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# Fuzzy-Rough Cognitive Networks

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## Abstract

*Rough Cognitive Networks* (RCNs) are a kind of granular neural network that augment the reasoning rule present in Fuzzy Cognitive Maps with crisp information granules coming from Rough Set Theory. While RCNs have shown promise in solving different classification problems, this model is still very sensitive to the similarity threshold upon which the rough information granules are built. In this paper, we cast the RCN model within the framework of *fuzzy rough sets* in an attempt to eliminate the need for a user-specified similarity threshold while retaining the model's discriminatory power. As far as we know, this is the first study that brings fuzzy sets into the domain of rough cognitive mapping. Numerical results in presence of 140 well-known pattern classification problems reveal that our approach, referred to as *Fuzzy-Rough Cognitive Networks*, is capable of outperforming most traditional classifiers used for benchmarking purposes. Furthermore, we explore the impact of using different heterogeneous distance functions and fuzzy operators over the performance of our granular neural network.

*Key words:* fuzzy cognitive maps, fuzzy rough sets, rough cognitive mapping, pattern classification, granular classifiers

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