

# To Do List

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April 13, 2022

- Read intros to listed texts (See Thesis section 2.1 Why Predictive Inference?) and summarize answers to that question in WhyPredictiveInference.Rnw
  - Nate Silver’s book (1st chapter or intro)
  - Hoff’s book
  - Geyser’s book (1st chapter or intro)
  - Aitchison and Dunsmore (1st chapter or intro)
  - Dean’s paper
  - maybe some googling
- Create example comparing predictive inference result with plug in parameter result
  - Dean’s suggestion: 1-sample binomial with small sample size. E.g. 3 successes, 7 failures ( $\Pr(\text{success}) < 0.5$ ). Difference will be more pronounced with smaller sample sizes.
- No do not Combine `rpredNormIG()`, `rpredNormIG2()`, and `rpredNormIGk()` into one function
- Read up on convergence in probability and justification for MCMC (Hoff, Casella & Berger)
- Compare variance computations: `var()` function on MCMC sample vs direct computation from theory ( $EX^2 - (EX)^2$ )
- General guidance: Read up on “How to write a thesis in Latex,” for example [https://www.overleaf.com/learn/latex/How\\_to\\_Write\\_a\\_Thesis\\_in\\_LaTeX\\_\(Part\\_1\)%3A\\_Basic\\_Structure](https://www.overleaf.com/learn/latex/How_to_Write_a_Thesis_in_LaTeX_(Part_1)%3A_Basic_Structure)
- Figure formatting: save figures as .png files and insert? Or what? Need better control over how figure appears in resulting pdf.
- (0) Incorporate any guidance from Dean.
- Write up explanation of how each function works
- Ask Melanie for “Master’s Thesis Style File”

- Not unless Dean asks for it: write intro paragraph (couple of sentences) for each model
- Exponential-Gamma random sampler: draw a single theta from posterior or draw a new one for each prediction? (Can't tell the difference from histograms)
- Beta-Binomial: Use posterior of theta (which is a gamma) and then make prediction based on draw(s) of theta (like I'm doing for Exponential-Gamma?) Why did I go to the trouble of using the inverse transform method before? Try drawing  $\theta \sim \text{Beta}(t + \alpha, N - t + \beta)$  and then predict t using `rbinom(S,N,theta)`.
- Establish S as random sample size, make sure consistent throughout
- Make sure consistent with  $\tilde{y}$  for predicted value throughout
- add sample function calls to R Implementation sections (see end of BB right before example) **done through Poisson-Gamma**
- add (model name) to example section headings
- Work through the math for the 2-sample Normal-Inverse Gamma full conditional distributions (see Hoff p. 128)
- Section 3 intro: mention split of NormIG into 1, 2, and k sample models.
- Section 3 intro: mention NormIG2() and NormIGk() only offer random sample functions.
- Establish S as random sample size throughout.
- In "R Implementation" sections, put function parameters into function at beginning of intros
- Make sure consistent with use of  $\tilde{y}$  for single prediction throughout. Also mention this in intro.
- Modify R Implementation section for EG to describe  $c =$  censoring indicator vector
- Come up with real EG example
- Come up with real PG example
- check  $\int_{\theta}$  for consistent use throughout
- Am I numbering all the formulas that need numbering?
- Review use of  $\pi(\cdot)$  to denote prior distributions of parameters. Right now my intro says I'm doing that but at least in the k-sample Normal-Inverse Gamma I'm not doing that.
- **Review Normal Regression section and pare down for draft.**
- List of Figures

- List of Tables
- Citations guidance: you should use the citation style appropriate for your discipline, following the guidance of your committee. Ask Melanie.
- Create appendix containing R code for functions and for examples.
- Check boxes for graduation
  - schedule thesis defense (must be April 29 or earlier–Try for earlier–4/8 and 4/22 are off Fridays for me)
  - change address at UAccess once we have closed on the house
  - confirm/change info for graduation at <https://grad.arizona.edu/commencement> (see email from Guadalupe Estrella on January 31)
  - Thesis submission: create account here and submit thesis by deadline (May 13 so earlier) <http://www.etsdadmin.com/arizona>

## Dean's Notes 1/4/2022

1. Remove the Chapter 1 and Chapter 2 from the chapter titles.
2. p 4, Abstract - You know that Bayesian inference need not be predictive.
3. p 4, section 2.1  
 I think you may need a citation for that first sentence.  
 I feel like you need several citation in this first paragraph.  
 How many of these assertions are your original ideas, and how many are borrowed?
4. p 5 What are the take-aways from this example?
5. p 8 Ch3 intro paragraph  
 Yes - add an intro paragraph  
 What about these problems makes them unique? or simple?  
 Also, describe (list) the problems you are going to address.
6. p9, bottom - The random sampling should work the same either way. Is one method preferable?
7. p10, bottom  
 The likelihood is a function of the parameter conditional on the data.

The conventional use of upper and lower case values for variables you know that Y is unobserved, y is observed.

Switching to the likelihood notation is a little less cumbersome.  
For discrete PMFs (like the binomial), the expression would be  $\Pr(Y_1 = y_1, \dots, Y_n = y_n | \theta)$

For continuous pdfs its trickier.

8. p 11 - first para. For the sentences above, I presume you want some censoring value and not a parameter theta?
9. p17 - section 3.3.3 I also don't know where you got this example. See note in red in theses text: My data was made up (random) and the example is completely abstract
10. p21 3.4.1.3 - I don't think you need other values for kappa or nu.
11. p24. 3.4.2.3 - I would probably just say that Hoff provides the following example and we reproduce his description.
12. p27. The two-column format would be more standard, and would fit better with the tidy data format. It would be easier to use.
13. p 33. Comparing the values of beta-ols to their standard errors  
This is the usual regression t-statistic for regression parameter estimates.
14. This is as far as I got. dean

## Questions for Dean 1/28/2022

1. NormIG2(): Subscript  $N$  in the parameters  $\mu_N, \gamma_N^2, \delta_N, \tau_N^2$ . Interpret these as  $N = N_1 + N_2$ ?  
Sure. Maybe add an explanation
2. annotating and numbering figures and tables?
3. spacing?
4. Poisson-Gamma example—use Hoff's? (see 3.3.3)
5. Should I use "Dr." with your name and others? (In intro, throughout, in bibliography) **yes—for my profs when first mentioned. No for authors.**
6. Scheduling defense
  - Date, time, place
  - Invite people (I'd rather not)

## Post Defense

1. Get rid of Grogan and Wirth citation since it's already cited in Hoff?
- 2.