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Gromov's Approximating Tree and the All-pairs Bottleneck Paths Problem.

Let X be a simple connected graph on $n + 1$ vertices. The Gromov hyperbolicity constant $\delta \geq 0$ measures "tree-likeness" of X . For a fixed vertex w , the Gromov approximating tree of (X, w) is an optimal tree T whose vertex set contains that of X , such that distances to the root are preserved, $\text{dist}_X(x, w) = \text{dist}_T(x, w)$, and pairwise distances satisfy $\text{dist}_X(x, y) - 2\delta \log_2 n \leq \text{dist}_T(x, y) \leq \text{dist}_X(x, y)$ for all $x, y \in X$.

We present an explicit algorithm that constructs Gromov approximating tree of (X, w) from the adjacency matrix of the graph in quadratic time. Our approach reduces the construction of the tree to the All-Pairs Bottleneck Paths (APBP) problem for a weighted graph on n vertices, which is known to be solvable in $O(n^2)$ time.

Joint work with Anders Cornect.