



KOÇ UNIVERSITY

## Science – Math Seminar

**Speaker:** Elvan Ceyhan  
Center for Imaging Science &  
Department of Applied Mathematics and Statistics  
Johns Hopkins University, Baltimore, MD, 21218, USA

**Date:** Tuesday, Feb. 08, 2005  
**Time:** 16:45 (Tea and cookies will be served at 16:30)  
**Place:** Science Building, Room Z42

**Title:** A Parametrized Family of Proximity Catch Digraphs in  
Delaunay Tessellations and its Use in Testing Spatial Point  
Patterns

### Abstract:

Statistical pattern classification methods based on data-random graphs were introduced recently. In this approach, a random directed graph is constructed from the data using the relative positions of the data points from various classes. Different random graphs result from different definitions of the proximity region associated with each data point and different graph statistics can be employed for data reduction. In this article we introduce a parameterized family of proximity maps determining an associated family of data-random digraphs and investigate the distribution of the domination number and relative arc density of the digraphs. The relative arc density of the digraph is used as the summary statistic, providing an alternative to the domination number employed previously. An important advantage of the relative arc density is that, properly re-scaled, it is a  $U$ -statistic, facilitating analytic study of its asymptotic distribution using standard  $U$ -statistic central limit theory. The approach is illustrated with an application to the testing of spatial patterns of segregation and association. Knowledge of the asymptotic distribution allows evaluation of the Pitman and Hodges-Lehmann asymptotic efficiencies, and selection of the proximity map parameter to optimize efficiency. Furthermore the approach presented here also has the advantage of validity for data in any dimension.

---

Please visit <http://sci-math.ku.edu.tr/> for a schedule of upcoming Science - Math seminars.