Dimension Reduction of Random Effects for Generalized Linear Mixed Models

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Abstract

Welcome to the fun and beautiful world of latex. Here is a quick rundown but there's tons of excellent resources online.

1 Equations and Code

If you want to display math in the body of the text, you have to use dollar signs. Let $y = (y_1, \ldots, y_n)^T$ be a vector of observed data. Let $u = (u_1, \ldots, u_q)'$ be a vector of unobserved random effects. Let β be a vector of p fixed effect parameters and let ν be a vector of T variance components for the random effects.

$$l(\theta) = \log \int f_\theta(y|u) f_\theta(u)\, du \tag{1}$$

The align environment is nice for typesetting equations. It'll give the equations numbers by default.

Here's another equation. This one has fractions and exponents and sums.

$$v_\theta(u_k, y) = \frac{e^{b_k - a}}{\sum_{k=1}^{m} e^{b_k - a}} \tag{2}$$

And we can refer to it with 2. You can opt out of the equation numbers by using an asterisk. Check it out:

$$
\begin{aligned}
G &= \sum_{k=1}^{m} \nabla \log f_\theta(u_k, y) v_\theta(u_k, y) \\
&= \sum_{k=1}^{m} \nabla \left[\log f_\theta(y|u_k) + \log f_\theta(u_k)\right] v_\theta(u_k, y) \\
&= \sum_{k=1}^{m} \left[\nabla \log f_\theta(y|u_k) + \nabla \log f_\theta(u_k)\right] v_\theta(u_k, y) \\
&= \sum_{k=1}^{m} \left[\frac{\partial}{\partial \beta} \log f_\theta(y|u_k) \quad \frac{\partial}{\partial \nu} \log f_\theta(y|u_k)\right] v_\theta(u_k, y) + \left[\frac{\partial}{\partial \beta} \log f_\theta(u_k) \quad \frac{\partial}{\partial \nu} \log f_\theta(u_k)\right] v_\theta(u_k, y)
\end{aligned}
$$

You need to typeset it a couple times to make the reference numbers show up. You can also refer to a section in a similar way. Section 2 contains more information on the family. Section 2.1 shows you can also refer to subsections.

You'll notice this equation has multiple lines. To align the equal signs, we use ampersand &.

The verbatim environment is really nice for showing R code.

```
glmm(y ~ x1+ x2, list(~0+school,~0+classroom),  family.glmm="binomial.glmm",
data=schooldat,varcomps.names=c("school","classroom"),varcomps.equal=c(1,2),
debug=FALSE )
```

2 Lists and Such

2.1 Bullets

Here's how to make a list with bullets

- First item
- Other item

You can get fancy with bullets if you want.

2.2 Numbered List

1. First item

2. Other item

3 Info on citations

In the paper folder, I added brref.bib, which is the file that holds the bibliography info. Rather than type the citation yourself, you can put your bib info in the brref file (using the setup that you see in there). You can see, for example, that I cite the R package aster by Charlie Geyer. In the brref file, the shortcut name is "aster-package" so when I want to cite this work in the paper, I can use one of the following options:

- The aster package (Geyer, 2014) was created for life history models.
- Geyer (2014) produced an R package that can analyze the radish data

To make the citations and bibliography work, typeset the document a few times (pdfLaTeX), typeset with BibTeX, and then typeset with pdfLaTeX again. I don't remember the right number of times for each, so I usually do each a couple. It's easier to just hit typeset (or use the typeset keyboard shortcuts) than to memorize stuff like numbers.

References

Geyer, C. J. (2014). R package `aster` (aster models), version .8-30. *http://cran.r-project.org/package=aster*.