

# Least-squares approximation by a tree distance

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## Abstract

Let  $T$  be a tree with vertex set  $V(T) = \{1, \dots, n\}$ , and with a positive weight associated with each edge. The tree distance between  $i$  and  $j$  is the weight of the  $(ij)$ -path. Given a symmetric, positive real valued function on  $V(T) \times V(T)$ , we consider the problem of approximating it by a tree distance corresponding to  $T$ , by the least-squares method. The problem is solved explicitly when  $T$  is a path or a double-star. For an arbitrary tree, a result is proved about the nature of the least-squares approximation. Some properties of the incidence matrix of all the paths in the tree are proved and used.

## Keywords

Tree, Distance, Least-squares method, Generalized inverse, All-paths matrix.