PHL 246: Probability and Inductive Logic, Wednesday, 6:10-9:00pm with two 10mins breaks, Room: HS610 – last updated: September 13, 2015

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E-mail: franz.huber@utoronto.ca (please talk to me in person whenever possible!)

Office hour: after class or by appointment, Jackman Humanities Building 425 (170 St. George Street)

Blackboard: Besides the classroom this is the official vehicle of communication. You have to check the course website for updates on a regular basis.

Homework assignments must be answered by hand and left in the drop box for PHL 246 on the fifth floor of the Jackman Humanities Building (170 St. George Street) by Wednesday, 6pm, of the due date. Homework assignments submitted in other ways, e.g. via e-mail, will not be accepted. Please do not forget to write your student number on your homework assignments! While we cannot forbid you to also write your name on your homework assignments, we ask you to please use your student number only: not knowing your name helps us to be fair graders.

Questions related to the readings or lectures should be asked at the beginning of class. Other questions, such as logistic/administrative questions, should be asked at the beginning of class (if they concern several people) or during office hours (if they concern mainly you). Please do not send us any content-related questions via e-mail, as we simply do not have the time to respond to them! Please use e-mail only in "emergencies"!

Plagiarism and Turnitin.com: http://www.artsci.utoronto.ca/osai/students

The University of Toronto treats cases of academic misconduct very seriously. Academic integrity is a fundamental value of learning and scholarship at the U of T. Participating honestly, respectfully, responsibly, and fairly in this academic community ensures that your U of T degree is valued and respected as a true signifier of your individual academic achievement.

The University of Toronto's Code of Behaviour on Academic Matters outlines the behaviours that constitute academic misconduct, the processes for addressing academic offences, and the penalties that may be imposed. You are expected to be familiar with the contents of this document. Potential offences include, but are not limited to:

In papers and assignments:

* Using someone else's ideas or words without appropriate acknowledgement.

* Submitting your own work in more than one course without the permission of the instructor.

* Making up sources or facts.

* Obtaining or providing unauthorized assistance on any assignment (this includes working in groups on assignments that are supposed to be individual work).

On tests and exams:

* Using or possessing any unauthorized aid, including a cell phone.

* Looking at someone else's answers.

* Letting someone else look at your answers.

* Misrepresenting your identity.

* Submitting an altered test for re-grading.

Misrepresentation:

* Falsifying or altering any documentation required by the University, including (but not limited to) doctor's notes.

* Falsifying institutional documents or grades.

All suspected cases of academic dishonesty will be investigated following the procedures outlined in the Code of Behaviour on Academic Matters. If you have any questions about what is or is not permitted in this course, please do not hesitate to contact me. If you have questions about appropriate research and citation methods, you are expected to seek out additional information from me or other available campus resources like the College Writing Centers, the Academic Success Centre, or the U of T Writing Website.

Accessibility:

Students with diverse learning styles and needs are most welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or Accessibility Services at (416) 978 8060; www.accessibility.utoronto.ca

8 homework assignments each worth 5%, totaling to 40% - Penalty for lateness: 100%!

It is a logistic impossibility for us to accept late homework assignments. The course is structured such that you can complete your homework assignments a week prior to the due date, sometimes several weeks earlier. I urge to please do so in order to avoid missing a due date!

Homework assignments must be answered by hand and left in the drop box for PHL 246 on the fifth floor of the Jackman Humanities Building (170 St. George Street) by Wednesday, 6pm, of the due date. Under normal circumstances they will be graded and returned within two weeks.

Please note: you must attach a signed note with the following text to the last assignment:

"I, [your student number], affirm that all eight (8) assignments represent entirely my own efforts, or the efforts of groups I have actively participated in. I understand the consequences of violating the University's academic integrity policies as outlined in the *Code of Behaviour on Academic Matters*."

Mid-term exam: 50 mins for 8 questions; 20% - please bring you student card and writing materials!

Final Exam: 2 hours, 20 questions; 40% - please bring you student card and writing materials!

