Prof. Dr. Johannes Blömer 3.12.2015

submission due: 17.12.2015, F1.110, 11:15

Clustering Algorithms

WS 2015/2016

Handout 6

Exercise 1:
Given a set of $P \subset M$ and $k \in \mathbb{N}$ ($|P| \geq k$), we define the discrete k-median problem as follows. Find a subset $C \subseteq P$, $|C| = k$, such that $cost(P, C) = \sum_{p \in P} \min_{c \in C} D_{l_2^2}(c, p)$ is minimized. Denote the optimal discrete k-means cost by $\text{opt}_k^{discr}(P)$.
Let $\text{opt}_k(P)$ be the optimal k-means cost of P. Prove that

$$\text{opt}_k^{discr}(P) \leq 2 \cdot \text{opt}_k(P).$$

Exercise 2:
Let $S \subset P$ be an ϵ-stable set of k centers, and let $O \subset P$ be an optimal set of k centers. Prove that

$$D(P, S) \leq \left(\frac{9}{1-\epsilon}\right)^2 D(P, O).$$