Colorado-Wyoming Chapter
American Statistical Association

Spring Meeting

Friday, April 11, 2003

National Center for Atmospheric Research
Foothills Lab
Boulder, Colorado

Spring Meeting Schedule

1:00   Registration & social time

1:15   Election of new officers
    President-Elect
    Treasurer

1:30   Presentation of student awards
  Jim Luhring, CO-WY Chapter President
    2003 Maurice Davies Awards
    2003 Outstanding High School AP Statistics Students

1:45   Invited Talk by Jay Breidt
  Colorado State University, Department of Statistics
  "A Semiparametric Stochastic Mixed Model for Increment-Averaged Data with Application to Carbon Sequestration in Agricultural Soils"

2:45   Break

2:55   Invited Talk by Philippe Naveau
  Univ. of Colorado, Boulder, Dept. of Applied Mathematics

"A Statistical Methodology to Extract Pulse-like Signal in Climatic Times Series"

3:55   Break

4:05   Student Paper Presentations

Alicia Johnson
Colorado State University, Department of Statistics *"Semiparametric Model-Assisted Estimation of Distribution Functions in Surveys with Auxiliary Information"*

Siobhan Everson-Stewart
Colorado State University, Department of Statistics
"Nonparametric Survey Regression Estimation in Spatial Sampling"

Mark Werner
University of Colorado at Denver, Dept. of Mathematics
"Identification of Multivariate Outliers in Large Data Sets"

Christopher H. Mehl
University of Colorado at Denver, Dept. of Mathematics
"A Spatial Model for Chronic Wasting Disease in Rocky Mountain Mule Deer"

Uli Schneider
Univ. of Colorado at Boulder, Dept. of Applied Math
"Perfect Sampling in Bayesian Variable Selection"

5:30   Cocktail Hour & Presentation of Student Paper Winners

6:30   Optional dinner at Murphy's Bar & Grill
2731 Iris Ave, Boulder, (303)449-4473

Meeting Registration: $10 ($5 students)

Facility Sponsor: The CO-WY Chapter of the ASA wishes to thank the National Center for Atmospheric Research for the use of the meeting facilities.

ASA CO-WY Chapter website: *www.stat.colostate.edu/ASA/*
A big thanks to Jim Zumbrunnen of CSU for doing such an excellent job of maintaining our website!

A Special Invitation
Please join us tomorrow for a special traveling course, "Statistical Methods for Reliability Data," taught by Dr. Luis Escobar, Department of Experimental Statistics, Louisiana State University. Course materials will be provided.
Location: NCAR Foothills Lab, 8:30 a.m. – 4:00 p.m.
Registration Fee: $50 ($30 students)

Abstracts

Jay Breidt
Colorado State University, Department of Statistics
"A Semiparametric Stochastic Mixed Model for Increment Averaged Data with Application to Carbon Sequestration in

Agricultural Soils"

Abstract:

Adoption of conservation tillage practice in agriculture offers the potential to reduce greenhouse gas emissions. Studies comparing conservation tillage methods to traditional tillage pair fields under the two management systems and obtain soil core samples from each field. Within each core, carbon stock is recorded at multiple depth increments. These data represent not the instantaneous value at a particular depth, but the total or average over the increment at that depth. Such data have, effectively, been smoothed. A semi-parametric mixed model is developed for such increment-averaged data. The model uses parametric fixed effects to represent covariate effects, random effects and a stochastic process to capture within-core correlation, and an integrated, smooth function to describe effects of depth. The model is formulated so that the instantaneous depth function is estimated as a natural cubic spline, using penalized maximum likelihood. Variance components and the smoothing parameter are estimated using restricted maximum likelihood. The methodology is applied to the problem of estimating change in carbon stock due to change in tillage practice.

This is joint work with **Nan-Jung Hsu**, National Tsing Hua University, and **Stephen Ogle**, Colorado State University

Philippe Naveau
University of Colorado at Boulder, Department of Applied Mathematics
"A Statistical Methodology to Extract Pulse-like Signal in Climatic Times Series"

Abstract:

To understand the full range of climate variability, it is important to attribute past climate variations to particular forcing factors. In this talk, our main focus is to estimate the impact of strong but short-lived perturbations from large explosive volcanic eruptions on climate. An extraction method to model simultaneously the slowly changing background climate component and the superposed volcanic pulse-like events is presented and applied to a variety of climatic data sets.

This approach based on a statistical multi-state space model provides an accurate estimator of the timing of an eruption. It not only allows for a more objective estimation of its associated amplitude, but at the same time it provides a posterior probability for each cooling event. The extraction results suggest that a clear cooling recognizable against the noise is restricted to a relatively small number of explosive volcanic events. Finally, the classification of events in terms of their impact is compared to other volcanic indices.

This is joint work with **C. M. Ammann**, National Center for Atmospheric Research, **H.S. Oh**, University of Alberta, **W. Guo**, University of Pennsylvania School of Medicine.

Alicia Johnson
Colorado State University, Department of Statistics
"Semiparametric Model-Assisted Estimation of Distribution Functions in Surveys with Auxiliary Information"

Abstract:

The availability of auxiliary information in many surveys facilitates an increase in efficiency of survey estimators. Classical survey regression estimators incorporate this information through linear, parametric models. Nonparametric methods may also be applied to minimize parametric restrictions and better represent complex relationships between auxiliary information and variables of interest. Multiple auxiliary variables, including categorical variables, are often available. In this case, the nonparametric approach can be extended to an additive semiparametric model, which incorporates both parametric and nonparametric techniques. A semiparametric approach to the estimation of population parameters, including distribution functions, is developed and applied to aquatic resources data from the Environmental Monitoring and Assessment Program. In this application, auxiliary information is obtained from a variety of remotely-sensed images and geographic information system layers. The semiparametric model-assisted distribution function estimator has good statistical properties and desirable operational features.

