STATISTICAL PROBLEMS IN ESTIMATING THE "TOPOLOGICAL INDEX" FOR PLANT ROOT-ARCHITECTURE DATA

L. Murray[1], K. Wang[2], J. Schroeder[1], S. H. Thomas[1]

[1] *New Mexico State University, Las Cruces, NM, USA*
[2]*Colorado State University, Fort Collins, CO, USA*

Email: estatu10@nmsuvm1.nmsu.edu

Topological trees have been used to study, among many other applications, the root architecture of various species of plants. In a rooted tree (a tree with a distinct basal link), magnitude (n=the total number of exterior links), altitude (a=number of links of the longest path from the basal link to an exterior link) and total path length (pe=the total number of links in the paths from the basal link to all exterior links) are three topological parameters which have been used to characterize a root system. Root systems range from the extremes of herringbone to dichotomous (or binary) topologies. For a sample of root systems, one way of differentiating between herringbone, intermediate, and dichotomous root systems has been a "topological index" which is the slope of the regression of ln(a) on ln(n), or alternatively of ln(pe) on ln(n). In theory, the slope of the regression of ln(a) on ln(n) should be a maximum of 1, which occurs when all trees in a sample are herringbone. In practice, slope values can be larger than the theoretical maximum. Similar problems can occur with the theoretical minimum slope which occurs when all trees in a sample are dichotomous. Several solutions to this problem are illustrated, including rescaling data, fitting a spline, and categorical analyses of the unlogged data.