CENTRAL TOPICS IN THE PHILOSOPHY OF SCIENCE

2023-24 Course Guide

**LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN
FACULTY OF PHILOSOPHY, PHILOSOPHY OF SCIENCE AND THE
STUDY OF RELIGION**

CENTRAL TOPICS IN THE PHILOSOPHY OF SCIENCE

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Office hours: By appointment (via Zoom or in person)

Sessions: Tuesdays, 16-18, Ludwigstr. 31 / 021
Tutorials: Thursdays 12-14, Geschw.-Scholl-Pl. 1 (M) - M 001

Overview

This course provides a systematic introduction to Bayesian philosophy of science, that is, a discussion of central topics in the general philosophy of science from a Bayesian perspective. Unit 1 of the course introduces the basic concepts of probability theory and Bayesian network theory, and discusses various interpretations of the concept of probability. Unit 2 then focuses on applications of Bayesian methods to topics such as confirmation and evidence, scientific reasoning, scientific explanation, inter-theoretical relations, scientific realism, and scientific objectivity. The course is accompanied by a tutorial that covers mathematical problems in probability theory and Bayesian network theory. Students are expected to work on problems each week and learn how to construct and analyze Bayesian models themselves.

Coursework

Students are requested to attend all sessions, to carefully study the reading assignments beforehand, and to participate in the classroom discussions. Students are also expected to attend the tutorials and to hand in **solutions of the weekly problem sets** by email by the deadline specified at the top of the problem sets. In week 12, there will be a **Midterm-Exam** with mathematical problems. (Details to be announced.) In week 13, the tutorial session will focus on improving your essay writing skills. In the last session of the seminar, students are expected to give a short presentation of (the idea of) their term paper. (Details to be announced.) By 31 March 2024, students have to submit a **term paper** of about 4000 words (without references). The term paper presents and analyzes a model (which may build on the basis of one of the models discussed in the readings). More detailed instructions follow. Outlines of 500 words (What is the problem you are addressing? How do you want to address it? What model do you want to use?) and a literature list (at least five relevant texts) have to be submitted by 1 February 2024. The instructor and the TAs will provide feedback.

Assessment

The final mark will be determined from the weekly problem sets (15%), the Midterm-Exam (35%), and the term paper (50%).

Course Material

All texts can be found in the GoogleDrive of the course. Here is the link:

https://drive.google.com/drive/folders/1ql0ceo88a3Zuk6jCk6IRJhLPjL-ZWo1T?usp=sharing

Topics

Unit 1: Subjective Probability

Week 1 (17 October 2023): The Problem of Induction

Required Reading

Hume, David (1748): *Enquiries Concerning Human Understanding and Concerning the Principles of Morals*. Ed. by L. A. Selby-Bigge. Oxford: Oxford UP 1997, Secs. 2–5

Howson, Colin (2000): *Hume's Problem. Induction and the Justification of Belief*. Oxford: Oxford UP, pp. 1–34

Additional Reading

Godfrey-Smith, P. (2003): *Theory and Reality: An Introduction to the Philosophy of Science*. Chicago: University of Chicago Press, chs. 2 and 3

Goodman, Nelson (1954): *Fiction, Fact, and Forecast*. Cambridge/Mass.: Harvard UP 1983, ch. 3

Henderson, Leah (2018): The Problem of Induction, *Stanford Encyclopaedia of Philosophy*

Week 2 (24 October 2023): Basic Probability Theory

Required Reading

Pfeiffer, chs. 1–5

Additional Reading

Houston, K. (2009): *How to Think Like a Mathematician*. Cambridge: Cambridge University Press

Week 3 (31 October 2023): Bayesian Networks

Required Reading

Neapolitan, chs. 1 and 2

Week 4 (7 November 2023): Bayesian Epistemology

Required Reading

Hajek, A. and S. Hartmann (2010): "Bayesian Epistemology", in: J. Dancy et al. (eds.): *A Companion to Epistemology*. Oxford: Blackwell, pp. 93–106

Pettigrew, R. (2019). "Epistemic Utility Arguments for Probabilism", *Stanford Encyclopedia of Philosophy*

Additional Reading

Hartmann, S. and J. Sprenger (2010): "Bayesian Epistemology", in: S. Bernecker and D. Pritchard (eds.): *Routledge Companion to Epistemology*. London: Routledge, pp. 609-620

Joyce, J. (2003): "Bayes Theorem", *Stanford Encyclopedia of Philosophy*

Talbott, W. (2008): "Bayesian Epistemology", *Stanford Encyclopaedia of Philosophy*

Week 5 (14 November 2023): Interpretations of Probability

Required Reading
Hájek, A. (2012): "Interpretations of Probability", *Stanford Encyclopaedia of Philosophy*

