

The Hitchhiker's Guide to Longitudinal Models: A Primer on Model Selection for Repeated-Measures Methods

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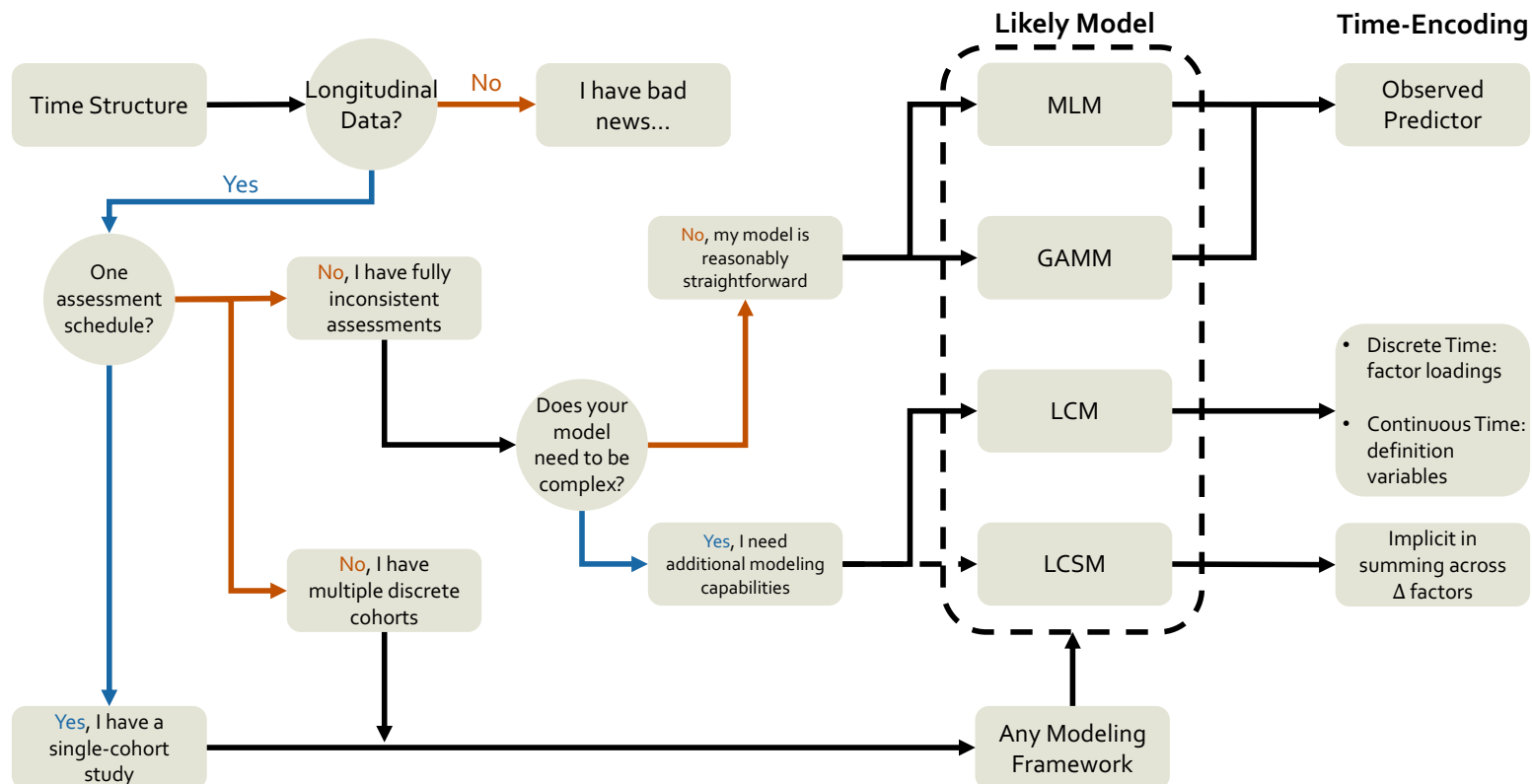
@McCormickNeuro



