy, but there's a lot packed in. A long list of original sources are linked to this syllabus, in a separate Bibliography (others are likely to be added) in the Captain's library. I will pinpoint some these as optional in connection with class themes. Your final paper includes at least 2 of these resources. We have people with very different backgrounds and interests– as we have in the past–and letting participants choose which areas they want to spend the most time on easily accommodates this. I will also adjust topics in the syllabus accordingly.

Class presentations: I would like to give everyone the opportunity to present a portion of the seminar, perhaps as a pair or team. This has worked well in the past. Anyone who prefers not to (or if there's insufficient time) can write (and share) an example of a current controversy in your field of interest. Everyone is free to earn extra credit points by sharing examples or contributing to my blog.

Doing PhilStat: I will provide a separate document on what's special about doing and writing philosophy. It involves a type of generosity of interpretation, and slow pondering over a position and argument, that might feel different for those who haven't written philosophy before. However, it's a skill that will make you a better writer and more critical thinker in any field. It will feel new to some of you, please be patient. By the same token, working with formal notions and equations might be new to some. You will be able to work in groups on the exercises. Be patient and trust me. I will always give many examples associated with a "stat exercise". The book is written so that an idea not caught in one place is caught in another. We'll work in stages, not questioning everything at once. So everyone is bound to be energized and stimulated, and we will all be in a much better position to contribute to the urgent business of improving science and philosophy of science.