

STUDY ON IMPROVEMENT OF FCM BASED ON EVOLUTIONARY ALGORITHMS

Zhenbang Ju

Dr. James Keller, Thesis Supervisor

ABSTRACT

The Fuzzy C-Means (FCM) is a widely used clustering algorithm in unsupervised learning. It always converges to an optimum solution very quickly, thanks to its alternating optimization (AO) strategy. However, this AO strategy cannot guarantee the solution is global optimal. Hence, FCM may produce some counterintuitive results. On the other hand, evolutionary algorithms (EAs) are good at finding global optima in optimization problems. Hence, this thesis studied how to improve the FCM with the help of EAs.

The evolving FCM (EFCM) was first proposed. It had a slight higher performance in term of the Rand Index (RI) result measurement, but took much longer time compared with FCM. An improved EFCM approach was then proposed, which had a better performances and used less time than EFCM. What's more, the improved EFCM found better results which was not found by FCM. Finally, another related approach, modified genetic FCM (modified GFCM) was proposed by optimizing the existing improved GFCM. The modified GFCM greatly shorten the runtime compared to improved GFCM, but with no performance loss.