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PHIL 6334 (crn: 15631): Spring 2014
Philosophy of Statistical Inference and Modeling
Thurs 3:30-6:15pm, Major Williams 225
Syllabus: Fourth Installment (April 2)

<i>Date</i>	<i>Theme/Assignment</i>
1. 1/23	Introduction to the Course: Four waves of controversy in the philosophy of statistics
2. 1/30	How to tell what's true about statistical inference: Probabilism, performance and probativeness Introduction to probability and statistical inference Reading: • Draft of chapter 1 of "How to Tell what's True about Statistical inference" (HOTTT): Mayo forthcoming CUP • Mayo (2005) "Philosophy of Statistics" * • Probability/Statistics notes (Spanos) Optional: • Mayo (2004) "An Error-Statistical Philosophy of Evidence"
3. 2/6 Ex.-1	Induction and Confirmation: Formal Epistemology Bayesian confirmation philosophy: B-bumps and tacking paradox Reading: • Fitelson, B. & Hawthorne, J. (2004). "Re-Solving Irrelevant Conjunction with Probabilistic Independence" • Probability/Statistics notes (Spanos) • Crupi, V. & Tentori, K. (2010). "Irrelevant Conjunction: Statement and Solution of a New Paradox"

4. 2/13	Induction, falsification, severe tests: Popper
Q-1	Reading: • Popper, K. (1962). <i>Conjectures and Refutations</i>: 35-59 • Chapter 1 (EGEK)
5. 2/20	Statistical models and estimation Reading: • Probability/Statistics notes (Spanos)
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6. 2/27	Fundamentals of significance tests and severe testing
Ex-2	Reading: • Mayo, D. & Cox, D. R. (2010). “Frequentist Statistics as a Theory of Inductive Inference” (1st half) • Probability/Statistics notes (Basics of testing)
7. 3/6	Fraudbusting and scapegoating 1
Q-2	Five sigma and the Higgs Boson discovery Is it “bad science”? (the p-value police) Reading: • Short section from chapter 3, HOTTT; Lindley-O’Hagan letter • Mayo, D. & Cox, D. R. (2010). “Frequentist Statistics as a Theory of Inductive Inference” (2nd half) • Probability/Statistics notes (Spanos) Optional: • Mayo, slides from the Boston Colloquium: “Is the philosophy of probabilism and obstacle to fraudbusting” • Ch. 9 EGEK
<i>SPRING BREAK Statistical Exercises While Sunning</i>	

8. 3/20 Ex-3 Q-3	Fundamentals of Testing: Family Feuds and 70 years of controversy One passage, five interpretations (from HOTTTS) Reading: • The “triad”: Fisher (1955), Pearson (1955), Neyman (1956) • Howson and Urbach (2006): Chapter 5 Spring Break exercises Optional: • Chapter 11 EGEK or • Mayo, D. & Spanos, A. (2006). “Severe Testing as a Basic Concept in a Neyman-Pearson Philosophy of Induction”
9. 3/27 Essay #1 (or no later than 4/3)	How can we test the assumptions of statistical models? Philosophical problems of M-S testing: circularity, infinite regress, double-use of data and data snooping Reading: • Mayo and Spanos (2004), "Methodology in Practice: Statistical Misspecification Testing". • Meehl, P. (1978) Theoretical Risks and Tabular Asterisks: Sir Karl, Sir Ronald, and the Slow Progress of Soft Psychology. • Probability/Statistics notes (Spanos) Optional: • Spanos (2013) “Who Should Be Afraid of the Jeffreys-Lindley Paradox?”

