

**Title: Geometry of the Space of Phylogenetic Trees**

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**Abstract:**

We consider a continuous space which models the set of all phylogenetic trees having a fixed set of leaves. This space has a natural metric of nonpositive curvature, giving a way of measuring distance between phylogenetic trees and providing some procedures for averaging or combining several trees whose leaves are identical. This geometry also shows which trees appear within a fixed distance of a given tree and enables construction of convex hulls of a set of trees.

This geometric model of tree space provides a setting in which questions that have been posed by biologists and statisticians over the last decade can be approached in a systematic fashion. For example, it provides a justification for disregarding portions of a collection of trees that agree, thus simplifying the space in which comparisons are to be made.