

Quantitative Analysis I

Anthropology 4840/7840

Fraser D. Neiman

<http://www.people.virginia.edu/~fn9r>

University of Virginia

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Class Schedule and Reading List

Last update: 02.28.2016

1. [1.26] Introduction.

Models and data, samples and experiments, and a little R.

2. [2.2] A Little More R.

Diez, David M., Christopher Barr, and Mine Chtinkaya-Rundel

2015 *OpenIntro Statistics, Third Edition*. Chapter 1, Introduction to Data, pp. 1-26.

Marwick, Ben

2015 How computers broke science. *The Conversation*.

<https://theconversation.com/how-computers-broke-science-and-what-we-can-do-to-fix-it-49938>

Peng, Roger

2013 *Computing for Data Analysis: Week 1*.

Videos 1-11.

See the course website for links to for all four weeks

<http://people.virginia.edu/~fn9r/anth4840.7840/index.html>.

Here is the link for Week 1:

<https://www.youtube.com/playlist?list=PLjTlxb-wKvXNSDfcKPFH2gzHGyjpeCZmJ>

3. [2.9] A Picture is Worth....

Diez, et al.

2015 Chapter 1 (continued), pp. 26-54.

Peng, Roger

2013 *Computing for Data Analysis, Week 3*

Video 1: Plotting Base.

Video 2: Plotting Base Demo

https://www.youtube.com/playlist?list=PLjTlxb-wKvXOzi2h0F2_rYZHIXz8GWBop

Optional

Peng, Roger

2013 *Computing for Data Analysis, Week 3*

Video 6: Plotting with ggplot2: Part 1

Video 7: Plotting with ggplot2: Part 2

https://www.youtube.com/playlist?list=PLjTlxb-wKvXOzi2h0F2_rYZHIXz8GWBop

Computing for Data Analysis, Week 4

Video 1: Plotting and Colors in R

https://www.youtube.com/playlist?list=PLjTlxb-wKvXOdzysAE6qrEBN_aSBCOLZS

Drennan, Robert
2010 *Statistics for Archaeologists, Second Edition*
Chapters 1-6, pp. 3-75.

4. [2.16] Transformations, Fundamentals of Probability, and a Bit of Bayes

Diez, et al.
2015 Chapter 2, Probability, pp. 76-103.

5. [2.23] Random Variables, Probability Distributions, Expected Value, Variance

Diez, et al.
2015 Chapter 2, Probability, pp. 103-115

Kahn Academy

Random Variables and Probability Distributions.

https://www.khanacademy.org/math/probability/random-variables-topic/random_variables_prob_dist/v/random-variables

Expected Value.

https://www.khanacademy.org/math/probability/random-variables-topic/expected-value/e/expected_value

6. [3.1] Some Useful Probability Distributions,

Bernoulli, Binomial, Poisson, Gaussian distributions, the Gaussian approximation.

Diez, et al.

2015 Chapter 3, Distribution of Random Variables, pp. 127-158.

Kahn Academy

The Binomial Distribution. https://www.khanacademy.org/math/probability/random-variables-topic/binomial_distribution/v/binomial-distribution

The Poisson Distribution

https://www.khanacademy.org/math/probability/random-variables-topic/poisson_process/v/poisson-process-1

The Gaussian (normal) distribution

https://www.khanacademy.org/math/probability/statistics-inferential/normal_distribution/v/introduction-to-the-normal-distribution

Peng, Roger

2013 *Computing for Data Analysis, Week 2*

Video 1: Control Structures in R.

https://www.youtube.com/watch?v=s_h9ruNwl_0&index=1&list=PLjTlxb-wKvXNnjUTX4C8IelhPBjPkg6B

Video 2: Writing Functions.

<https://www.youtube.com/watch?v=KlqKw2zqEQ&index=2&list=PLjTlxb-wKvXNnjUTX4C8IelhPBjPkg6B>

Optional

Drennan

2010 Chapters 8-10, pp. 97-138.

[3.8] Spring Break!

