Modeling Under Uncertainty

Winter 2022-23

Instructor:	Corey Dethier	(corey.dethier@philos.uni-hannover.de)
Class:	TBD	TBD
Office hours:	TBD	

Course Description: Uncertainty is ubiquitous in the sciences: not only are we typically uncertain about the truth of the hypotheses we test, we're often uncertain about the accuracy of measurements, the reliability of instruments, and the adequacy of various models and assumptions.

In this course, we'll discuss a number of philosophical questions raised by the inescapable character of uncertainty in the sciences, such as: How should we understand uncertainty? Do all kinds or varieties of uncertainty have the same epistemic implications? What can scientists do to mitigate uncertainty? And how should scientists communicate uncertainty to the public and other interested parties? Throughout the course, we'll use climate science as a running case study / exemplar of reasoning under uncertainty.

Course instruction and examination will be in English.

Texts: All readings will be uploaded as PDFs to the Stud.IP website for the course.

Grades & **Assignments:**

Normal coursework (Studienleistung): students will be expected to hand in questions for each reading assignment by [TBD] on the day of class.

Graded / with examination (Prüfrungsleistung): students aiming for a grade in the course must (a) complete the weekly reading assignments AND either (b) sit for an oral exam or (c) write a longer (∼15 page) research paper on a subject of their choosing. Details for both examination options can be found on Stud.IP.

Course policies: I expect students to (a) be respectful of their fellow students, (b) turn their assignments in on time, and (c) behave ethically both in class and in fulfilling their assignments. I also encourage all students to feel free to come to office hours and/or contact me by email with any questions about the course, the readings, or philosophy more generally.

Schedule:

Unit 1: Bayesianism ([TBD] - [TBD])

Reading:

Day 1 Easwarran, "Bayesianism I: Introduction and Arguments in Favor"

Day 2 Easwarran, "Bayesianism II: Applications and Arguments Against"

Key discussion questions:

What is Bayesianism? Can Bayesianism provide an adequate account of confirmation?

Some suggested further readings:

Lin, "Bayesian Epistemology"; Roussos, "Normative Formal Epistemology as Modelling"; Sprenger and Hartmann, *Bayesian Philosophy of Science*; Titelbaum, *Fundamentals of Bayesian Epistemology*

Unit 2: Models ([TBD] - [TBD])

Reading:

Day 3 Winsberg, *Philosophy and Climate Science*, ch. 2: Models

Day 4 Bokulich, "Towards a Taxonomy of the Model-Ladenness of Data"

Day 5 Parker, "Model Evaluation: An Adequacy-for-purpose View"

Key discussion questions:

What are models? What roles do they / can they play in science? How are models different from experiments? How should we evaluate models?

Some suggested further readings:

Currie, "From Models-as-Fictions to Models-as-Tools"; Frigg and Hartman, "Models in Science"; Frigg and Nguyen, *Modelling Nature*; Morgan and Morrison, "Models as Mediators"; Morrison, *Reconstructing Reality*; Parker, "Does Matter Really Matter?"; Sanches de Oliveira, "Representationalism is a Dead End';' Winsberg, *Philosophy of Climate Science*, ch3: Simulations

Unit 4: Statistics ([TBD] - [TBD])

Reading:

Day 6 Romeijn, "Philosophy of Statistics" §§2-4

Day 7 Zhao, "Sample Representation in the Social Sciences"

Day 8 Parker, "Whose Probabilities?"

Key discussion questions:

What is the aim of statistics? What do we need to do statistics correctly? Should we prefer one interpretation of probability over another? Can we do statistics without random samples?

Some suggested further readings:

Fletcher and Mayo-Wilson, "Evidence in Classical Statistics"; Katzav et al., "On the Appropriate and Inappropriate Uses of Probability Distributions in Climate Projections"; Mayo, *Error and the Growth of Experimental Knowledge*; Sprenger, "Conditional Degrees of Belief and Bayesian Inference"; Winsberg, *Philosophy and Climate Science*

Unit 5: Values and objectivity ([TBD] - [TBD])

Reading:

Day 9 Jebeile, "Values and Objectivity in the Intergovernmental Panel on Climate Change"

Day 10 Pulkkinen et al, "The Value of Values in Climate Science"

Key discussion questions:

What is the proper role of "values" in science? Does the proper role differ for climate science, where the science concerns ethically-important subjects? There's often disagreement—and uncertainty—about which values are the right ones; how should science account for values in those cases?

Some suggested further readings:

Anderson, "Uses of Value Judgments in Science"; Douglas, *Science, Policy, and the Value-Free Ideal*; John, "The Example of the IPCC does not Vindicate the Value Free Ideal"; Leuschner, "Uncertainties, Plurality, and Robustness in Climate Research and Modeling"; Longino, *Science as Social Knowledge*; Parker and Winsberg, "Values and Evidence"

Unit 6: Decision ([TBD] - [TBD])

Reading:

Day 12 John, "Epistemic Trust and the Ethics of Science Communication"

Day 13 Steel, from *Philosophy and the Precautionary Principle*

Day 14 Nordhaus, from *The Climate Casino*

Key discussion questions:

How should we make decisions under uncertainty? What should scientists advise when their conclusions are uncertain?

Some suggested further readings:

Briggs, "Normative Theories of Rational Choice: Expected Utility"; Broome, *Climate Matters*; Cripps, *What Climate Justice Means and Why We Should Care*; Gardiner, *A Perfect Moral Storm*; Jamieson, *Reason in a Dark Time*; Robeyns, "Why Limitarianism?"