Additional Reading
Gillies, chs. 2-5
Rowbottom, chs. 5, 7-9

Unit 2: Bayesian Philosophy of Science

Week 6 (21 November 2023): Confirmation I

Required Reading
Fitelson, B. (1999): "The Plurality of Bayesian Measures of Confirmation and the Problem of Measure Sensitivity", *Philosophy of Science* 66 Supplement, pp. S362–S378
Sprenger & Hartmann, Theme and Variation 1

Additional Reading
Crupi, V. (2013): "Confirmation", *Stanford Encyclopaedia of Philosophy.*
Huber, F. (2007): "Confirmation and Induction", *Internet Encyclopaedia of Philosophy*
Norton, J. (2011): "Challenges to Bayesian Confirmation Theory", in: P. S. Bandyopadhyay and M. R. Forster (eds.): *Handbook of the Philosophy of Science Vol. 7: Philosophy of Statistics*. Elsevier, pp. 391–440

Week 7 (28 November 2023): Confirmation II

Required Reading
Bovens & Hartmann, chs. 3 and 4
Jarvstad, A. and U. Hahn (2009): Unreliable Sources and the Conjunction Fallacy, in: *Proceedings of the 31st Annual Meeting of the Cognitive Science Society*. Mahwah NJ: Erlbaum

Additional reading
Crupi, V. (2013): "Confirmation", *Stanford Encyclopaedia of Philosophy*
Huber, F. (2007): "Confirmation and Induction", *Internet Encyclopaedia of Philosophy*

Week 8 (5 December 2023): The No Alternatives Argument

Required Reading
Sprenger & Hartmann, Variation 2
Dawid, R. (2013): *String Theory and the Scientific Method*. Cambridge: Cambridge University Press, ch. 3

Additional Reading
Dawid, R., S. Hartmann and J. Sprenger (2015): "The No Alternatives Argument", *The British Journal for the Philosophy of Science.* 66(1): 213–234

Week 9 (12 December 2023): Learning Conditional Evidence

Required Reading
Douven, I. (2012): "Learning Conditional Information", *Mind and Language* 27: 239–263
Sprenger & Hartmann, Variation 4

Additional Reading
Douven, I. and J. W. Romejn (2012): "A New Resolution of the Judy Benjamin Problem", *Mind* 120: 637-670
Douven, I. (2016): *The Epistemology of Indicative Conditionals*. Cambridge: Cambridge University Press

Week 10 (19 December 2023): Causal Strength and Explanatory Power

Required Reading
Sprenger & Hartmann, Variation 6
Sprenger & Hartmann, Variation 7

Additional Reading
Sprenger, J. (2018): "Foundations of a Probabilistic Theory of Causal Strength", *The Philosophical Review* 127: 371–398
Lombrozo T. and N. Vasilyeva (2017): Causal Explanation. In M. Waldmann (ed.) *Oxford Handbook of Causal Reasoning* . Oxford: Oxford University Press, pp. 415–432
Hitchcock, C. (2012): "Probabilistic Modeling", *Stanford Encyclopaedia of Philosophy*
Cohen, M. (2015). "On Schupbach and Sprenger's Measures of Explanatory Power", *Philosophy of Science* 82: 97–109
Sprenger, J. and J. Schupbach (2011): "The Logic of Explanatory Power", *Philosophy of Science* 78: 105–127
Schupbach, J. (2011): "Comparing Probabilistic Measures of Explanatory Power", *Philosophy of Science* 78: 813–82

Week 11 (9 January 2024): Source-reliability models in social epistemology and philosophy of science

Required Reading
Bovens & Hartmann (2004) *Bayesian Epistemology*, Chapter 3.

Additional Reading
Hahn, Ulrike, Christoph Merdes, and Momme von Sydow. 2018. "How good is your evidence and how would you know?" *Topics in Cognitive Science* 10 (4): 660–678.
Merdes, Christoph, Momme von Sydow, and Ulrike Hahn. 2021. "Formal models of source reliability." *Synthese* 198 (23): 5773–5801.

Tutorial 11 January: Review Session for the Midterm

Week 12 (16 January 2024): Scientific Realism and the No Miracles Argument

Required Reading

Howson, C. (2000): "Realism and the No-Miracles Argument". In: C. Howson: *Hume's Problem: Induction and the Justification of Belief.* Oxford: Oxford University Press, ch. 3

Sprenger & Hartmann, Variation 3

Additional Reading

Dawid, R. and S. Hartmann (2018): "The No Miracles Argument without Base Rate Fallacy". *Synthese* 195: 4063–4079

Tutorial 18 January: Midterm (in Lecture Room)

Week 13 (23 January 2024): Intertheoretic Reduction

Required Reading

Dizadji-Bahmani, F., R. Frigg, and S. Hartmann (2010): "Who's Afraid of Nagelian Reduction?" *Erkenntnis* 73(3): 393–412

Sprenger & Hartmann, Variation 8

Additional Reading

Dizadji-Bahmani, F., R. Frigg, and S. Hartmann (2011): "Confirmation and Reduction: A Bayesian Account", *Synthese* 179 (2): 321–338

