

Learning and Reasoning with Conceptual Space Representations*

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Conceptual spaces were proposed by Gärdenfors as an intermediate representation level between symbolic and connectionist representations [8]. They are geometric representations of knowledge, in which the objects from some domain of interest (e.g. movies) are represented as points in a metric space, and concepts (e.g. comedy) or properties (e.g. scary) are modelled as (possibly vague) convex regions. As such, they are similar in spirit to vector space representations that have been proposed and largely used in NLP and machine learning, but there are also notable differences. Conceptual spaces support the view that symbolic knowledge can be expressed as qualitative constraints on some underlying geometric model. While the theory of conceptual spaces offers an elegant solution to combine symbolic and vector representations, in practice, it is often difficult to learn region-based representations of concepts from data. In this talk, we will discuss learning and reasoning with conceptual spaces. I will present some methods for learning suitable entity embedding (e.g. [9]), and region-based representations of concepts (e.g. [7, 4]). I will show how meaningful (interpretable) dimensions can be discovered and organised into domains from a given vector representation in an unsupervised fashion (e.g. [1, 2, 3]). Finally, I will present some examples of reasoning with conceptual spaces (e.g. [5, 6]).

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