Applications of logic in the normative domain

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Overview

Our main area of research
This presentation concerns applications of logical methods in the analysis of fundamental problems in the normative domain.

Motivation
Formal methods are becoming increasingly common in the normative domain, since the development of new technologies (e.g., self-driving cars) poses new challenges to existing normative frameworks and high conceptual precision is called for. For instance, logic helps one answer the following questions:

- how can one specify the duties of a non-human agent?
- how can we detect whether two norms are related?
- how can we assess whether a normative framework is appropriate?

Overview

Structure of the presentation
We will briefly discuss a list of recent articles we have written on
the following topics:

- interdefinability of normative concepts;

- formalization of complex normative notions;

- fine-grained semantics for normative concepts;

- logical properties of normative frameworks.
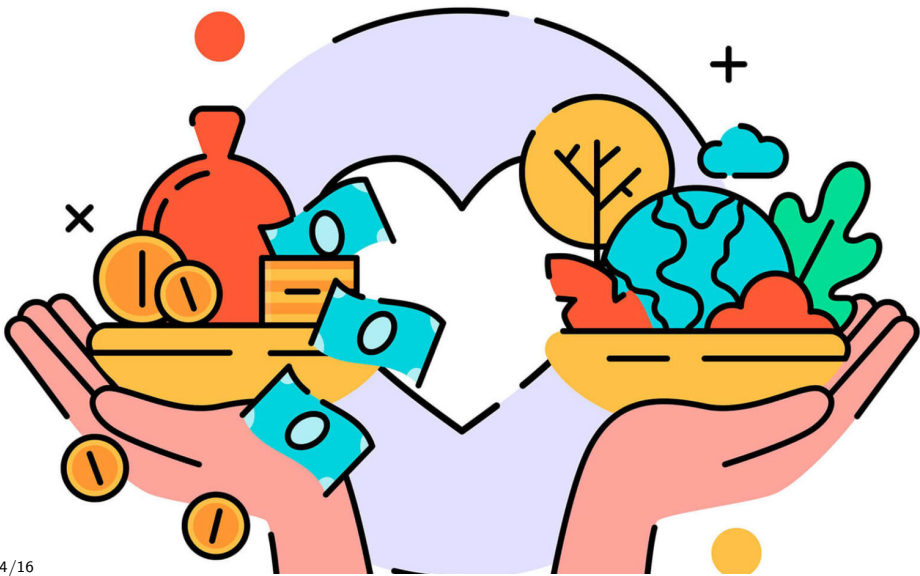
Interdefinability of normative concepts

In the article **"The good, the bad and the right: formal reductions among deontic concepts"** (2021) a language of modal logic is used in order to rigorously represent the relation between normative values (e.g., normative ideality and normative awfulness) and deontic concepts (e.g., obligation, permission, duty and right).

More precisely, the article illustrates how to construct logics of normative values in a *systematic* way and improves proposals to define deontic concepts in terms of values formulated in the literature. The results obtained shed light on the issue whether normative concepts belonging to different families are *interdefinable*: at least to a certain extent, deontic concepts can be explained in terms of values.

Formalization

The article "**Formal analysis of responsibility attribution in a multimodal framework**" (2019) proposes a formalization of the fundamental conceptual components (causal, temporal, agentive, counterfactual, etc.) of various notions of responsibility.

The article "**Making Sense of Vicarious Responsibility**" (2022) proposes a semi-formal account of vicarious responsibility. This account applies in both law and morality.

The article "**Vicarious Liability: A Solution to a Problem of AI Responsibility?**" (2022ms.) applies vicarious responsibility to the problem of a specific (kind of) AI responsibility gap.

Semantics

The article "**Alternative semantics for normative reasoning
with an application to regret and responsibility**" (2021) also
addresses the conceptual structure of complex normative notions,
such as various senses of regret and responsibility, in terms of a
language of modal logic.

However, its main focus is on the choice of semantics for
normative reasoning: it proposes some variations of traditional
possible worlds semantics and analyses their connections.

Semantics

Two sorts of models

The formal language used is interpreted via two sorts of models:

- relating models, which are endowed with a relation of propositional pertinence,

- synonymy models, which are endowed with a relation of propositional synonymy.

The main technical result is that each synonymy model can be transformed into an equivalent relating model satisfying certain properties (a *strictly relating model*). Moreover, the notion of validity in the class of all strictly relating models is axiomatized.

Properties of normative frameworks

The article "**Correctness and completeness of programming instructions for traffic circulation**" (2021) uses the logical notions of correctness and completeness to draw attention on some fundamental problems that can be encountered by a software developer when transforming norms for traffic circulation into programming instructions.

For instance, consider a set of instructions Γ given as an input to a self-driving car: Γ may correctly encode a portion of the relevant traffic regulation while failing to address all relevant scenarios (or vice versa). Moreover, Γ often needs to cover norms that are not specified in traffic regulations.

Properties of normative frameworks

A procedure to assist investigations
Our analysis allows for the definition of a question and answer
procedure that can be helpful, in case of an accident, to clarify
which components of an existing framework should be revised and
to what extent software developers can be held responsible.

Works

- D. Glavaničová and M. Pascucci (2022ms.). Vicarious liability: a solution to a problem of AI responsibility?. Conditionally accepted in *Ethics and Information Technology*.
- D. Glavaničová and M. Pascucci (2022). Making sense of vicarious responsibility: moral philosophy meets legal theory. Online first in *Erkenntnis*.
- D. Glavaničová and M. Pascucci (2021a). Correctness and completeness of programming instructions for traffic circulation. *Science and Engineering Ethics* 27(6): 1–16.
- D. Glavaničová and M. Pascucci (2021b). Alternative semantics for normative reasoning with an application to regret and responsibility. *Logic and Logical Philosophy* 30(4): 653–679.
- D. Glavaničová and M. Pascucci (2021c). The good, the bad and the right: formal reductions among deontic concepts. *Bulletin of the Section of Logic* 50(2): 151–176
- D. Glavaničová and M. Pascucci (2019). Formal analysis of responsibility attribution in a multimodal framework. In: *Proceedings of PRIMA 2019: Principles and Practice of Multi-Agent Systems*, pp. 36–51. Springer.

Opportunities

If you would like to spend a period at our Department, please
contact us. The National Scholarship Programme supports stays
for up to 10 months:

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https://www.scholarships.sk/en/news/
call-for-applications-academic-year-2022/
2023-apply-now
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Deadline for applications: April 30

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Thanks a lot for your attention!