<https://mccormickneuro.github.io/>

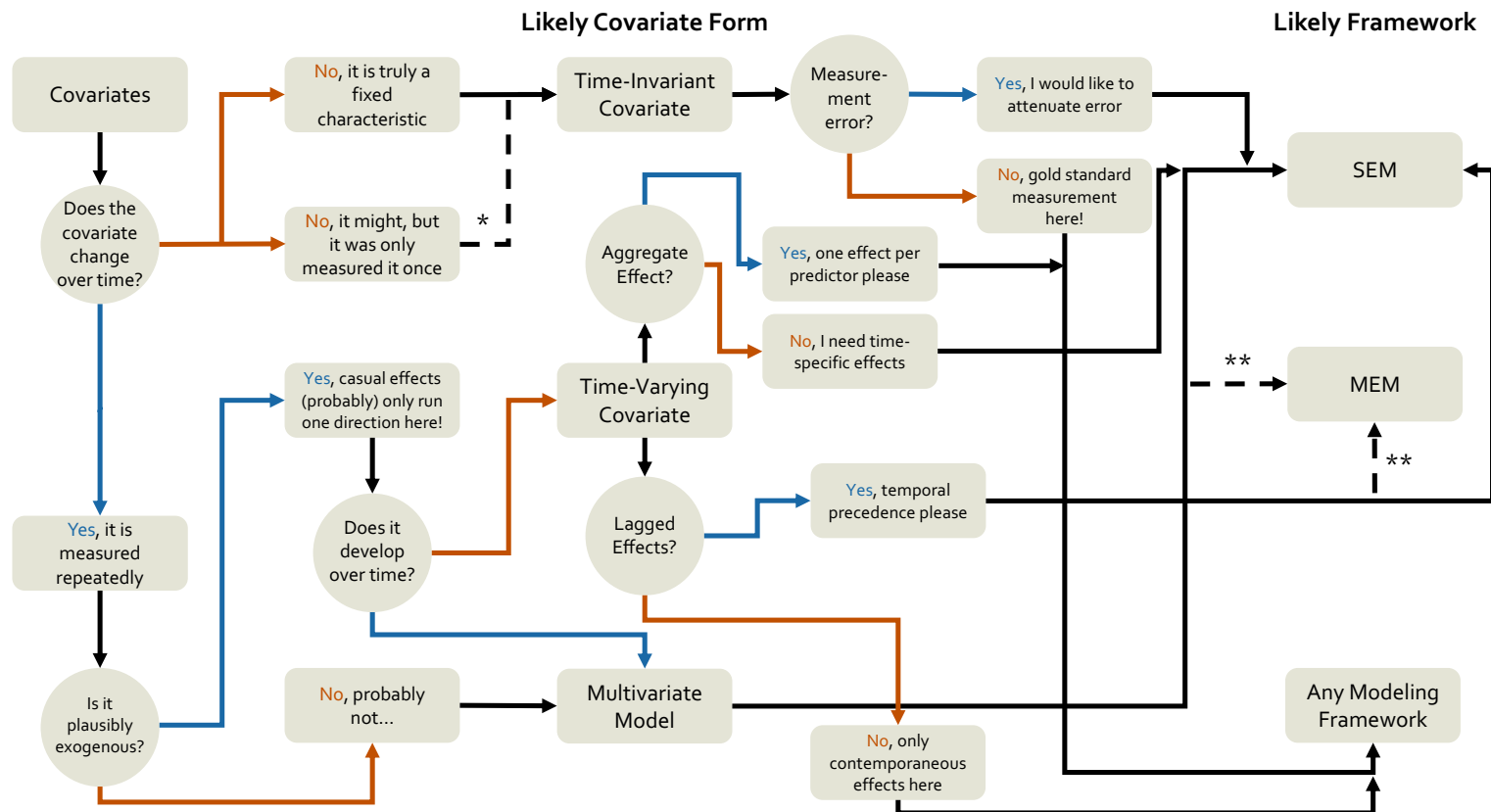
Take Home Message

Choosing between the multitude of options for longitudinal models can be challenging, especially when advanced methodological training is not universally accessible. In this primer, we provide 3 resources: 1) a heuristic map for longitudinal model selection, 2) a bibliography of primary sources for each method, and 3) a hands-on, freely-available code repository for fitting a variety of longitudinal models.



