Learning Fuzzy Cognitive Maps with modified asexual reproduction optimisation algorithm

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This paper present a comparison between Fuzzy Cognitive Map (FCM) learning approaches and algorithms. FCMs are fuzzy digraphs with weights and feedback loops, consisting of nodes interconnected through directed arcs mostly used for knowledge representation and system modelling. One of the most important characteristics of FCMs is their learning capabilities. FCMs are normally constructed through experts? opinions, thus they maybe subjective. Learning algorithms are introduced to overcome this inconvenient. One of the main problem of the new proposed algorithms is their validation. Using theoretical and experimental analysis, this research aims to (1) compare FCM learning algorithms proposed in the literature, (2) provide a validation tool for new FCM learning algorithms (3) present a new algorithm called Asexual Reproduction Optimisation (ARO) with one of its extensions ? Modified ARO (MARO) ? as a novel FCM learning algorithm to use the validation tool proposed. According to the findings from the literature, it seems that among FCM learning approaches, population-based algorithms perform better compared to other algorithms. Also, the testing was done in five benchmark datasets and a synthetic dataset with different node sizes using two criteria of in-sample and out-of-sample errors. The results show that MARO outperforms other algorithms in both error functions in terms accuracy and robustness. © 2018 Elsevier B.V.

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