Annual Meeting of the Montana Chapter of the American Statistical Association

September 15, 2009
Butte Highlands Room, Student Union Building
Montana Tech, Butte, MT

8:45 - 9:30	Coffee, treats, and socializing.
9:30 - 9:35	*Welcoming Remark* Kathi Irvine (Vice-president of the MT Chapter)
9:35 - 10:00	**SDACE: Sequential Design and Analysis of Computer Experiments** Ben Haaland, PhD Candidate University of Wisconsin, Madison
10:00 - 10:25	**Improved Estimation for MT Fish, Wildlife and Parks Hunter Harvest Survey** Kingsford Jones, Mathematical Sciences (Statistics), MSU
10:25 - 10:50	**A proposed analysis for the total system approach to pest management in agriculture** Ilai Keren, Mathematical Sciences (Statistics), MSU
10:50 - 11:15	**A study of optimization and uncertainty analysis in the use of response surface functions for time-expensive environmental models** Able Mashamba, Land Resources and Environmental Science, MSU
11:15- 1:15	******* LUNCH BREAK (No host)*******
1:15 - 1:40	**Statistics and Human Rights** Susan Hinkins, National Opinion Research Center, University of Chicago
1:40 - 2:05	**Actuary? What in the World Is That?** Margaret Miksch, Montana Insurance Department
2:10 - ?:??	Business Meeting

Abstracts

SDACE: Sequential Design and Analysis of Computer Experiments

Ben Haaland

A sequential approach to gathering data and building accurate emulators for expensive computer experiments is proposed. The approach minimizes the number of observations from the computer experiment, allows confidence statements to be made about the emulator's error rate, and has good numerical properties. Issues addressed include data collection, variance estimation, stopping rules, and numerical stability.

Improved estimators for the MT Fish, Wildlife Parks Hunter Harvest Survey

Kingsford Jones
Mathematical Sciences (Statistics), MSU-Bozeman

To develop game management strategies and set hunting regulations, MT Fish, Wildlife and Parks depends on estimates of annual harvest produced from post-season phone survey data. Current estimates are generally precise due to large sample sizes, but nonresponse and measurement error may introduce substantial bias. Here I present new estimators of hunter harvest which incorporate weighting adjustments for both types of bias, along with a finite-population bootstrap procedure to estimate associated standard errors. Furthermore I will describe a novel approach to finding optimal survey efficiency weights using a genetic algorithm. I will end with a short demonstration of an R package developed to implement these methods.

A proposed analysis for the total system approach to pest management in agriculture

Ilai Keren
Mathematical Sciences (Statistics), MSU-Bozeman

Wheat stem sawfly, Fusarium crown rot, and cheatgrass are major pests in wheat cropping systems and in the Northern Great Plains they form a multi-trophic complex whose members interact in both positive and negative ways. To better understand these relationships and resolve contradictions among single-pest management recommendations, we manipulated crop variety, crop density, and herbicide application rate in fields were all three pests occur. However, estimates of yield losses from such field observations may be confounded by the occurrences of multiple interacting pests and thus the true effect of any single member of the complex not estimable. We propose a solution may be in adopting a Bayesian approach with informative empirical priors to model this system and will present an initial predictive model developed as a first step towards a management decision tool for wheat cropping systems.

A study of optimization and uncertainty analysis in the use of response surface functions for time-expensive environmental models

Able Mashamba
PhD candidate, MSU-Bozeman, Industrial and Management Engineering

The advancement of geographic information science, availability of measured environmental data and increasing computing power is promoting widespread use of spatially distributed environmental models. Distributed models represent spatial heterogeneity in weather, terrain, hydrology and other environmental processes thus providing an understanding of the internal physical processes being modeled. However one challenge from using distributed models is their many parameters and higher computational complexity which makes automated model calibration and uncertainty analysis time consuming. To improve computational efficiency, model approximating functions, known as response surface models, RSM, are being used instead of running the actual time-expensive distributed environmental models during calibration and uncertainty assessment. Popular RSM functions (aka, models of models or meta-models) include the second order least squares multiple linear regression, LSMLR, and the radial basis functions, RBF. These approximating functions typically evaluate orders of magnitude faster than running the actual distributed models. However the amount of calibration and uncertainty analysis information lost from using approximating functions and the mechanism of loss remains to be studied. This research studies the influence of (i) the number of previously evaluated points used in building the approximation function, (ii) the approximating function used (LSMLR and RBF) and (iii) the sampling process used in selecting the previously evaluated points (simple random, stratified and symmetric Latin hypercube sampling) on the quality of model approximations. For the approximating functions and actual model scenarios, classical Bayesian Adaptive Metropolis and evolutionary optimization algorithms will be used for uncertainty analysis and model calibration respectively. For illustrative purposes and to test these concepts we use simple hydrologic models for the prediction of main channel flow. Results will be used in developing a fast and efficient calibration and uncertainty analysis framework for distributed environmental modeling.

Statistics and Human Rights

Susan Hinkins
National Opinion Research Center, at the University of Chicago

Recent articles in the AMSTAT News have described ASA's commitment to the AAAS Coalition on Science and Human Rights and also the recent development of the Statistics without Borders Group. I will briefly describe my experience with the AAAS Coalition. The Coalition was launched in January 2009 and currently has 26 member organizations and 15 affiliated organizations. Individuals may also join as affiliated scientists. I will describe examples of "science serving human rights," and solicit from attendees their experiences or additional examples of science and human rights.

Actuary? What in the World Is That?

Margaret Miksch
Life and Health Actuary, Montana Insurance Department

Most people I've encountered don't know what an actuary is or what we do, and many have never even heard the word before. In my presentation I will describe what an actuary is, give a general description of what all actuaries do, and describe the specific types of work that actuaries are, or could be, involved in. I will explain how to become an actuary. Finally I will discuss the actuarial positions in Montana.

Thank you to Montana Tech for hosting the conference.