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PHIL 6334 (crn: 15631): Spring 2014
Philosophy of Statistical Inference and Modeling
 Thurs 3:30-6:15pm, Randolph 209

Syllabus: Second Installment

<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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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	<p>Reading:</p> <ul style="list-style-type: none"> • Popper, K. (1962). <i>Conjectures and Refutations</i>: 35-59 • Chapter 1 (EGEK)

5. 2/20	Statistical models and estimation
	<p>Reading:</p> <ul style="list-style-type: none"> • Probability/Statistics notes (Spanos)

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6. 2/27	Fundamentals of significance tests and severe testing
Ex-2	<p>Reading:</p> <ul style="list-style-type: none"> • 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	<p>Five sigma and the Higgs Boson discovery Is it "bad science"? (the p-value police)</p> <p>Reading:</p> <ul style="list-style-type: none"> • Short section from chapter 3, HOTT; Lindley-O'Hagan letter • Mayo, D. & Cox, D. R. (2010). "Frequentist Statistics as a Theory of Inductive Inference" (2nd half) • Probability/Statistics notes (Spanos) <p>Optional:</p> <ul style="list-style-type: none"> • Mayo, slides from the Boston Colloquium: "Is the philosophy of probabilism and obstacle to fraudbusting"

SPRING BREAK Statistical Exercises While Sunning

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<p>8. 3/20</p> <p>Ex-3</p>	<p>Fundamentals of Testing: Family Feuds and 70 years of controversy</p> <p>Reading:</p> <ul style="list-style-type: none"> • The “triad”: Fisher (1955), Pearson (1955), Neyman (1956) • (pages from) Mayo, D. & Spanos, A. (2006). “Severe Testing as a Basic Concept in a Neyman-Pearson Philosophy of Induction” • Draft of chapter 5 (HOTTT) part 1: One passage, five interpretations <p>Spring Break exercises</p> <p>Optional:</p> <ul style="list-style-type: none"> • Chapter 11 EGEK
<p>9. 3/27</p> <p>Q-3</p>	<p>How can we test the assumptions of statistical models?</p> <p>All models are false; no methods are objective</p> <p>Philosophical problems of M-S testing: circularity, infinite regress, double-use of data and data snooping</p> <p>Readings:</p> <ul style="list-style-type: none"> • Mayo and Spanos (2004), "Methodology in Practice: Statistical Misspecification Testing". • TBA • Probability/Statistics notes (Spanos) <p>Optional:</p> <ul style="list-style-type: none"> • Spanos (2013) “Who Should Be Afraid of the Jeffreys-Lindley Paradox?”
<p>10. 4/3 & 4/10</p> <p>Q-4</p>	<p>Error Statistical Philosophy: Highly Probable vs Highly Probed</p> <p>13 howlers of tests</p> <p>Reading:</p> <ul style="list-style-type: none"> • Mayo & Spanos (2011). “Error Statistics”. • Howson, C. (1997). “A Logic of Induction”; Mayo (1997). “Response to Howson and Laudan” • Probability/Statistics notes (Spanos) <p>Optional:</p> <ul style="list-style-type: none"> • Achinstein, P. (2010). “Mill’s Sins or Mayo’s Errors?”, and Mayo (2010) “Exchange with Achinstein”.
<p>11. 4/10</p>	<p>Offshoots of class #10 (TBA)</p>

<p>12. 4/17 Q-5</p>	<p>What ever happened to Bayesian Foundations? Bayesian-frequentist reconciliations, unifications, and O-Bayesians</p> <p>Reading: (tentative)</p> <ul style="list-style-type: none"> • Berger, J. (2003), “Could Fisher, Jeffreys, Neyman have agreed on testing?” and Mayo (2003) response. • Selected pages: Cox D. R. and Mayo. D. G. (2010). "Objectivity and Conditionality in Frequentist Inference" • Spanos (2010). “Exchanges with David Cox and Deborah G. Mayo” <p>Optional:</p> <ul style="list-style-type: none"> • Senn, S. (2011). “You May Believe You Are a Bayesian But You Are Probably Wrong “
<p>13. 4/24 Ex</p>	<p>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</p> <p>Reading:</p> <ul style="list-style-type: none"> • 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”

15. TBA Resampling statistics and severe testing (TBA)

<p>14. 5/1</p>	<p>Overview: Answering the critics Should philosophy be divorced from methodology?</p> <p>Reading:</p> <ul style="list-style-type: none"> • Gelman & Shalizi (2013) "Philosophy and the Practice of Bayesian Statistics" and Mayo (2013) "Comments". • Howson, C. & Urbach, P. (1993). Chapter 15: “Objections to subjective Bayesian theory”
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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)

5 micro essays in response to reading questions (lowest dropped)

5 prob/stat exercises (lowest dropped)

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:

Achinstein (2010). Mill's Sins or Mayo's Errors? (**E&I:** 170-188).

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

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.

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 (2010). [Sins of the Epistemic Probabilist: Exchanges with Achinstein](#) (**E&I:** 189-201).

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.
- 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:

- 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 (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