Ann Inst Stat Math (2015) 67:335–357
DOI 10.1007/s10463-014-0454-0

Strong consistency of factorial *K*-means clustering

Yoshikazu Terada

Received: 26 June 2013 / Revised: 12 January 2014 / Published online: 27 March 2014

Abstract Factorial k-means (FKM) clustering is a method for clustering objects in a low-dimensional subspace. The advantage of this method is that the partition of objects and the low-dimensional subspace reflecting the cluster structure are obtained, simultaneously. In some cases that reduced k-means (RKM) clustering does not work well, FKM clustering can discover the cluster structure underlying a lower dimensional subspace. Conditions that ensure the almost sure convergence of the estimator of FKM clustering as the sample size increases unboundedly are derived. The result is proved for a more general model including FKM clustering. Moreover, it is also shown that there exist some cases in which RKM clustering becomes equivalent to FKM clustering as the sample size goes to infinity.

Keywords Subspace clustering · K-means