10. 4/3 Q-4	Error Statistical Philosophy: Highly Probable vs Highly Probed 13 howlers of tests Reading: • Mayo & Spanos (2011). “Error Statistics” (mainly 178-195). • Howson, C. (1997). “A Logic of Induction”; Mayo (1997). “Response to Howson and Laudan” Optional: • Achinstein, P. (2010). “Mill’s Sins or Mayo’s Errors?”, and Mayo (2010) “Exchange with Achinstein”.
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11. 4/10 Ex-4	Bayesian Inference Reading: - Barnett 1999 (Chapter 6) - Spanos notes (Lecture notes 7)
12. 4/17 Q-5	Objectivity Bayesian-frequentist reconciliations, and Objective-Bayesians Reading: (tentative) - Howson, C. & Urbach, P. (1993). Chapter 15: "Objections to subjective Bayesian theory" - Selected pages: Cox D. R. and Mayo. D. G. (2010). "Objectivity and Conditionality in Frequentist Inference" (276-282;288-291;294-303) - Spanos (2010). "Exchanges with David Cox and Deborah G. Mayo" Optional: - Senn, S. (2011). "You May Believe You Are a Bayesian But You Are Probably Wrong "
13. 4/24 Ex-5	Statistics and Scientific Integrity (Fraudbusting and scapegoating 2) S. Stanley Young, PhD , Assistant Director for Bioinformatics, National Institute of Statistical Sciences Research Triangle Park, NC (TBA) Reading: - Young & Karr (2011). "Deming, data and observational studies: A process out of control and needing fixing." - Begley & Ellis (2012) "Raise standards for preclinical cancer research." - Ioannidis JPA (2005). "Why most published research findings are false"

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14. 5/1	Overview: Answering the critics + topic to be chosen by students Topic: (Arguments to) the Strong Likelihood Principle Reading: Mayo: “An Error in the Argument to the Strong Likelihood Principle” (E& I: 305-314) Topic: Probability and Dutch Books Dutch books Reading: • Bacchus, F., H. E. Kyburg, and M. Thalos (1990). “Against Conditionalization” (Section from Mayo HOTTS) Topic: What ever happened to Bayesian foundations? (should philosophy be divorced from methodology?) Reading: • Gelman & Shalizi (2013) "Philosophy and the Practice of Bayesian Statistics" and Mayo (2013) "Comments". (selected pages) • Other: TBA 5/2 Dept. colloquium: Mayo: “An Error in the Famous Argument to the Strong Likelihood Principle” (E& I: 305-314)
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THIS SYLLABUS IS SUBJECT TO CHANGE AS ANNOUNCED IN CLASS COMMUNICATION

Michael Michaelides (TA for Prob/Stats)

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Office hours: Tuesday 3:30-5:30 (Pamplin RM 3121)

Evaluation (tentative)

8-9 short items (~54)

4 of 5 micro essays in response to reading questions

4 of 5 prob/stat exercises 1 example (PhilStat in your field, article, other with write-up)

Short essay + rewrite 15

Final paper 25

Participation and Contributions

BIBLIOGRAPHY:

E&I: Mayo & Spanos (eds) (2010). *Error and Inference: Recent Exchanges on Experimental Reasoning, Reliability and the Objectivity and Rationality of Science*, CUP.

EGEK: Mayo ([1996](#).) *Error and the Growth of Experimental Knowledge*, U of Chicago P.

http://www.phil.vt.edu/dmayo/personal_website/bibliography%20complete.htm

PTSI: Spanos (1999). *Probability Theory and Statistical Inference: Econometric Modeling with Observational Data*, CUP.

Readings:

Bacchus, Kyburg, & Thalos (1990). Against Conditionalization, *Synthese* (85): 475-506.

Barnett, V. (1999). *Comparative Statistical Inference*, John Wiley & Sons.

Begley & Ellis (2012) Raise standards for preclinical cancer research. *Nature* 483: 531-533.

Berger, (2003). [Could Fisher, Jeffreys and Neyman have Agreed on Testing?](#), *Stat Sci* 18: 1-12.

Cox & Mayo. (2010). [Objectivity and Conditionality in Frequentist Inference](#) (**E&I**: 276-304).

Crupi & Tentori (2010). [Irrelevant Conjunction](#): Statement and Solution of a New Paradox, *Phil Sci*, 77, 1-13.

Fisher ([1955](#)), Statistical Methods and Scientific Induction, *J R Stat Soc* (B) 17: 69-78.

Fitelson & Hawthorne ([2004](#)). Re-Solving Irrelevant Conjunction with Probabilistic Independence, *Phil Sci* 71: 505-514.

Gelman & Shalizi (2013). ["Philosophy and the Practice of Bayesian Statistics" \(with discussion\)](#), *Brit. J. Math. Stat. Psy.* 66(1): 5-64.

Howson (1997). [A Logic of Induction](#), *Phil Sci* 64(2): 268-290.

Howson & Urbach (1993). *Scientific Reasoning: The Bayesian Approach*, 2nd ed. Open court.

