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## 5 Open problems

### 5.1 Is HOL (as a metalogic) all we need for flexible normative reasoning?

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**Main reference** Christoph Benzmüller, Xavier Parent, Leendert W. N. van der Torre: “Designing normative theories for ethical and legal reasoning: LogiKEy framework, methodology, and tool support”, *Artif. Intell.*, Vol. 287, p. 103348, 2020.  
**URL** <https://doi.org/10.1016/j.artint.2020.103348>

**Main reference** Christoph Benzmüller, David Fuenmayor, Alexander Steen, Geoff Sutcliffe: “Who Finds the Short Proof?”, *Logic Journal of the IGPL*, p. jzac082, 2023.  
**URL** <https://doi.org/10.1093/jigpal/jzac082>

In previous work we have shown that classical higher-order logic (HOL), when used as a metalogic, enables (shallow) semantic embeddings of various state-of-the-art logics for normative reasoning. To this end, the logico-pluralistic LogiKEy [1] methodology and framework has been developed to support both metalogical studies of logics for normative reasoning [2] and their applications [3].

In this talk I summarise these developments and ask the obvious question: Is HOL already all we need to support flexible normative reasoning on computers? Or are there logics for normative reasoning that cannot be addressed by the LogiKEy approach?

We also briefly address typical arguments against HOL, namely that undecidability and complexity considerations militate against its use. With reference to very recent practical work on speeding up proofs in HOL [4], we will take a partially contrary position.

#### References

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- 4 C. Benzmüller, D. Fuenmayor, A. Steen, G. Sutcliffe. Who Finds the Short Proof? *Logic Journal of the IGPL*. 2023. <http://doi.org/10.1093/jigpal/jzac082> (Preprint: <https://www.researchgate.net/publication/367464450>)