Rough Knowledge and its Refinement

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Abstract

Learning, understanding, and teaching concepts often requires executing a series of refinement steps: a broad class is subsequently divided into smaller ones as distinguishing features and details arise. This is specially true when the concepts under consideration are vague, and no perfect boundaries between the inclusion and exclusion of objects to the class can be provided.

Rough sets are a simple formalism which can be used for describing imprecise concepts. In very simple terms, rough sets are sets with a "thick border," where objects which cannot be distinguished from some members of the class, nor from some members of its complement. The refinement process, in this setting, corresponds to making those borders thinner and thinner. On the other hand, reasoning and explanations often require accessing previous degrees of refinement, or communicating with agents who followed a different refinement path.

In this talk, we present a rough extension of the light-weight description logic $\mathcal{EL}$, which allows for a large class of rough concept representations and see how to reason over them. We show that if the concept representations are constructed through knowledge refinement, then reasoning remains polynomial time (as in classical $\mathcal{EL}$). However, if the representations are incomparable (as when different agents follow diverse refinement steps), reasoning becomes ExpTime-complete.

Declaration on Generative AI

The author(s) have not employed any Generative AI tools.

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