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# GDPC: Gravitation-based Density Peaks Clustering Algorithm<sup>☆</sup>

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## Abstract

The Density Peaks Clustering algorithm, which we refer to as DPC, is a novel and efficient density-based clustering approach, and it is published in *Science* in 2014. The DPC has advantages of discovering clusters with varying sizes and varying densities, but has some limitations of detecting the number of clusters and identifying anomalies. We develop an enhanced algorithm with an alternative decision graph based on gravitation theory and nearby distance to identify centroids and anomalies accurately. We apply our method to some UCI and synthetic data sets. We report comparative clustering performances using  $F$ -Measure and 2-dimensional vision. We also compare our method to other clustering algorithms, such as  $K$ -Means, Affinity Propagation (AP) and DPC. We present  $F$ -Measure scores and clustering accuracies of our GDPC algorithm compared to  $K$ -Means, AP and DPC on different data sets. We show that the GDPC has the superior performance in its capability of: (1) detecting the number of clusters obviously; (2) aggregating clusters with varying sizes, varying

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