Heuristic Maps

- While we cannot account for every possible configuration of data, we provide a heuristic map with major decision-points and the relevant options for modeling
 - See below for an example related to covariates



Bibliography of Primary-Source Citations

- Many longitudinal models were developed outside of the developmental neurosciences
 - We seek to bridge the gap between our fields and quantitative methodology
 - E.g.: What differences exist between multilevel and latent curve growth models?

Further Reading

While relatively uncommon in the neuroscience fields, LCMs have been extensively developed and applied in other developmental and aging-related fields. For those interested, theoretical (Biesanz et al., 2004; Bollen & Curran, 2006; Hancock et al., 2001; Hancock & Choi, 2006; Marcoulides, 2018; McArdle et al., 2009; Meredith & Tisak, 1990; Preacher & Hancock, 2015) and practical applications (Curran et al., 2010; Harden & Tucker-Drob, 2011; King et al., 2018; Moustafa et al., 2021) exist to model many different longitudinal processes that may be of interest (see the [Canonical Models](#) chapter of the codebook for examples).

Code Implementation

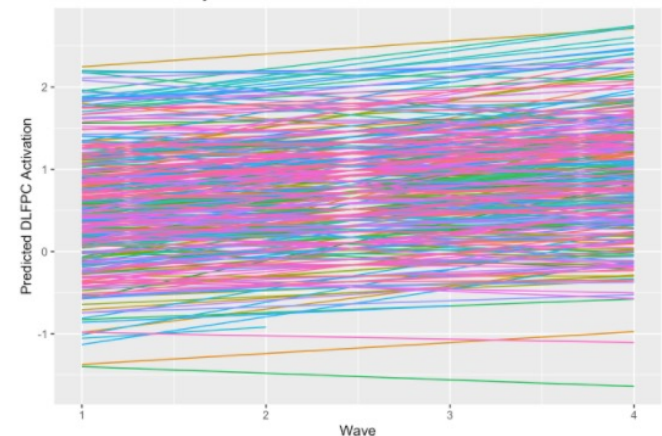
- Practical code-repository for all longitudinal approaches, as well as visualizations of model results

MLM Plotting Model-Implied Trajectories

If we want to plot the model-implied trajectories for each individual, we can use the `ggplot2` package. To plot data, we need to have it in long format. Fortunately this is the format used in the MLM model so we don't need to do anything additional. We will plot predicted values generated from the `predict()` function. While we could append these values to our `executive.function.long` dataframe in a separate step, we will instead generate the values locally within the `ggplot()` function. This will save us a step and we won't have to deal with merging the predicted values into our dataframe or having to remove those values later. Because MLMs drop NA values, our predicted values will not match up to the original dataframe unless we also drop those NA values, so we will use the `drop_na()` function from `tidyr`.

```
ggplot2::ggplot(tidyr::drop_na(executive.function.long),
  aes(x = wave + 1,
      y = predict(mlm.lmerTest),
      group = id,
      color = factor(id))) +
  geom_line() +
  labs(title = "Canonical MLM Trajectories",
       x = "Wave",
       y = "Predicted DLFP Activation") +
  theme(legend.position = "none")
```

Canonical MLM Trajectories



The Hitchhiker's Guide to Longitudinal ...

About

Introduction

Canonical Models

Time Structure

The Shape of Development

Covariates and Distal Outcomes

Nested Data

Datasets

Published with bookdown

The Hitchhiker's Guide to Longitudinal Models

Code Companion

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About

The following document is a code companion to [The Hitchhiker's Guide to Longitudinal Models: A Primer on Model Selection for Repeated-Measures Methods](https://osf.io/bn6yu/), <https://osf.io/bn6yu/>.

Some general notes about this code companion:

- We believe in the importance of using real data in our examples of longitudinal models. However, some of the models we discuss can not yet be fit using publicly-available neuroimaging data (most

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<https://abcdworkshop.github.io/>