7. [3.15] Inference for Means of Numeric Variables (1)

Sampling distributions, confidence intervals, sample-size requirement, central limit theorem, hypothesis testing basics: type 1 and 2 errors, small-sample inference for one and two means with the t distribution.

Diez, et al.

2015

Chapter 4. Foundations for Inference, pp. 168-203.

Chapter 5. Inference for Numerical Data, pp. 219-239.

Optional

Drennan

2010 Chapter 12, pp. 147-163.

8. [3.22] Inference for Means of Numeric Variables (2)

Evaluating differences between two or more means: ANOVA and the F distribution.

Diez, et al.

2015 Chapter 5. Inference for Numerical Data, pp. 239-257.

Optional

Drennan

2010 Chapter 13, pp. 165-179.

9. [3.29] Inference for Proportions of Categorical Variables.

One proportion, two proportions, three proportions: the Gaussian approximation, and the chi-square distribution.

Diez, et al.

2015 Chapter 6. Inference for Categorical Data, pp. 274-312.

Optional

Drennan

2010 Chapter 11, pp. 139-143. *Beware of Drennan's bogus use of the t -distribution for binomial confidence intervals!*

Chapter 14, pp. 181-196.

10 [4.5] Fundamentals of Linear Regression

Characterizing the relationship between two variables, prediction from a single variable, outliers, inference.

Diez, et al.

2015 Chapter 7. Introduction to Linear Regression, pp. 331-356.

Gelman, Andrew, and Jennifer Hill

2007 *Data Analysis Using Regression and Hierarchical/Multilevel Models*. Cambridge University Press, New York. Chapter 3, Linear Regression: the basics, pp. 31-51.

Optional

Drennan

2010 Chapters 15-16, pp. 199-228.

11. [4.12] Multiple Linear Regression and the General Linear Model

Multiple predictors (ANOVA and ANCOVA), model selection, regression diagnostics.

Diez, et al.

2015 Chapter 8. Multiple and Logistic Regression, pp. 372-395.

Gelman, Andrew, and Jennifer Hill

2007 *Data Analysis Using Regression and Hierarchical/Multilevel Models*. Cambridge University Press, New York. Chapter 4, Linear Regression: Before and After Fitting the Model 53-78.

12. [4.19] Ordination: Principal Components Analysis and Multidimensional Scaling

Zuur, Alain F., Elena Ieno, and Graham Smith

2007 *Analyzing Ecological Data*. Springer, New York. Chapter 12, Principal Component Analysis, pp. 193-206; Chapter 15, Principal Coordinate Analysis and Non-metric Multidimensional Scaling, pp. 258-264.

Drennan

2010 Chapter 22, Similarities Between Cases, pp. 271-283. Chapter 23, Multidimensional Scaling, pp. 285-297, Chapter 24, Principal Components Analysis, pp. 299-307.

Shennan, Stephen

1997 *Quantifying Archaeology, Second Edition*. Edinburgh University Press, Edinburgh. Chapter 12, Multidimensional Spaces and Principal Components Analysis, pp. 265-306.

13. [4.26] Ordination: Correspondence Analysis

de Leeuw, Jan.

2007 Correspondence Analysis of Archeological Abundance Matrices. Department of Statistics, UCLA.

Smith, Karen Y. and Fraser D. Neiman

2007 Frequency seriation, correspondence analysis, and Woodland-Period ceramic assemblage variation in the Deep South. *Southeastern Archaeology* 26 (1):47-72.

14. [5.3] Frequentist Perils and a Taste of the Bayesian Approach

Andrew Gelman and Eric Loken

2013 The garden of forking paths: Why multiple comparisons can be a problem, even when there is no “fishing expedition” or “p-hacking” and the research hypothesis was posited ahead of time.

http://www.stat.columbia.edu/~gelman/research/unpublished/p_hacking.pdf

Shahbaba, Babak

2011 *Biostatistics with R*. Springer, New York. Chapter 13. Bayesian Analysis, pp. 303-315.

Buck, C.E., W.G. Cavanaugh, and C.D. Litton

1996 *Bayesian Approach to Interpreting Archaeological Data*. Wiley, Chichester. Chapter 7, Bayesian Inference. pp. 137-176.