Howson & Urbach (2006). *Scientific Reasoning: The Bayesian Approach*, 3rd ed. Open court.

Ioannidis (2005). [Why most published research findings are false](#). *PLoS Med* 2(8): e124.

Mayo (1997). [Response to Howson and Laudan](#), *Phil Sci* 64(2): 323-333.

Mayo (2003). ["Commentary on J. Berger's Fisher Address"](#), *Stat Sci* 18: 19-24.

Mayo (2005). [Philosophy of Statistics](#) in Sarkar & Pfeifer (eds.) *Philosophy of Science: An Encyclopedia*, Routledge: 802-815.

Mayo (2013). [Comments on A. Gelman and C. Shalizi](#), *Brit. J. Math. Stat. Psy.* 66(1): 5-64.

Mayo & Cox (2010). [Frequentist Statistics as a Theory of Inductive Inference](#) (**E&I**: 247-275).

Mayo & Spanos (2004). ["Methodology in Practice: Statistical Misspecification Testing"](#), *Phil Sci* 71: 1007-1025.

- Mayo & Spanos (2006). [Severe Testing as a Basic Concept in a Neyman-Pearson Philosophy of Induction](#), *Brit. J. Phil. Sci.*, 57: 323-357.
- Mayo & Spanos (2011). [Error Statistics](#) in *Philosophy of Statistics, Handbook of Philosophy of Science 7, Philosophy of Statistics*, (Gabbay, Thagard & Woods (eds); Bandyopadhyay & Forster (Vol eds.)) Elsevier: 1-46.
- Meehl, P. (1978). Theoretical Risks and Tabular Asterisks: Sir Karl, Sir Ronald, and the Slow Progress of Soft Psychology, *Journal of Consulting and Clinical Psychology* 46: 806-834. <http://www.psych.umn.edu/people/meehlp/113TheoreticalRisks.pdf>
- Neyman (1956). Note on an Article by Sir Ronald Fisher, *J R Stat Soc* (B) 18: 288-294.
- Pearson (1955). Statistical Concepts in Their Relation to Reality, *J R Stat Soc* (B) 17: 204-207.
- Popper (1962). *Conjectures and Refutations: The Growth of Scientific Knowledge*. Basic Books.
- Simmons, Nelson & Simonsohn (2011). False-Positive Psychology: Undisclosed Flexibility in Data Collection and Analysis Allow Presenting Anything as Significant, *Psych. Sci.*, 22(11): 1359-1366 ([SSRN](#))
- Spanos (2010). Exchanges with David Cox and Deborah G. Mayo (**E&I**: 315-330).
- Young, S. & Karr, A. (2011). Deming, Data and Observational Studies. *Signif.* 8 (3), 116–120.

Optional Readings:

- Achinstein (2010). [Mill's Sins or Mayo's Errors?](#) (**E&I**: 170-188).
- Howson & Urbach (2006). *Scientific Reasoning: The Bayesian Approach*, 3rd ed. Open court.
- Mayo (2004). [An Error-Statistical Philosophy of Evidence](#) in *The Nature of Scientific Evidence: Statistical, Philosophical & Empirical Considerations*. (Taper & Lele eds.), UCP: 79-118.
- Mayo (2010). [An Error in the Argument from Conditionality and Sufficiency to the Likelihood Principle](#) (**E&I**: 305-14).
- Mayo (2010). [Sins of the Epistemic Probabilist: Exchanges with Achinstein](#) (**E&I**: 189-201).
- Mayo (forthcoming). On the Birnbaum Argument for the Strong Likelihood Principle, (with discussion) *Stat. Sci.*
- Senn (2011). [You May Believe You Are a Bayesian But You Are Probably Wrong](#). *RMM* 2.
- Spanos (2013). Who Should Be Afraid of the Jeffreys-Lindley Paradox? *Phi Sci* 80 (1):73-93.

RMM COLLECTION (2011-2012): *Rationality, Markets and Morals: Studies at the Intersection of Philosophy and Economics*, (Albert, Kliemt, Lahno eds.). Special Topic: *Statistical Science and Philosophy of Science: Where Do (Should) They Meet in 2011 and Beyond?* (Mayo, Spanos & Staley Guest eds).

The Cartoon Guide to Statistics