

# Logical Relations

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## Why logical?

Everybody seems to agree that the name is highly appropriate!

- Logical relations are built using the correspondence between types and formulas: type constructors are interpreted as logical connectives.
- The relations are closed under (suitably defined) logical operations.
- They have been used to characterise elements that are defined by logical means, i.e. the lambda calculus.

## ML-like languages

Logical relations can be used to reason about contextual equivalence in a variety of type-theoretic frameworks. We will have a closer look at [3].

<http://www.cl.cam.ac.uk/~amp12/papers/operfl/operfl.pdf>

More recent papers covering the same language (and more) are [1] and [2]. This is a very dynamic area at the moment (Ahmed, Benton, Birkedal, Dreyer, Hofmann, Kennedy, Neis, Rossberg, Schwinghammer, ...).

- [1] A. Ahmed, D. Dreyer, and A. Rossberg. State-dependent representation independence. In *Proceedings of POPL*, pages 340–353. ACM, 2009.
- [2] D. Dreyer, G. Neis, and L. Birkedal. The impact of higher-order state and control effects on local relational reasoning. In *Proceedings of ICFP*, pages 143–156. ACM, 2010.
- [3] A. M. Pitts and I. D. B. Stark. Operational reasoning for functions with local state. In A. D. Gordon and A. M. Pitts, editors, *Higher-Order Operational Techniques in Semantics*, pages 227–273. Cambridge University Press, 1998.