Regular attendance is mandatory, although there won't be a grade for it. Regular attendance is not mandatory just because I like it this way, but because it is virtually impossible to pass this course without attending regularly. In particular, studying all the texts and homework assignments alone, without also attending, will not enable you to pass this course! Conversely, if you attend regularly and you make an effort by reading all the texts and by completing both the mandatory and voluntary homework assignments, then it should be easy for you to pass this course.

Conduct during tests:

o No unauthorized aids in the exam room, including – or especially – cell phones.

o All books, bags and backpacks to be left to the side of the room or under desks, not in or on desks.

o No unaccompanied washroom breaks.

o Disruptions from invigilators moving about or chatting kept to a minimum.

o No leaving the exam room during the interval before the end of the exam.

o No writing beyond the signal to stop.

o Clear instructions about bringing tests forward or waiting to have them picked up.

PHL 246: Probability and Inductive Logic

Probability and Inductive Logic is an introduction to the mathematical theory of probability and its many and varied applications in philosophy. On the philosophical side we will mainly be concerned with the so-called problem of induction and its reception in the philosophy of science, where it is discussed under the heading of 'confirmation theory.' On the mathematical side we will study elementary set-theory and propositional and predicate logic in order to be able to formulate the theory of probability.

The first two lectures will provide us with the relevant background in set-theory and logic.

Then there are four lectures covering Hume's argument for the thesis that we cannot justify induction; Hempel's work on the logic of confirmation and the ravens' paradox; Popper's falsificationism and hypothetico-deductive confirmation; and Kolmogorov's axiomatization of the probability calculus.

The next four lectures are covering Carnap's inductive logic and his philosophy of induction; Goodman's philosophy of induction and the new riddle of induction; Haack's comparison between deduction and induction; and the Dutch Book argument for subjective, or Bayesian, probabilities.

The final two lectures are covering Bayesian confirmation theory and the distinction between absolute and incremental confirmation; Lewis' principal principle relating subjective credences and objective chances; and Reichenbach's "straight rule" and the strong law of large numbers.

Along the way we will come across probability puzzles such as Bertrand's Paradox and von Mises' Wine/Water Paradox and paradoxes from set-theory and logic (most notably, Russell's paradox).

There is no single textbook that introduces all and only the concepts and techniques that we will be studying. Most textbooks are too advanced for our purposes, and the few others barely scratch the surface of what we need. I have tried to compile accessible texts that cover everything we need. However, it is absolutely crucial that you attend the lectures: studying the texts and lecture notes and homework assignments will certainly (and not just probably!) not be enough! Also, while the course is structured along philosophical problems, please be prepared to use mathematical symbols and logical formulas, and to calculate and solve equations as well as to prove and derive theorems.

Readings: * = obligatory

The dates are the dates when the reading will be discussed. So you must have read it *by* then!

Week 0:

Skyrms, Brian (2000), *Choice and Chance: An Introduction to Inductive Logic.* 4th ed., Belmont, CA: Wadsworth Thomson Learning. (call no.: BC91 .S5 2000)

Week 1: Wednesday, September 16, 2015

Ferreirós, José (2011), The Early Development of Set Theory. In E.N. Zalta (ed.), *Stanford Encyclopedia of Philosophy*. http://plato.stanford.edu/entries/settheory-early/

Jech, Thomas (2002), Set Theory. In E.N. Zalta (ed.), *Stanford Encyclopedia of Philosophy*. http://plato.stanford.edu/entries/set-theory/

*Papineau, David (2012): *Philosophical Devices: Proofs, Probabilities, Possibilities, and Sets*. Oxford: Oxford University Press. Chapter 1. Pdf available at Blackboard.

http://site.ebrary.com.myaccess.library.utoronto.ca/lib/utoronto/detail.action?docID=10612580

Papineau, David (2012): *Philosophical Devices. Proofs, Probabilities, Possibilities, and Sets.* Oxford: Oxford University Press. Chapter 2. Pdf available at Blackboard. http://site.ebrary.com.myaccess.library.utoronto.ca/lib/utoronto/detail.action?docID=10612580

*Steinhart, Eric (2009), *More Precisely: The Math You Need to Do Philosophy*. Peterborough: Broadview Press. Chapter 1. Pdf available at Blackboard. Copyright © 2009 Eric Steinhart. Reproduced with the permission of Broadview Press.

