Methods 1: Logic

Introduction, overview, & practicalities

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Why are you here?

Logic puzzle

There are two villages. In the honest village (H) everybody always speaks the truth. In the dishonest village (D) everybody always says the opposite of what is true.
Before you the road splits: one way leads to the honest, the other to the dishonest village.
At the splitting there is a man. He may be from village H or D, you don't know.
What do you ask the man to find out where the honest village is?

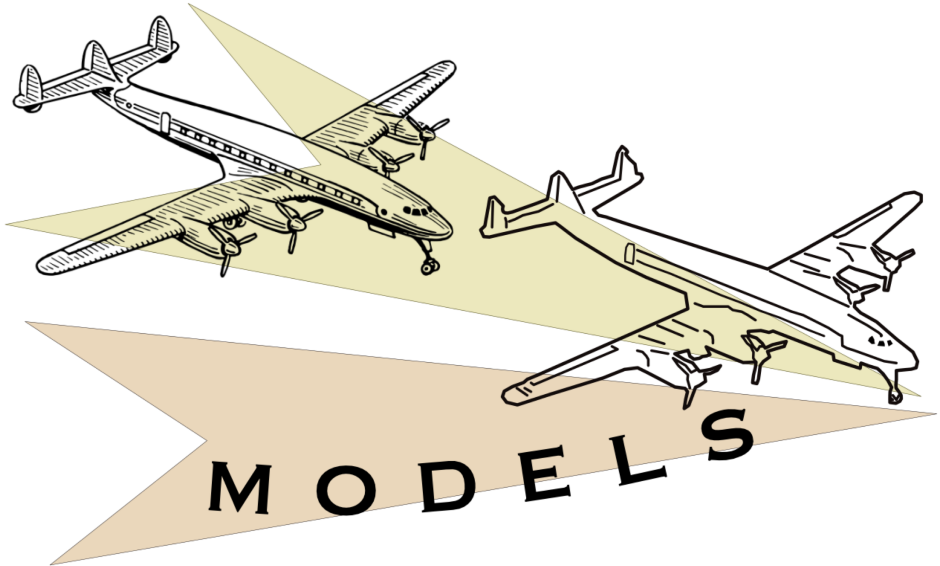
honest village	man	where're you from?
left	honest	"left"
left	dishonest	"left"
right	honest	"right"
right	dishonest	"right"

What is logic?

proof entailment meaning

All Europeans are human.
All humans are mortal
Therefore, all Europeans are mortal.

Modeling



Normative model: how it *should* be

proof	entailment	meaning
argumentation	inference	precision of expression

What is **a** logic?

- there are different kinds of logic
- a logic is a formal system that captures some structural properties of meaning
- this course will cover three logics:
  1. propositional logic [meaning of connectives *and*, *or*, *not* . . .]
  2. predicate logic [meaning of quantifiers *all*, *some*, *none* . . .]
  3. modal logic [meaning of epistemic attitudes *belief*, *knowledge* . . .]

Course content

- set theory
- (informal) proofs
- propositional logic
- predicate logic
- natural deduction
- modal (epistemic) logic
- probability theory
- information theory

	date	topic
1	2022-10-27	Course overview & introduction
2	2022-11-03	Basics of (naive) set theory
3	2022-11-10	Proofs
4	2022-11-17	Relations & functions
5	2022-11-24	PropLog: Syntax & truth tables
6	2022-12-01	PropLog: Translations & logical validity
7	2022-12-08	PropLog: Natural Deduction
8	2022-12-15	PredLog: Syntax & Translations
9	2022-12-22	PredLog: Semantics & Identity
10	2023-01-12	Modal logic
11	2023-01-19	Probability theory
12	2023-01-26	Information theory
13	2023-02-02	Recap
14	2023-02-09	no class
15	2023-02-16	final exam

Practicalities

- enroll for this course on **moodle**:
  - `https://moodle.zdv.uni-tuebingen.de/course/view.php?id=2876`
- necessary for
  - assessing course material
  - receiving notifications
  - asking questions in the forum
  - submitting homework
  - receiving feedback on homework

Best practice guide

1. self-study
   - prepare the assigned reading material before the lecture
   - bring questions, know what you don't know, ask and probe
2. lecture
   - provides motivation, context and overview
   - focuses on conceptual understanding
3. homework [start as early as possible each week]
   - discussion with others is allowed & encouraged
   - write-up & submissions must be made individually
   - ask general questions on moodle, but do not share solutions
4. tutorials [go to at least one tutorial every week!]
   - start working on homework questions before the tutorial(s)
   - emphasis on hands-on support for exercises

How to get answers

- tutorials: [tutorials start in the week of Nov 7]
  1. Aydemir Shamsutdinov: Monday 12 :00 (room TBA)
  2. Benedict Konhäuser: Tuesday 12 :00 (Zoom), Tuesday 16:00 (room TBA)
  3. Fanyi Meng: Wednesday 12:00 (room TBA)
- moodle
- dischord: https://discord.gg/fJ7ZmZHw

Homework

- **no copying from others** [plagiarism will lead to failure]
- release: Thursday after lecture
- submission:
  - Friday 18:00 (one week after release)
  - electronically via moodle as PDF
  - handwritten (legible) or typeset (as PDF)

Exam

- February 16 2023, 10:00-16:00 (CET)
- take-home exam:
  - released electronically at 10:00 via moodle
  - solvable in ca. 3 hours
  - you may use any material you like (books, handouts, ...)
  - cooperation is forbidden, submissions may not be copied
  - submit electronically at 16:00 the latest via moodle