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The geometric median of samples from measures induced by simple random walks

A geometric median or Fermat point of a finite subset A of a metric space (S, d) is simply a point of the space that minimizes the total distance to points of A, i.e. $d(x, A) := \sum_{a \in A} d(x, a)$. A set of points may have more than one median. The total distance of a median of A to A is called the median value.

Using some natural measures arising from simple random walks, tree indexed random walks and the uniform measure, we sample points from some discrete metric spaces. Both problems of small and large sampling will be considered. Our goal is to study the median of the sample data. In some cases, the median in an asymptotic geometry will be discussed. In particular, defining the asymptotic tree indexed random walk, we will see some examples of metric spaces for which after a convenient rescaling of the metric there are some median points in the trajectories of the tree indexed random walk asymptotically almost surely.