Formal Epistemology Meets Computation: Modeling Inferable Beliefs with Python

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Abstract

This paper develops a framework for formal epistemology using computational tools. We present methods to model epistemic states, inferable belief sets, and degrees of acceptance for propositions. All computations are implemented in Python, and the library is openly available for reproducibility.

Keywords: Formal epistemology, inferable beliefs, Python, computational philosophy

1 Introduction

Formal epistemology provides tools to analyze belief, knowledge, and uncertainty. In this work, we integrate computational methods with formal epistemology to allow practical simulations and reasoning.

We also release a Python library implementing these methods, enabling reproducible experiments:

- GitHub: `https://github.com/yourusername/yourlibrary`
- Zenodo DOI (optional): `https://doi.org/10.xxxx/zenodo.xxxx`

2 Formal Definitions

Definition 2.1 (Epistemic Space)**.** *An epistemic space is defined as a tuple* $(\mathcal{P}, \mathcal{W}, m)$ *where*

- $\mathcal{P}$ *is a set of propositions,*
- $\mathcal{W}$ *is a set of possible worlds,*
- $m : \mathcal{P} \to [0, 1]$ *assigns a mass (degree of belief) to each proposition.*

Definition 2.2 (Inferable Base)**.** *A set of propositions* $B \subseteq \mathcal{P}$ *is an inferable base if the intersection of worlds where all propositions in* B *hold is non-empty, and* B *is maximal under this property.*

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Example 2.1 (Python Implementation). *We compute inferable bases using the following Python snippet:*

```
es = EpistemicSpace(cf, mass=masses)
inferable_bases = es.get_inferable_base()
```

3 Computational Experiments

We illustrate computations of inferable bases and degree of acceptance with the Python library:

1. Define masses for propositions
2. Compute endorsed focal subsets
3. Compute inferable bases
4. Compute degrees of acceptance using minimal grounds

Example 3.1 (Degree of Acceptance). *For proposition P_{13}:*

$$A(P_{13}) = 1 - \prod_j (1 - s_j)$$

where s_j are the strengths of minimal grounds in the inferable base.

4 Discussion

Our computational framework allows philosophers to experiment with formal models of epistemic states and verify theoretical results. Linking code and theory ensures reproducibility and transparency in formal epistemology research.

5 Conclusion

We presented a Python-based approach to formal epistemology. Preprints can be shared open-access (PhilArchive/arXiv), while peer-reviewed publication ensures academic validation. The library is publicly available to allow replication and further development.

References

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