

Symbolic models and computational properties of constructive reasoning in cognition and creativity

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Abstract

Analogy is one of the most studied forms of non-classical reasoning working across different domains, usually taken to play a crucial role in creative thought and problem-solving. In the first part of the talk, I will introduce general principles of computational analogy models (relying on a generalisation-based approach to analogy-making). We will then have a closer look at Heuristic-Driven Theory Projection (HDTP) as an example for a theoretical framework and implemented system: HDTP computes analogical relations and inferences for domains which are represented using many-sorted first-order logic languages, applying a restricted form of higher-order anti-unification for finding shared structural elements common to both domains. The presentation of the framework will be followed by a few reflections on the cognitive plausibility of the approach motivated by theoretical complexity and tractability considerations. In the second part I will touch upon several applications of HDTP to modeling important cognitive capacities, including concept blending processes as current hot topic in Cognitive Science.

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