Continuing Your Learning

May 9, 2019

1. *Be patient. Modeling is a learned craft.* Models are a central part of science. Improving your modeling skills should form a lifelong endeavor. If you stick with it, you will be able to solve more challenging problems. Take pride in your craft

2. *Let problems guide your learning. Let learning guide your problems.* The most important next step is to choose a problem of just manageable difficulty and solve it with Bayesian methods. Choose future problems in part because they will teach you something. A way of working:

   (a) Diagram and write the simplest possible version of your model. Omit group level effects, spatial structure, errors in observations or covariates.

   (b) Simulate data from this simple model. There will likely be some interplay between (a) and (b).

   (c) Fit the model to simulated data.

   (d) Return to (a) and add some complexity. Repeat until you are satisfied with the model.

   (e) Starting with simple model and progressing through more complex ones, fit the model to data. The multi-level model problem used this approach.

   (f) Proceed with model checking and, perhaps model selection.

3. *Strike a collaboration with a statistician.*

4. *Read papers with a new trained, eye.* You probably skipped over the technical aspects of Bayesian papers, taking the results and discussions on faith. This is no longer necessary or productive. Slow down. Try to understand every aspect of the model.

5. *Learn modern tools for coding, collaborating and preparing documents.* I strongly urge you to learn a system for version control and collaboration Git being the most widely used today. Learning writing tools like LaTeX or LyX (a gui for LaTeX) will pay enormous dividends in preparing attractive, competitive documents. Learn how to attach you results from R directly to your scientific papers using Knitr. If you go this route, you will never look back. Don't be bullied by your advisor into using archaic tools like Microsoft Word.

6. *Learn from many sources.* I often find that I need to look around among text, papers, and sources on the web to find a treatment of a topic that is particularly understandable. Some useful texts for future self teaching that I know well and can recommend without reservation:

Gelman and Hill (2009)

You should own this book. I don't recommend that you study it from cover to cover, you should know what it contains. Most of you will have research problems that are covered in this excellent text.

Gelman et al. (2013)

This is the standard graduate text in Bayesian modeling. I really like it. It is a bit more challenging that the other Gelman reference, but it is a great reference nonetheless.

McCarthy (2007)

This is a delightful little book, with many excellent examples. It emphasizes WinBUGS coding that is almost identical to JAGS. Data and code are available on the web.

Royle and Dorazio (2008)

The source for population and community ecologists. It is basically a book about mixture models for analysis of population data – occupancy modeling, N-mixture models, distance sampling, mark-recapture.

References

Gelman, A., J. B. Carlin, H. S. Stern, D. Dunson, A. Vehhtari, and D. B. Rubin, 2013. Bayesian data analysis. Chapman and Hall / CRC, London, UK.

Gelman, A. and J. Hill, 2009. Data analysis using regression and multilievel / hierarchical modeling. Cambridge University Press, Cambridge, UK.

McCarthy, M. A., 2007. Bayesian methods for ecology. Cambridge University Press, Cambridge, UK.

Royle, J. A. and R. M. Dorazio, 2008. Hierarchical modeling and inference in ecology: the analysis of data from populations, metapopulations, and communities. Academic Press, London, UK.