

Analogy and the Continuum of Knowledge Hypothesis

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One of the hallmarks of human cognition is our ability to use abstract conceptual knowledge. How is such conceptual knowledge learned? Dedre Gentner and I have been exploring the *Continuum of Knowledge* hypothesis (Forbus & Gentner, 1997), i.e. that experiential knowledge is incrementally refined via analogical generalization into increasingly abstract representations. Concrete, abstract, and intermediate forms are all applied via analogy to reason about new situations. Under this view, experience and rules are simply two ends of a continuum of knowledge (Gentner & Medina, 1998).

This talk will describe how we are exploring this hypothesis in the Companion cognitive architecture (Forbus & Hinrichs, 2017). The *analogy stack* (matching, retrieval, generalization) it uses will be contrasted with the usual view of rules in cognitive architectures. Three lines of computational investigations will be summarized. The first is how analogy can be used to model aspects of human conceptual change. These experiments use analogical generalization over simulated experiences provided by sketches to learn a sequence of models that overlaps with those learned by human students (Friedman & Forbus, 2010). The second is how analogy can be used to model aspects of theory of mind, including how children might learn it from experience (Rabkina et al. 2017). The third is how analogy can be used to perform commonsense reasoning, via analogical chaining, where small pieces of knowledge provided via natural language can extend a Companion's capabilities incrementally (Blass & Forbus, 2017). I will close with describing some open questions and resources that we hope will expand the community for analogy research.

Talk preferred.

References

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