

# Applying Empirical Likelihood Theory To Phylogenetic Trees

Nancy Glenn, Ph.D.  
University of South Carolina

## **Abstract:**

The empirical likelihood (EL) function, a non parametric likelihood function, is as fundamental to the field of statistics as its parametric counterpart. EL's applications include estimating parameters, constructing confidence intervals, and constructing confidence regions. Robust empirical likelihood (REL) is a nonparametric function that generalizes EL. The REL methodology uses the Karush-Kuhn-Tucker Theorem to solve a robust version of the empirical likelihood function, thus allowing data analysts to estimate parameters accurately despite any potential contamination. This research incorporates the underlying theory of EL and REL, then employs the REL methodology to find the likelihood of phylogenetic trees. The REL methodology involves formulating a nonlinear programming problem that places probability mass on a set of sequences of a given phylogenetic tree. This results in the empirical likelihood of phylogenetic trees.