

Survey of Formal Methods

PHIL 49

Fall 2016

T&R 10:30-11:50am

Location: 460-334

Contact information

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Office hours: 90-92k, F 1-3pm, or by appointment

Course description

Survey of important formal methods used in philosophy. The course covers the basics of propositional and elementary predicate logic, probability and decision theory, game theory, and statistics, highlighting philosophical issues and applications. Specific topics include the languages of propositional and predicate logic and their interpretations, rationality arguments for the probability axioms, Nash equilibrium and dominance reasoning, and the meaning of statistical significance tests. Assessment is through a combination of problems designed to solidify competence with the mathematical tools and short-answer questions designed to test conceptual understanding. 4 units.

Note: This course satisfies the Formal Reasoning WAYS requirement.

Resources

Readings for this course will come from two sources:

- Class notes
- Manuscript on decision theory by Brian Weatherson, available for download here:

<http://brian.weatherson.org/DecisionTheoryNotes.pdf>

Readings and topics, announcements, and assignments will be posted on Canvas:

<https://canvas.stanford.edu/courses/49168/>

Students may wish to consult additional resources. Here are a few suggestions:

- Paul Teller, *A Modern Formal Logic Primer* (free)
 - o <http://tellerprimer.ucdavis.edu>
- Colin Allen and Michael Hand, *Logic Primer*
- Michael D. Resnick, *Choices: An Introduction to Decision Theory*

Grading

Problem sets (68%)

- 17% logic
- 17% probability and decision theory
- 17% game theory
- 17% statistics

Final exam (25%)

Class participation (7%)

Disability accommodation

Students who have a disability which may necessitate an academic accommodation or the use of auxiliary aids and services in a class must initiate the request with the Office of Accessible Education (OAE). The OAE will evaluate the request with required documentation, recommend appropriate accommodations, and prepare a verification letter dated in the current academic term in which the request is being made. Please contact the OAE as soon as possible: timely notice is needed to arrange for appropriate accommodations. The OAE's contact details are as follows.

Address: 563 Salvatierra Walk, Stanford, CA 94305

Phone: (650) 723-1066

Web address: <http://studentaffairs.stanford.edu/oea>

Honor code and plagiarism policy

Students are not merely bound by Stanford University's Honor Code. It is also their responsibility to know what the Honor Code states. Students unfamiliar with the Honor Code should consult the following site:

<http://www.stanford.edu/dept/vpsa/judicialaffairs/guiding/honorcode.htm>

(Read this page and download the PDF.) Students are also responsible for knowing what constitutes plagiarism. If you are unsure about what counts as plagiarism, ask the instructor.

Schedule of topics

Unit 1: Logic

Basic concepts of logic
Translations into propositional logic
Truth tables
Patterns of argument in PL
Quantification
Translations into predicate logic
Models for predicate logic
Patterns of argument in PC

Unit 2: Probability and Decision Theory

Basic concepts of probability
Basic principles of probability
Conditionalization
Bayes' Theorem
Interpretations of probability
Expected value and expected utility
Utility and welfare
Allais's paradox
Newcomb's paradox
Dutch books

Unit 3: Game Theory

Prisoner's dilemma
Normal and extensive forms
Strong dominance
Weak dominance
Nash equilibria
Mixed strategies
Puzzles of backwards induction

Unit 4: Statistics

Ampliative reasoning
Significance testing
p-values
The Bayesian critique
Problem of the priors