Seminars on Statistics in Marketing and Psychology, Spring 2006

TUESDAYS 2.30 to 3.30pm or 4.00pm in Cockins Hall 212.

These seminars will consist of ongoing research presentations and discussions of future research topics. You are welcome to join us.

LIST OF SEMINARS

March 28th. Greg Allenby, Marketing Department.
A Direct Approach to Evaluating Technical and Allocative Efficiency in Marketing

Assessing the efficiency of expenditures for promotion, distribution and other marketing variables requires models of consumer response that are often not well represented by standard economic production functions. Marketing production functions may not have simple dual cost representations used by existing estimation methods for dealing endogenous expenditures. Moreover, prices may not be available for some input variables. This paper proposes a direct approach to evaluation that does not rely on a dual cost specification, dealing directly with the issue of simultaneity without the use of instrumental variables. We illustrate our approach using data from a services company operating in multiple geographic regions.

This is joint work with
Ling-Jing Kao and Thomas Otter, Marketing Department
Chih-Chou Chiu,National Taipei University of Technology
Timothy J. Gilbride, University of Notre Dame

April 4th. Qing Liu and Angela Dean, Statistics Department
Optimal design criteria for hierarchical and other models

Discussion paper "Bayesian Experimental Design: A Review", by Kathryn Chaloner and Isabella Verdinelli, (1995), *Statistical Science*, 10, 273-304.

April 11th *****in Fisher 500**** Chris Hans, Statistics Department
A discussion of the paper
"Calibration and empirical Bayes variable selection"
by George and Foster, 2000, Biometrika, 87, 731-747.

April 18th. David Bakken, Harris Interactive.
Problems in modelling context-based consumer decisions

The overarching theme of the research projects is to understand the effect of usage context in conjoint analysis. Goods used across a variety of contexts have variability in their utility that is context dependent. We will attempt to answer the following questions, and others that arise in the course of our discussion and analysis.

1.How do respondents in a survey aggregate across contexts when stating preferences of goods and services?
2.Should context be treated as a latent variable?
3.If context is treated explicitly, how best to proceed.

April 25th. Kevin Passino, Departments of Electrical & Computer Engr, and Evol, Ecology & Org Biology
The Wisdom of the Swarm

Honey bee swarms perform a nest-site selection task that involves search, nest-site assessment, and group agreement before the swarm flies to its new home. Swarm cluster elements can be identified that have close analogs to known components and structures in neuron-based brains of animals that perform perception-attention- choice tasks. These elements include an interconnection of communicating units, group-level memory, parallel and converging paths, and identifiable early and late processing. To provide justification that this swarm cognition perspective is more than just an extended analogy, we first conduct a series of behavioral tests on an experimentally validated simulation of the nest-site selection process. These tests demonstrate the ability of a swarm (i) to discriminate between site qualities even in the presence of significant individual bee nest-site assessment noise, (ii) to avoid being misled by multiple inferior distractor nest sites and simultaneously focus on the best site, and (iii) to order the percentage of choices for each site according to relative nest-site qualities and thereby avoid negative context-dependent effects on choice performance. Next, it is shown that (i) swarm cognition mechanism parameters have been tuned by natural selection to provide a balance between speed and accuracy of choice, and (ii) the key component of swarm cognition, accurate group memory, is a result of this same balance. Our analysis at multiple levels, from mechanisms and behavioral levels to the adaptation level, serves to solidify connections between neuroscience, sociobiology, and cognitive ecology that we hope will have implications in the study of robust group decision making for other species.

May 2nd. Ling-Jing Kao, Marketing Department
Modeling Preference Change in Panel Data.

May 9th. Peter Craigmile, Statistics Department
An Autocorrelated Mixture Model for Sequences of Response Time Data
This is joint work with Mario Peruggia, Statistics Department and Trisha Van Zandt, Psychology Department.

