

Decision Theory, with Applications to Epistemology: Syllabus

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1 Overview

This graduate-level seminar aims to introduce students to the formal theory of rational choice and various attempts to apply this framework to epistemological questions.

Unit 1 will provide a basic overview of classical decision theory, covering decisions under ‘risk’ (where the probabilities of all ‘external’ factors relevant to the outcome of the decision are known) as well as under ‘complete uncertainty’ (where none of the relevant probabilities fail to be known - we shall not be discussing partial uncertainty). We will first look at the notion of preference and the constraints that rational preferences are argued to obey. We will then turn to decisions under complete uncertainty, examining a number of norms of choice that have been offered in the literature. The next step is a discussion of decision under risk, with respect to which the standard view is that agents should choose acts that ‘maximise expected utility’. We shall give a brief introduction to the formal rules that probabilities obey, followed up by a brief discussion of various accounts of what probabilities might *be*. We will then discuss the concept of ‘utility’, focussing on Von Neuman and Morgenstern’s derivation of utilities from probabilities and certain rational constraints on preferences. Unit 2 will follow up with some well-known philosophical conundrums that this decision theoretic framework generates, including the Allais, Ellsberg, St Petersburg and Newcomb paradoxes. The last issue will lead to a discussion of the relative merits of so called ‘causal’ versus ‘evidential’ decision theories. Unit 3 will examine a number of possible points of intersection between decision theory and epistemology. We will notably take a look at the proposal that one’s system of beliefs should maximise so-called expected ‘cognitive’ utility. Also on the menu is a discussion of Pascal’s famous ‘Wager’ argument in support of theism.

Units 0-2 will make primary use of sections from Michael Resnick’s extremely accessible *Choices: an introduction to decision theory* [Resnik, 1987], supplemented by various further readings. Readings for Unit 3 will consist of selections from a variety of sources.

This module does have a certain formal component. Although *very little* background mathematical knowledge is required, it will be assumed that

the student will possess at least a rudimentary grasp of high-school algebra—manipulation of inequalities, fractions, etc.—and very elementary set theory—operations on sets, relations, orderings, etc. Regarding the latter, I recommend [ter Meulen and Partee, 1990] Ch1, Ch2 & Ch3.

2 Teaching methods

The course will consist of 13 x weekly 2-hour seminars.

3 Assessment

Overall credit for this course will consist in a weighted average of the grades for the following:

- *1 essay* of 3 000 to 4 000 words on a topic of your choice, subject to my approval [50% of the total mark]. Sample essay topics of an appropriate level of specificity will be provided.
- *1 take-home exam* pertaining to formal issues touched upon in the first few units of the course [25% of the total mark]. Questions will bear on relations and orderings, probability and expectations.
- *Class participation* [25% of the total mark]. For each session, you will be expected to have (i) completed the relevant required reading and (ii) drafted a list of points to discuss (issues that you deem controversial, sections requiring clarification, etc.). Completion of supplementary reading will also contribute towards the mark, as will class attendance.

Please take note of the university policy on plagiarism (plagiaat), which can be found at:

- <http://www.kuleuven.be/plagiarism/index.html>

4 Time & location

Seminars will take place on Thursdays, 3-5pm in the ‘Professorrenlocaal’ (00.26) of the HIW. I do not hold fixed office hours but I am happy to arrange additional meetings if you wish to meet me in person to discuss any aspect of the course.