Week 2: Wednesday, September 23, 2015

*Klement, Kevin C. (2005), Propositional Logic. In J. Fieser & B. Dowden (eds.), *Internet Encyclopedia of Philosophy*. http://www.iep.utm.edu/prop-log/

*Papineau, David (2012): *Philosophical Devices. Proofs, Probabilities, Possibilities, and Sets.* Oxford: Oxford University Press. Chapter 10.
http://site.ebrary.com.myaccess.library.utoronto.ca/lib/utoronto/detail.action?docID=10612580

Papineau, David (2012): *Philosophical Devices. Proofs, Probabilities, Possibilities, and Sets.* Oxford: Oxford University Press. Chapter 11.
http://site.ebrary.com.myaccess.library.utoronto.ca/lib/utoronto/detail.action?docID=10612580

Week 3: Wednesday, September 30, 2015 – homework assignment 1 due

Vickers, John (2014): The Problem of Induction. In E.N. Zalta (ed.), *Stanford Encyclopedia of Philosophy*. http://plato.stanford.edu/entries/induction-problem/

Classic:

*Hempel, Carl Gustav (1945), Studies in the Logic of Confirmation I. *Mind* **54**, 1-26.

Super-classic:

Hume, David (1748/1993), *An Enquiry Concerning Human Understanding*. Ed. By E. Steinberg. Indianapolis: Hackett. Sections IV – V.I. Pdf available at Blackboard.

Week 4: Wednesday, October 7, 2015 – homework assignment 2 due

Crupi, Vincenzo (2014), Confirmation. In E.N. Zalta (ed.), *Stanford Encyclopedia of Philosophy*. http://plato.stanford.edu/entries/confirmation/

Huber, Franz (2007), Confirmation and Induction. In J. Fieser & B. Dowden (eds.), *Internet Encyclopedia of Philosophy*. http://www.iep.utm.edu/conf-ind/

Sprenger, Jan (2011) , Hypothetico-Deductive Confirmation. *Philosophy Compass* **6**, 497-508.

Classic:

*Hempel, Carl Gustav (1945), Studies in the Logic of Confirmation II. *Mind* **54**, 97-121.

Week 5: Wednesday, October 14, 2015 – homework assignment 3 due

*Papineau, David (2012): *Philosophical Devices. Proofs, Probabilities, Possibilities, and Sets.* Oxford: Oxford University Press. Chapter 7. Pdf available at Blackboard.
http://site.ebrary.com.myaccess.library.utoronto.ca/lib/utoronto/detail.action?docID=10612580

*Papineau, David (2012): *Philosophical Devices. Proofs, Probabilities, Possibilities, and Sets.* Oxford: Oxford University Press. Chapter 8.
http://site.ebrary.com.myaccess.library.utoronto.ca/lib/utoronto/detail.action?docID=10612580

Papineau, David (2012): *Philosophical Devices. Proofs, Probabilities, Possibilities, and Sets.* Oxford: Oxford University Press. Chapter 9.
http://site.ebrary.com.myaccess.library.utoronto.ca/lib/utoronto/detail.action?docID=10612580

Classic:

Carnap, Rudolf (1962), *Logical Foundations of Probability*. 2nd ed. Chicago: University of Chicago Press. §87 (468-478). Pdf available at Blackboard.

Week 6: Wednesday, October 21, 2015

Mid-term exam

Week 7: Wednesday, October 28, 2015 – homework assignment 4 due

*Steinhart, Eric (2009), *More Precisely: The Math You Need to Do Philosophy*. Peterborough: Broadview Press. Chapter 5. Pdf available at Blackboard. Copyright © 2009 Eric Steinhart. Reproduced with the permission of Broadview Press.