Human response time (RT) data are widely used in experimental psychology to evaluate theories of mental processing. Typically, the data constitute the times taken by a subject to react to a succession of stimuli under varying experimental conditions. Because of the sequential nature of the experiments there are trends (due to learning, fatigue, fluctuations in attentional state, etc.) and serial dependencies in the data. The data also exhibit extreme observations that can be attributed to lapses, intrusions from outside the experiment, and errors occurring during the experiment. Any adequate analysis should account for these features and quantify them accurately, but current modeling practices (both frequentist and Bayesian) are lacking in this respect. We recognize that Bayesian hierarchical models are an excellent modeling tool, but note that most of the current literature is based on likelihood specifications that are mainly dictated by computational convenience. For this reason we focus on the elaboration of a realistic likelihood for the data and on a careful assessment of the quality of fit that it provides. We judge quality of fit in terms of how well the model captures the essential features of the data. Specifically, we validate our model by simulation, comparing the marginal and first order serial dependence properties of synthetic data generated from the posterior predictive distribution with those of the observed data. Our work demonstrates good fit for several RT sequences, indicating that the proposed mixture model can provide a solid building block for elaborating complex Bayesian hierarchies.

May 16th. Discussion, led by Greg Allenby, Marketing Department

Group discussion on the topics raised by David Bakken and formation of exploratory working groups.

SUMMER
There will be a working group looking at the data supplied by David Bakken that will meet over the summer and present their findings next Fall. Please contact Greg Allenby if you would like to join this group.

Chris Hans will be organising the seminars in the fall quarter. Please contact Chris if you have a paper or research you could talk about.

Other seminars of interest

David Plaut, PhD, Carnegie Mellon University 2006-05-16 - 3:30 p.m. - 035 Psychology Building

The cognitive area is pleased to announce a colloquium presentation by Daivd C. Plaut, PhD, Carnegie Mellon University. Professor Plaut will address A recurrent neural network approach to sequential behavior.

Two simulations demonstrate that recurrent neural networks offer a useful framework for understanding sequential behavior over both long and short time scales. The first addresses the nature of long-term knowledge underlying routine sequential action. Rather than explicitly building in hierarchical representations of task structure, a recurrent network learns to deal flexibly with a complex set of sequencing constraints, encoding contextual information at multiple timescales within a single, distributed internal representation. Mildly degrading this context representation leads to errors resembling the everyday œindividuals commit under distraction. More severe degradation leads to a pattern of disorganization resembling that observed in a variety of apraxia termed œ

The second simulation addresses short-term memory for serial order. Psychological models in this domain typically employ transient associations between independent item and context representations. An alternative account proposes that sequence information is encoded through sustained patterns of activation. A recurrent network implementation provides a parsimonious account for numerous benchmark characteristics of immediate serial recall, including data that have been considered to preclude the application of neural networks in this domain. The model also deals naturally with effects of background knowledge in serial recall, and gives rise to testable predictions that differentiate it from competing theories.

Department of Psychology Colloquium Announcement

Mark Steyvers University of California, Irvine

"Probabilistic Topics Models"

Monday, May 22 at noon - 1pm
Psychology Building (PS), Room 35

Abstract: To what extent can the acquisition and processing of natural language be explained by simple statistical computations? I will describe a hierarchical Bayesian approach to model natural language semantics. The model takes as input a corpus of words divided into "documents" sequences of words that represent a single coherent discourse, story, conversation, or merely a list. It represents each document as the result of drawing words from a set of topics,

where each topic is a probability distribution over words. The model can be used to discover semantically related categories of words, or to identify the gist of a document. The topics in which a word participates reflect the meaning of that word, and the gist of a document is expressed by the distribution of topics that appear in that document. A set of topics can be learned automatically from a collection of documents, as a computational analog of how human learners might discover semantic knowledge through their linguistic experience. Part I of the talk will focus on applications in Computer Science. From various collections of documents such as corporate email and scientific publications, the topic model is able to automatically extract interesting content and detect important topic trends. Part II of the talk will focus on applications in Cognitive Science at the intersection of memory and language research. I will show how the topics model can explain semantic effects in word association and episodic memory tasks such as free recall.