Syllabus

Instructor:
Dominique Haughton: dhaughton@bentley.edu

Course Meeting:
Tuesdays 5:30-8:30

Course Description and Objectives:
The course will be divided into three parts

1. Bayesian analysis
2. Advanced Analytics topics to be finalized at the beginning of term according to the needs and interests of seminar participants
3. Essentials of stochastic processes

Expected Outputs:

1. In class presentation on each of the topics in parts 1, 2 and 3 of the course, inclusive of discussion of bibliographies established by participants to complement references given below
2. Preparation of a paper for submission to a refereed journal.

Part I: Bayesian Analysis

- Prior and posterior distributions, normal models
- Regression and variable selection
Part I: Topics vary according to the interests and needs of participants but can include (tentatively for Fall 2015):

- Directed Acyclic Graphs (AKA Bayesian Networks); the issue of causation
- Deep learning
- Experimental designs, notably fractional designs; Conjoint Analysis; Concept of Uplift
- Simulation
  - Analytics Solver Platform
  - SAS OR tool
  - Agent Based Modelling

Part II: Essentials of Stochastic Processes

- Introduction to Stochastic Processes
- Markov Chains
- Queuing Theory; SAS queuing simulator
- Poisson Processes

Assessment:

Grading will rely on the completion of output 1 and 2.

Course materials:

Software tools (preliminary):

- Tetrad and Genie for directed acyclic graphs
- OpenBugs/Winbugs for Bayesian analysis
- R as needed
- SAS and SAS Enterprise Miner as needed

Selected Internet resources:

- Conjoint analysis:  [http://www.dobney.com/Conjoint/CnjtDemo.htm](http://www.dobney.com/Conjoint/CnjtDemo.htm)
- Directed Acyclic Graphs:  [http://agecon2.tamu.edu/people/faculty/bessler-david/WebPage/Homepage.htm](http://agecon2.tamu.edu/people/faculty/bessler-david/WebPage/Homepage.htm)
- Directed Acyclic Graphs:  [http://www.phil.cmu.edu/projects/tetrad/](http://www.phil.cmu.edu/projects/tetrad/)

Selected research articles (the list will be expanded as the course proceeds):
For Conjoint Analysis

- Using conjoint analysis to take account of patient preferences and go beyond health outcomes: an application to in vitro fertilisation, by Ryan, *Social science and medicine*, 1999

For Directed Acyclic Graphs

- Chapter from Pearl’s *Causality* (Cambridge University Press, 2000) “The art and science of Cause and Effect”
- Work by David Bessler on the application of Directed Acyclic Graphs to economics
- Work by David Heckerman and colleagues at Microsoft research

For Stochastic Processes


For Bayesian Analysis