CENTER FOR OPTIMIZATION AND STATISTICAL LEARNING

McCORMICK SCHOOL OF
ENGINEERING

Robust Bivariate Error Detection in Skewed Data with Application to Historical Radiosonde Winds

Tuesday, **February 23** , 2016
Tech M228
11:00 a.m.
Refreshments Served

Amanda Hering
Colorado School of Mines

Abstract: The global historical radiosonde archives date back to the 1920's and contain the only directly observed measurements of temperature, wind, and moisture in the upper atmosphere, but they contain many random errors. Most of the focus on cleaning these large datasets has been on temperatures, but winds are important inputs to climate models and in studies of wind climatology. The bivariate distribution of the wind vector does not have elliptical contours but is skewed and heavy-tailed, so we develop two methods for outlier detection based on the bivariate skew-t (BST) distribution, using either distance-based or contour-based approaches to flag observations as potential outliers. We develop a framework to robustly estimate the parameters of the BST and then show how the tuning parameter to get these estimates is chosen. In simulation, we compare our methods with one based on a bivariate normal distribution and a nonparametric approach based on the bagplot. We then apply all four methods to the winds observed for over 35,000 radiosonde launches at a single station and demonstrate differences in the number of observations flagged across eight pressure levels and through time. In this pilot study, the method based on the BST contours performs very well.

Biography: Amanda Hering graduated from Baylor University with a bachelors degree in mathematics in 1999. She joined the Department of Applied Mathematics and Statistics at The Colorado School of Mines as an Assistant Professor in 2009 after earning her Ph.D. in Statistics from Texas A&M University. She is the CSM Site Director for the Center for Research and Education in Wind, and her research interests are in the areas of spatial and space-time modeling, wind speed forecasting, model validation, and multivariate methods. She is an Associate Editor for four journal, including Technometrics and Environmetrics. Association and past Associate Editor or Editorial Board Member of Technometrics, Journal of Quality Technology, Operations Research, and Naval Research Logistics.