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Discrete Mathematics Seminar

Time: Friday, 9 February 2017, 2:15 – 3:15 PM
Location: 237 Derrick Hall
Title: Tropical Fermat-Weber point
Speaker: Dr. Bo Lin, Department of Mathematics, UT-Austin

Abstract:

In a metric space, the Fermat-Weber points of a sample are statistics to measure
the central tendency of the sample and it is well-known that the Fermat-Weber
point of a sample is not necessarily unique in the metric space. We investigate the
computation of Fermat-Weber points under the tropical metric on the quotient space
$\mathbb{R}^n/\mathbb{R}\mathbf{1}$ with a fixed $n \in \mathbb{N}$, motivated by its application to the space of equidistant
phylogenetic trees with N leaves (in this case $n = \binom{N}{2}$) realized as the tropical
linear space of all ultrametrics. We show that the set of all tropical Fermat-Weber
points of a finite sample is always a classical convex polytope, and we present a
combinatorial formula for the minimal sum of distances from an arbitrary point to
the points in the sample (which is attained at this set). We identify conditions
under which this set is a singleton. We apply numerical experiments to analyze the
set of the tropical Fermat-Weber points within a space of phylogenetic trees. We
discuss the issues in the computation of the tropical Fermat-Weber points and the
k-ellipses that are generalizations of the Fermat-Weber points. This is a joint work
with Ruriko Yoshida.

Bio:

Bo Lin is a current postdoctoral researcher from University of Texas, Austin. He
received his Ph. D. degree in mathematics from University of California, Berkeley

in 2017 (advisor: Bernd Sturmfels). His research interests include combinatorics, tropical geometry and convex geometry.