5 Schedule & reading (provisional)

Unless otherwise specified (i.e. marked with a ‘*’), all readings will be made available in pdf on the course Toledo website. In addition to the topic-specific reading below, the following all provide brief and accessible general overviews of the first two units (i.e. decision theory):

- [Allingham, 2002]*
- [Hansson, ms]

- [Joyce, 2006]
- [Weatherson, ms]

The following articles also provide good overviews of the material covered in sessions 3-5:

- [Hajek, 2009]
- [Hajek et al., 2005]

Unit 1: Classical decision theory

1. Introduction, orderings and preferences

- *Compulsory:*
 - [Resnik, 1987], Ch1 + Ch2 Introduction & section 2.1
- *Supplementary:*
 - [Hansson and Grune-Yanoff, 2008], sections 1.1-1.4, 3.1-3.3 (*highly recommended*)
 - [Hansson, 2001], sections 1, 2 and 3 (more detailed and somewhat technical)
 - [Maher, 1993], Ch 2

2. Decisions under Complete Uncertainty

- *Compulsory:*
 - [Resnik, 1987], Ch2, sections 2.2-2.6 (2.7 is interesting, but not essential for this course)
- *Supplementary:*
 - [Luce and Raiffa, 1989], Ch13, up to—and including—section 13.4.

3. Decisions under Risk: Introduction + the probability calculus

- *Compulsory:*
 - [Resnik, 1987] Ch3, sections 3.1 and 3.2.
 - [Weisberg, ms]
- *Supplementary:*
 - [Hajek, 2003] (for issues concerning the ratio definition of conditional probability; worth reading but not *crucial* to this course)
 - [Goossens, 1979] (for axiomatisations of probability theory that circumvent some of the difficulties raised by Hajek—slightly technical)

4. Decisions under Risk: Frequentist interpretations of probability
 - *Compulsory:*
 - [Resnik, 1987] Ch3, sections 3.3, 3.3b.
 - *Supplementary:*
 - [Gillies, 2000], Ch5.
 - [Hajek, 1996]
 - [Hajek, ms]
 - [Mellor, 2005], Ch3.
5. Decisions under Risk: 'Subjectivist' interpretations of probability
 - *Compulsory:*
 - [Resnik, 1987], Ch3, sections 3.3c, 3-3d*.
 - *Supplementary:*
 - [Christensen, 2007], pp109-124
 - [Hajek, ms b]
 - [Hajek, 2005]
 - [Mellor, 2005], Ch3
 - [Vineberg, 2005]
6. Decisions under Risk: Utility and the Von Neuman Morgenstern approach
 - *Compulsory:*
 - [Resnik, 1987], Ch4, sections 4.1-4.3
 - *Supplementary:*
 - [Kreps, 1988], Ch5

Unit 2: Complications

7. Causal versus Evidential Decision Theory
 - *Compulsory:*
 - [Resnik, 1987], Ch4, sections 4.5, 4.6 and 4.6a.
 - *Supplementary:*
 - [Collins, 2001]
 - [Weirich, 2008]
 - [Joyce, 1999]
 - [Lewis, 1981] (I unfortunately do not have a copy of this)

8. Objections to Max EU: Allais, Ellsberg,...

- *Compulsory:*
 - [Resnik, 1987], Ch4, sections 4.4, 4.4a and 4.4b
- *Supplementary:*
 - [Ellsberg, 1961]
 - [Machina,]
 - [Maher, 1993], Ch3

9. Objections to Max EU: St Petersburg, Pasadena,...

- *Compulsory:*
 - [Resnik, 1987] Ch4, section 4.4c
 - [Martin, 2008]
- *Supplementary:*
 - [Nover and Hajek, 2004]
 - [Colyvan, 2006]

Unit 3: Applications to epistemology

10. Epistemology and Decision Theory: judgment and practical interests

- *Compulsory:*
 - [Levi, 1960]
- *Supplementary:*
 - [Rudner, 1953]
 - [Jeffrey, 1956]

11. Epistemology and Decision Theory: epistemic utility

- *Compulsory:*
 - [Levi, 1962] (unless you are familiar with the topic, feel free to skip section III, with deals with ‘classicist’ hypothesis testing)
- *Supplementary:*
 - [Maher, 1993], Chs 6, 7 & 8 (the last chapter is rather tough; feel free to skip it if you cannot follow it)

12. Pascal's Wager

- *Compulsory:*
 - [Hajek, 2008]
- *Supplementary:*
 - [Sobel, 2004]

References

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