NR 575 Instructions for Final Project

January 7, 2019

1 Purpose

It is important that you demonstrate that you have learned enough to apply your new knowledge of Bayesian modeling to your own research. This project will allow you to do so. It represents in nice coda (no pun intended) for the course. Your write up is due at the end of finals week, but I am happy to receive them sooner. Put them in the FinalProjects folder in the class dropbox. This is not a group project. Everyone in the class should turn one in.

2 Content

Please structure your write-up in the following sections.

2.1 Introduction

Write a brief introduction to the problem you are studying. The first few sentences should provide the broad context –why is the general topic broadly important to the discipline of ecology, citing a *few* key papers. Proceed to explain why your specific work will advance understanding of the broad topic. Describe the core questions and or objectives of the work. The introduction should resemble a funnel – big topics at the top narrowing to specific questions at the bottom.

2.2 Data and Research design

Describe the data that you will use to fit models and how they were collected. Imagine that you were giving me one of the word problems on writing hierarchical models I gave you (payback). I need to know enough to be able to write the model myself. I don't need to know details of methods for data collection, but I do need to understand the design. Explain spatial and or temporal structure of the data and describe sources of calibration and sampling uncertainty.

2.3 Model

Write and explain the deterministic model (or models if you plan model selection) that expresses your ideas about way a process works. Most of these are likely to be from the general linear model family. Others may be more specialized.

Write the proportionality between the posterior and joint distributions. I urge you to strive for a model that is hierarchical in some fashion because this has been the emphasis of the course. You may include a Bayesian network as part of the description if you like, but I want to see that diagram translated into fully specified math, including your choices of distributions for likelihoods, latent quantities, and priors.

I will not insist that you deal with spatial autocorrelation if your data are spatially structured because we will not cover this material until the end of the course. That said, I will be impressed and forgiving if you take this on.

2.4 Analysis

Write a section that describes the computational procedures you will use, tests for convergence, and posterior predictive checks. Describe any important derived quantities. This should read the section you would write for a paper to be submitted to a journal. Consult published Bayesian papers for examples.

3 Format

Length: No more than four pages, excluding a few literature citations. I expect that three pages will usually suffice.

Document: You may prepare this document in R Markdown, LyX or LaTeX compiled to a .pdf file. Word documents will not be accepted.

Math: All mathematics must be properly formatted using LaTeX. Pay close attention to the instructions for notation in the R Markdown handout I gave early in the course. Posterior and joint distributions will need to be written in the LaTeX equation array or align environment as illustrated in that handout. The math should look crisp and sharp.

Writing: Here are a few tips on grammar, usage, and clarity.

- Every paragraph must announce its purpose with a topic sentence.
- Minimize use of leading, dependent clauses. No more than three in the entire document, please. Simple declarative sentences are best until you can write like John McPhee.
- Usage and grammar
  - Although instead of while
  - Because instead of since
  - That for defining clauses; which for describing clauses
  - Never, ever, ever use "respectively."
  - Fewer to compare things counted; less for continuous variables
  - Data is the plural of datum. The data are; never the data is.
  - Avoid use of multi-word nouns, e.g., use "procedures for managing invasive plants" in favor of "invasive plant management procedures"
  - Avoid unfamiliar acronyms. They are a false economy. Better to use more words than to irritate the reader with mysterious, forgettable abbreviations.