LENGYI SPECTRUM HAN, University of Western Ontario

Prediction Contours for the Prometheus Fire Growth Model

The Prometheus Fire Growth Model is a deterministic simulator used by the Alberta Government to predict forest fire spread, given weather, topographical and fuel information. Unpredictability of fire behaviour makes such deterministic predictions inaccurate. Probability mapping is needed. The Prometheus model equations are estimated from data on experimental fires and well-documented wildfires. These data can be used to model not only the mean rate of spread (ROS) but also the variance, after applying variance-stabilizing transformations to the data in a piecewise manner: surface fires require a different transformation from crown fires. Probability contours are then based on ROS prediction quantiles.

JONATHAN LEE, University of Western Ontario

Parallel Computation of Spatial Lattice Models

Lattice models are a way of representing spatial locations in a grid where each cell is in a certain state and evolves according to transition rules and rates dependent on a surrounding neighbourhood. These models are capable of describing many phenomena such as the simulation and growth of a forest fire front. Lattice models have the potential to take advantage of parallel computing by dividing the lattice into smaller parts and having individual CPUs perform computations on a single sub-lattice while maintaining local interaction with neighbours using a message passing interface (MPI) framework in an efficient and scalable way.

SHUDONG LI, Wilfrid Laurier University

Analysis of Generalized Linear Mixed Models for Complex Survey Data

We analyze a class of generalized linear mixed models based on the Tweedie exponential dispersion model distributions for complex survey data. To take consideration of sampling design, we extend the orthodox best linear unbiased predictor approach in Ma and Jørgensen (2007) by incorporating sampling weights in both the optimal estimating function for the regression parameters and the prediction of the random effects. Variance estimates of the resulting estimators are derived. Performance of the survey estimates of the model parameters are examined through simulation studies. Empirical examples are given using then Canada Workplace Employer Survey data.

WENKAI MA, University of Western Ontario

Fitting a Stochastic Spread Model to Experimental Fire Data

We fit an interacting particle system model for fire spread to some fires burned at various slopes. The model has 5 parameters when the slope is nonzero and 2 when the slope is 0. We compare observed fire shapes and sizes with those computed from simulations of the model.

MATEEN SHAIKH, University of Guelph

Modelling with Association Rules

Association rules are a data mining technique for the analysis of transaction data. Though the concept of association rules is not novel, high-performance computing has recently made the discovery of interesting association rules more practical. Much of the work with association rules has been without statistical models. We present a statistical model-based approach to association rule mining. Our approach is illustrated on real data and the results are discussed.
AZADEH (FATEMEH) SHOHOUDI, Department of Mathematics and Statistics, McGill University

Variable Selection in Multipath Change-point Problems

Follow-up studies are frequently carried out to study evolution of one or several measurements taken on some subjects through time. When a stimulus is administered on subjects, it is of interest to study the reaction times, change-points. One may want to select the covariates that accelerate reaction to the stimulus. Selecting effective covariates in this setting pose a challenge when the number of covariates is large. We develop such methodology and study the large sample behavior of the method. Small sample behavior is studied by the means of simulation. The method is applied to a Parkinson disease data set.

LU XIN, University of Waterloo

An Improved Statistical Model for Predicting the Deuterium Ingress in Zirconium Alloy Pressure Tubes

In the CANDU pressurized heavy water reactor (PHWR), the corrosion of zirconium alloy produces deuterium that causes hydrogen embrittlement. An accurate prediction of deuterium accumulation over time is an important step for ensuring the fitness-for-service of pressure tubes. Deuterium ingress data exhibits heteroscedasticity. The currently used model by the nuclear industry does not deal with heteroscedasticity precisely, so it results in a conservative prediction of the deuterium ingress. We present a new approach for predicting deuterium ingress based on weighted least-squares regression that overcomes the limitations of the existing model, and it provides realistic prediction bounds of deuterium ingress.