Tešić, M. (2019): "Confirmation and the Generalized Nagel Schaffner Model of Reduction", *Synthese* 196: 1097–1129

Week 14 (30 January 2024): The Problem of Old Evidence

Required Reading

Glymour, C. (2011): "Why I am not a Bayesian", reprinted in Eagle, ch. 15

Sprenger & Hartmann, Variation 5

Additional Reading

Eva, B. and S. Hartmann (2020): "On the Origins of Old Evidence", *Australasian Journal of Philosophy* 98(3): 481–494

Hartmann, S. and B. Fitelson (2015): "A New Garber-Style Solution to the Problem of Old Evidence", *Philosophy of Science* 82(4): 712–717

Week 15 (6 February 2024): Presentation of Final Paper Ideas

No readings

Texts

Main Texts

Bovens, L. and S. Hartmann (2003): *Bayesian Epistemology*. Oxford: Oxford University Press (= Bovens & Hartmann).

Neapolitan, R. (2004): *Learning Bayesian Networks*. Upper Saddle River: Prentice Hall (= Neapolitan).

Pfeiffer, P.E. (1990): Probability for Applications. New York: Springer (= Pfeiffer).

Sprenger, J. and S. Hartmann (2019): *Bayesian Philosophy of Science*. Oxford: Oxford University Press (= Sprenger & Hartmann).

Introductions to Probability and its Interpretation

Eagle, A. (2011): *Philosophy of Probability: Contemporary Readings*. London: Routledge.

Gillies, D. (2000): *Philosophical Theories of Probability*. London: Routledge (= Gillies).

Mellor, H. (2005): *Probability: A Philosophical Introduction*. London: Routledge.

Rowbottom, D. (2015): *Probability*. Cambridge: Polity.

Classical Texts about Bayesianism

Earman, J. (1996): *Bayes ort Bust*. Cambridge, Mass: MIT Press.

Howson, C. and P. Urbach (2006): *Scientific Reasoning: The Bayesian Approach*. Chicago: Open Court.

Jeffrey, R. (2004): *Subjective Probability. The Real Thing*. Cambridge: Cambridge University Press.

Bayesian Networks and Causal Networks

Pearl, J. (2009): *Causality: Models, Reasoning and Inference*. Cambridge: Cambridge University Press.

Pearl, J. (1988): *Probabilistic Reasoning in Intelligent Systems: Networks of Plausible Inference*. Morgan and Kaufmann.

Sprites, P., C. Glymour, and R. Scheines (2001): *Causation, Prediction, and Search*. Cambridge: MIT Press.

Woodward, J. (2005): *Making Things Happen: A Theory of Causal Explanation*. Oxford: Oxford University Press.

Mathematics Texts (with many examples and exercises)

Houston, K. (2011): *How to Think Like a Mathematician: A Companion to Undergraduate Mathematics*. Cambridge: Cambridge University Press.

Lipschutz, S. and J. Schiller (2011): *Schaum's Outline of Introduction to Probability and Statistics*. McGraw-Hill Professional.

Introductions to Philosophy of Science

Curd, M., J. A. Cover and C. Pincock (2012): *Philosophy of Science. The Central Issues*. New York and London: W. W. Norton.

Godfrey-Smith, P. (2003): *Theory and Reality: An Introduction to the Philosophy of Science*. Chicago: University of Chicago Press.

Ladyman, J. (2002): *Understanding Philosophy of Science*. London: Routledge.

Rosenberg, A. (2011): *Philosophy of Science. A Contemporary Introduction*. London: Routledge.
Schurz, G. (2013): *Philosophy of Science. A Unified Approach*. Routledge.

Companions and Encyclopaedias

Newton-Smith, W. (ed.) (2000): *A Companion to the Philosophy of Science*. Malden/MA and Oxford: Blackwell.
Machamer, P. and M. Silberstein (eds.) (2002): *The Blackwell Guide to the Philosophy of Science*. Oxford: Blackwell.
Psillos, S. and M. Curd (eds.) (2010): *The Routledge Companion to Philosophy of Science*. London: Taylor & Francis.
Sarkar, S. (ed.) (2012): *Philosophy of Science: An Encyclopedia*. London: Routledge.

Web Resources

Stanford Encyclopaedia of Philosophy (= SEP): http://plato.stanford.edu
The Internet Encyclopedia of Philosophy (= IEP): http://www.iep.utm.edu/

Writing Analytical Philosophy

Students with no prior training in analytical philosophy may find the following texts helpful when planning and writing essays:

Hübner, D. (2012): *Zehn Gebote für das philosophische Schreiben: Ratschläge für Philosophiestudierende zum Verfassen wissenschaftlicher Arbeiten*. UTB.
Rosenberg, J. (1995): *The Practice of Philosophy: Handbook for Beginners*. Pearson.
Weston, A. (2000): *A Rulebook for Arguments*. Indianapolis: Hackett.