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Sketching and Clustering Metric Measure Spaces.

We study the problem of approximating a metric space with another metric space of smaller size, such that properties of the input metric space are retained by the smaller metric space. We refer to this problem as “Sketching”. Sketching has been studied by various methods, such as by sampling randomly distributed points from the input metric space, using farthest point sampling, etc. We provide a natural mathematical formulation of the sketching problem and show that k-sketching i.e. approximating with a metric space of cardinality k , is equivalent to certain notions of k-clustering. This equivalence provides us with a constant factor approximation algorithm for computing a k-sketch of a metric space. We also study the sketching problem for metric measure spaces. These are metric spaces with a notion of weights on points. These spaces arise naturally in various applications, wherein the points are assigned different weights based on their importance for the underlying application. We again show that k-sketching is equivalent to certain notions of k-clustering of metric measure spaces, and this implies existence of constant factor approximation algorithms for obtaining a k-sketch of a metric measure space. (Received August 25, 2019)