Book plan for “On the R way to hell”

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## Preface

done

* ☒ book explanation
* ☒ author info
* ☒ credits

## Part I: Using R

*nearly done*

1. ☒ start (done)
   * ☒ intro to working with R
2. ☒ basics (done)
   * ☒ R basic use
3. data (need tidyverse section)
   * ☒ basic R loading and wrangling data
   * tidyverse intro
4. graphics (need advanced ggplot use)
   * ☒ making basic plot
   * ☒ ggplot basic
   * ggplot advanced
5. programming (convoluted need rewrite)
   * loop and conditions (exist)
   * making function (exist)
   * making package - just brief section (not done)
6. Writing report and reproducible science with R (need new screenshoot)
   * ☒ intro to Rmarkdown from install to use
7. Using git and github with R (need last read)
   * ☒ intro to using git and github with R

## Part II: Fundamentals of statistics

*A lot of new stuffs but some will come from course notes in BIO4158*

1. Why doing stats
   * prediction, inference, observation
2. Model building and selection
   * talk about causality
3. Notion of experimental design
   * define replication, continuous, fixed and random effects
4. Frequentist vs Bayesian
5. Distribution, CI and p-value
6. Permutation and Bootstrap
7. Multiple testing correction

## Part III: Linear models

*A lot can be taken from the BIO4158 lab manual*

1. Principles and assumptions
2. Simple model
   * t-test
   * one-way anova
   * simple linear regression
3. Multiple model
   * multi-way anova
   * multiple regression
   * general linear regression

## Part IV: Generalized linear models

*some from the Bio4158 and Bio8940 lab manual*

1. intro and principles
2. Count data
   * chi-square
   * poisson regression
3. Binary and proportion data
   * logistic regression

## Part V: Mixed models

*A lot can be taken from the Bio8940 lab manual*

1. intro
2. LMM
3. GLMM
4. multivariate MM

## Part VI: Generalized additive models

*Completely new*

1. intro to splines
2. gam

## Part VII: Multivariate analysis

*Completely new*

1. PCA
2. Overview others

## Part VIII: Bayesian approach

*A lot can be taken from the Bio8940 lab manual and WAM tutorial*

1. intro to Bayesian analysis
   * Bayes theorem
   * principle of parameter estimation with random walk
   * explanation of interpretation of posterior distribution
2. lm
   * redo and discuss some of lm/glm chapter cases using brms
3. lmm
   * redo and discuss some of lmm/glmm chapter cases using brms
4. gam
   * redo and discuss some of gam chapter cases using brms

## References

*done*

Code to automatically:

1. ☒ cite all R packages
2. ☒ create bibliography

## Appendices

1. Data files
   * list of data file used with link to download
2. Latex installation (done)
   * installation instruction for Quarto and latex