Siobhan Everson-Stewart
Colorado State University, Department of Statistics
"Nonparametric Survey Regression Estimation in Spatial Sampling"

Abstract:

A nonparametric model-assisted survey estimator based on local polynomial regression is extended to incorporate spatial auxiliary information. Under mild assumptions, this estimator is asymptotically design-unbiased and consistent. Simulation studies show that the nonparametric regression estimator is competitive with standard parametric techniques when the parametric specification is correct, and

outperforms those techniques when the parametric specification is incorrect.

Mark Werner

University of Colorado at Denver, Department of Mathematics
"Identification of Multivariate Outliers in Large Data Sets"

Abstract:

In this investigation, we propose a new algorithm for detecting multivariate outliers in large data sets. This procedure uses Tukey's biweight function to assign weights to data values in each dimension, then reassigns a weight of one to those values with weight above a certain cutoff value and zero to those below. The sample mean and covariance can be efficiently calculated over those observations with weight equal to one, leading to robust Mahalanobis distances for all the observations. We estimate the density of these Mahalanobis distances and determine a rejection point where the slope of the density is sufficiently close to zero. All observations with Mahalanobis distance greater than this rejection point are declared outliers. This procedure demonstrates extremely good outlier identification properties, especially with non-Normal data. It is computationally fast and not adversely affected by high dimensions. Using a logistic regression model, we are also able to predict its success rate in various situations. To analyze its performance from a theoretical perspective, we calculate several important asymptotic robustness properties at the standard Normal distribution. Compared to other methods that we have examined, it is considerably faster, and with special reference to non-Normal data, offers excellent all-round performance.

Christopher H. Mehl

University of Colorado at Denver, Department of Mathematics
"A Spatial Model for Chronic Wasting Disease in Rocky Mountain Mule Deer"

Abstract:

Chronic wasting disease (CWD) causes damage to portion of the brain and nervous systems in deer and elk. The disease has been spreading rapidly throughout the Rocky Mountain Region and its economic and biological impacts have made this problem both scientifically and socially important. Previous efforts at modeling the spread of the disease have focused on simulating stochastic individual interactions between deer using standard epidemic models. We propose a hierarchical Bayesian model that captures the spatial and temporal components of the disease spread and incorporates multiple data types. Critical to our model are differential equations used to represent disease dynamics, the hierarchy which aggregates the individual interactions in both space and time, and the Bayesian formulation which naturally incorporates available data to estimate parameters in the model.

Uli Schneider

University of Colorado at Boulder, Department of Applied Mathematics
"Perfect Sampling in Bayesian Variable Selection"

Abstract:

We describe the use of perfect sampling algorithms for Bayesian variable selection in a linear regression model.

The problem of variable selection arises when one wants to model the relationship between a variable of interest and a subset of explanatory variables. One disadvantage in the Bayesian approach using MCMC algorithms is the statistical error that these methods introduce --- a drawback that completely vanishes with the use of perfect sampling algorithms.

Award Recipients:

Maurice Davies Awards

Congratulations to the following students nominated by their university departments for recognition of excellence in the statistical studies.

Melissa Kerschner – Colorado State University
Jacqueline Pollock – University of Denver
Ulrike A. Schneider – University of Colorado, Boulder

Mark Werner – University of Colorado, Denver

Outstanding High School AP Statistics Student Awards

Congratulations to the following students nominated by their high school Advanced Placement statistics teachers for recognition of outstanding work in statistics.

Cherry Creek High School – **Ellie Wulliman**

Heritage High School – **Elizabeth Dickinson**
Matt Loar
Wade Simmons
Jonathon Wee

Overland High School – **Christen Grace**
Scott Johnson

Telluride High School – **Killian Harwell**
Rhea DePagter
Nicholas Chancellor
Beau Kent

Student Paper Competition Awards

Christopher H. Mehl, 1st place
Mark Werner, 2nd place

Driving Directions to NCAR Foothills Campus

From Denver:

Hwy 36 West to Foothills Parkway (Hwy 157) North. Take a right at Valmont (east), go to first light at 47th. Take a left (north again). Proceed to Mitchell Lane (before railroad tracks), take a right. Proceed straight into parking lot. Enter at main entrance in center building.

From Longmont/Ft. Collins:

Take Diagonal Hwy into Boulder until it turns into Foothills Parkway. Take left at Valmont (east), go to first light at 47th. Take a left (north again). Proceed to Mitchell Lane (before railroad tracks), take a right. Proceed straight into parking lot. Enter at main entrance in center building.

Where: Room 1022, Building FL2
NCAR **Foothills** Campus, Boulder, CO (please note this is at the Foothills Campus, **not** the Mesa Lab)
Driving directions to Foothills Campus
Registration Form This form is used for the Spring Meeting and the ASA Reliability course, on Saturday, April 12th.

CALL FOR STUDENT PAPERS - Spring ASA CO/WY Chapter Meeting

The CO-WY ASA spring meeting on Friday, April 11, will feature a student presentation competition. Presentations should be fifteen minutes with up to an additional five minutes for questions. Our chapter members are very receptive to student talks, so this is an excellent opportunity for students to obtain some public speaking experience, perhaps before giving a subsequent related talk at a national meeting.

Certificates of participation will be presented at the social hour immediately following the chapter meeting, with a $50 award given to the best student presentation.

Students wishing to participate in the presentation competition should submit an abstract of 200 words or less to **Amy Biesterfeld**, abiester@colorado.edu, by **APRIL 2, 2003.**

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