Classic:

Popper, Karl R. (1935/2002), *The Logic of Scientific Discovery*. London, New York: Routledge. Part I: A Survey of Some Fundamental Problems, 3-26. http://search.library.utoronto.ca/details?6016797

Week 8: Wednesday, November 4, 2015 – homework assignment 5 due

Easwaran, Kenny (2011), Bayesianism I: Introduction and Arguments in Favor. *Philosophy Compass* **6**, 312-320.

*Hájek, Alan (2003), Probability, Interpretations of. In E.N. Zalta (ed.), *Stanford Encyclopedia of Philosophy*. http://plato.stanford.edu/entries/probability-interpret/

Classic:

Goodman, Nelson (1954/1983), *Fact, Fiction, Forecast*. Cambridge, MA: Harvard University Press. Chapter 3: The New Riddle of Induction. Pdf available at Blackboard.

Week 9: Wednesday, November 11, 2015 – homework assignment 6 due

diFate, Victor (2007), Evidence. In J. Fieser & B. Dowden (eds.), *Internet Encyclopedia of Philosophy*. http://www.iep.utm.edu/evidence/

Easwaran, Kenny (2011), Bayesianism II: Applications and Criticisms. *Philosophy Compass* **6**, 321-332.

*Talbott, William (2008), Bayesian Epistemology. In E.N. Zalta (ed.), *Stanford Encyclopedia of Philosophy*. http://plato.stanford.edu/entries/epistemology-bayesian/

Classic:

Haack, Susan (1976), The Justification of Deduction. *Mind* **85**, 112-119.

Week 10: Wednesday, November 18, 2015

Tutorial: instead of answering a homework assignment for this week please prepare at least four questions about the material we have covered so far and be prepared to ask them in class (you may also write your questions down and hand them to me, if you do not like to speak in front of others).

*Fitelson, Branden (2006), The Paradox of Confirmation. *Philosophy Compass* **1**, 95-113.

Joyce, James M. (2003), Bayes' Theorem. In E.N. Zalta (ed.), *Stanford Encyclopedia of Philosophy*. http://plato.stanford.edu/entries/bayes-theorem/

Week 11: Wednesday, November 25, 2015 – homework assignment 7 due

Briggs, Rachael (2010), The Metaphysics of Chance. *Philosophy Compass* **5**, 938-952.

Classic:

Lewis, David (1980), A Subjectivist's Guide to Objective Chance. In Richard C. Jeffrey (ed.), *Studies in Inductive Logic and Probability*. Vol. II. Berkeley: University of Berkeley Press, 263-293. Reprinted with Postscripts in D. Lewis (1986), *Philosophical Papers*. Vol. II. Oxford: Oxford University Press, 83-132. http://search.library.utoronto.ca/details?7063261

Week 12: Wednesday, December 2, 2015 – homework assignment 8 due

Reichenbach, Hans (1938), *Experience and Prediction. An Analysis of the Foundations and the Structure of Knowledge.* Chicago: University of Chicago Press. §§38-40 (339-363). Pdf available at Blackboard.

Schulte, Oliver (2002), Formal Learning Theory. In E.N. Zalta (ed.), S*tanford Encyclopedia of Philosophy*. http://plato.stanford.edu/entries/learning-formal/

Putnam, Hilary (1963a), "Degree of Confirmation" and Inductive Logic. In P.A. Schilpp (ed.), *The Philosophy of Rudolf Carnap*. La Salle, IL: Open Court, 761-783. Pdf available at Blackboard.

Week 13: (in case you can't get enough of it either)

Earman, John (1992), *Bayes or Bust? A Critical Examination of Bayesian Confirmation Theory*. Cambridge, MA: MIT Press. http://search.library.utoronto.ca/details?2760104

Hacking, Ian (2001): *An Introduction to Probability and Inductive Logic*. Cambridge: Cambridge University Press. http://search.library.utoronto.ca/details?4587869

Hawthorne, James (2012), Inductive Logic. In E.N. Zalta (ed.), *Stanford Encyclopedia of Philosophy*. http://plato.stanford.edu/entries/logic-inductive/

Howson, Colin & Urbach, Peter (2005), *Scientific Reasoning: The Bayesian Approach*. 3rd ed. La Salle, IL: Open Court. http://search.library.utoronto.ca/details?5876773