Mathematics

Honour's Thesis Presentation

The University of Winnipeg

Speaker: Erik Youngson

Time and place: Tuesday, April 26 11:00 to 12:30pm, Room 2C14

Thesis Title:

Incomplete Data in Generalized Linear Models With Applications to Clinical Data

Abstract:

In this thesis, I examine methods for analyzing some real data obtained from clinical experiments. The data was obtained from the Mental Health Program of St. Boniface Hospital Research Centre in Winnipeg, Manitoba. The purpose of the study was to investigate factors that contribute to surgery patients suffering from the acute mental disorder delirium. Patients were recruited from cases seen in the St. Boniface Hospital Outpatient Clinic for elective management of abdominal aortic aneurysm. Many factors were considered, and I will consider only a subset of these factors in my analysis. Of the factors I consider, several of them have missing observations. One method of dealing with missing observations is to delete any subject for which an observation taken on the subject is missing. This method is called the method of case deletion. This method allows the modified data to be analyzed as complete data using standard methods such as the method of maximum likelihood. By using this method, information is lost because by deleting cases which contain missing observations, observed values are also deleted.

I propose a method for analyzing generalized linear models with incomplete data using the expectation maximization (EM) algorithm which allows all observed information to be utilized. The E step of the algorithm is implemented using a Metropolis algorithm to generate random draws from the distribution of missing observations which allows a Monte-Carlo approximation of the expected value of the likelihood function to be obtained. The maximization of the likelihood function in the M step is then carried out using a Newton-Raphson iterative equation. The Delirium data is fit using both the method of CD and the method of EM, and the results are compared.