Bayesian Nonlinear Multilevel Growth Models

February 21, 2019

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1 Target Journal

Journal	url
Methods in Ecology and Evolution	https://besjournals.onlinelibrary.wiley.com/journal/2041
Journal of Applied Ecology	https://besjournals.onlinelibrary.wiley.com/journal/1365
Ecological Modeling	https://www.journals.elsevier.com/ecological-modelling
Forest Ecology and Management	

Rewrite to be more general growth model.

paper on methods in ecology and evolution about stan https://besjournals.onlinelibrary.wiley.com/doi/full/10.1111/2041-210X.12681

about plant growth https://besjournals.onlinelibrary.wiley.com/doi/full/10.1111/j.2041-210X.2011.00155.x

fitting fixed and random effects in them, as these topics are elegantly presented elsewhere (Pinheiro & Bates 2000; Bolker 2008; Ritz & Streibig 2008; Bolker et al. 2009)

bolker et al 2009 https://www-sciencedirect-com.ezproxy.library.wisc.edu/science/article/pii/S0169534709000196

old email

I'm thinking of splitting it into two parts/papers. p The first would be methodological - rewriting for a more general audience interested in how to fit bayesian multilevel growth models in ecology via brms and Stan. I'm thinking the journal Methods in Ecology and Evolution might be fitting. They have previously published a paper highlighting Stan and others about plant growth models. I think my work would be in the same vein as these and a good addition.

The second would be applied and focused on urban forestry. Talking to people at the forest service there is more data that I should incorporate into the model to make it actually useful to this audience. But I also think it would involve significant additional work (many of the things I mentioned as next steps) and warrant a new paper. For this I was thinking of targeting the journal Forest Ecology and Management or Urban Forestry and Urban Greening.

2 submission requirements

https://besjournals.onlinelibrary.wiley.com/hub/journal/2041210X/author-guidelines

Single column, double line spaced Within the word count (6000-7000 words for Standard Articles, 3000 words for Applications) Continuous line and page numbering throughout Clearly defined manuscript structure as standard: Author details, Abstract (must be numbered according to Manuscript Specifications), Keywords, Introduction, Materials and Methods, Results, Discussion, Figures and Tables with captions Figures and Tables can be embedded within the text where referenced to facilitate reviewing Statement of where you intend to archive your data

Research article: should have a maximum of 6000-7000 words (including tables/figure

captions and references) and describe new methods and how they may be used. We place emphasis on methods that are applicable as broadly as possible. Papers describing methods that apply to one species or system are unlikely to meet these criteria, unless authors are able to show that their methods can be generalised. Structure: see Manuscript specifications below.

Manuscripts should be formatted with double-spaced lines and continuous line numbers throughout the article, including pages for acknowledgements, references, tables and figures. Manuscripts must be written in English. Authors for whom English is not their first language may wish to consider using a professional editing service before submission, e.g. Wiley's editing services. The use of these services does not guarantee acceptance or preference for publication. It is also recommended that authors follow search engine optimisations guidelines to maximise the reach of their article.

Submissions should be divided into the following sections:

Title Page should include:

A concise and informative title. Do not include the authorities for taxonomic names. A list of all authors' names with names and addresses of Institutions. The name, address and e-mail address of the correspondence author. A running headline of not more than 45 characters. Abstract

The Abstract must not exceed 350 words and should list the main results and conclusions, using simple, factual, numbered statements:

Point 1: set the context for and purpose of the work;

Point 2: indicate the approach and methods;

Point 3: outline the main results;

Point 4: identify the conclusions and the wider implications.

Key-words: A list in alphabetical order not exceeding eight words or short phrases. The most important key-words should appear in the title and the abstract as well as the key-word list. More advice on selecting good keywords can be found here.

Introduction

This should state the reason for doing the work, the nature of the hypothesis or hypotheses under consideration, and should outline the essential background.

Materials and Methods

Include sufficient details for the work to be repeated. Where specific equipment and materials are named, the manufacturer's details (name, city and country) should be given so that readers can trace specifications by contacting the manufacturer. Where commercially available software has been used, details of the supplier should be given in brackets or the reference given in full in the reference list. Do not describe or refer to commonplace statistical tests in this section but allude to them briefly in Results.

Results

State the results and draw attention in the text to important details shown in tables and figures.

Discussion

This should point out the significance of the results in relation to the reasons for doing the work, and place them in the context of other work.

Conclusions (optional)

Acknowledgements (optional)

A brief statement acknowledging collaborators and research assistants who do not meet the criteria for authorship described above, or acknowledging funding sources, providing relevant permit numbers (including institutional animal use permits), or giving recognition to nature reserves or other organizations that made the work possible.

3 Questions for Jun

Why model the correlation between groups / covariance structure? What does that add? Does it affect prediction? pg 157 touches on this a bit

How to deal with the normal response. since I use a gamma. even log transform won't make it exactly comparable

4 Improvements before submission. / new notes

Comparison to lmer

- attempt to fit in nlme
- if not possible to fit, simulate data from the proposed model and then fit in both lmer and with brms/stan

plot random effects of coefficients by species kinda like this:

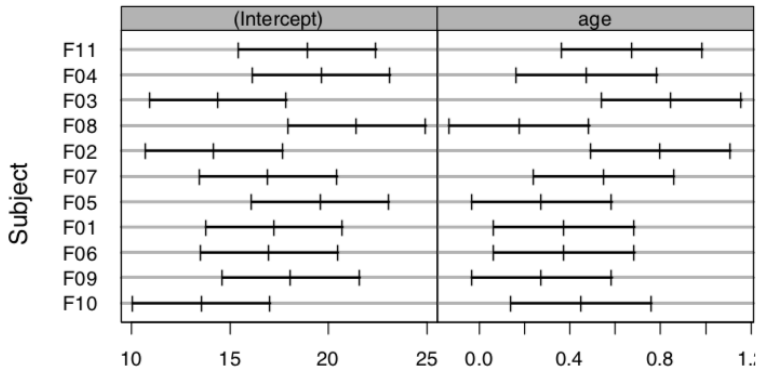

FIGURE 1.12. Comparison of 95% confidence intervals on the coefficients of simple linear regression models fitted to the orthodontic growth curve data for the female subjects.

nlme uses maximum likelihood (not restricted maximum likelihood) so that likelihood ratio tests can be done.

check the confidence intervals for the correlation of random effects. Make sure the intervals are not huge (-1 to 1) which would indicate the matrix is ill-conditioned. pg 364 has good text on testing which rfs to include.

5 Abstract

Growth equations commonly used in ecology. Give examples. Biomass growth important for ecosystem dynamics and services....

Data are often correlated/ multilevel. For example species nested with genus. Or individual nested within site. Nonlinear mixed models have been addressed nlme. growth equations discussed in detail.

bayesian approach

- bayesian interpretation of confidence intervals
- prior information
- greater flexibility in modeling (e.g. gamma response
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