

Spatial Data Analysis in Archaeology

Anthropology 589b

Fraser D. Neiman
Updated: 3.4.07

University of Virginia
Spring 2007

Reading List

1. [1.22] Introduction

2. [1.29] ANOVA, Regression, and Correlation (a tune up).

Drennan, Robert

1996 *Statistics for Archaeologists*. Plenum, New York. Chapter 11, Comparing means for more than two samples (pp.167-185), Chapter 14, Relating a measurement variable to another measurement variable (203-234).

Sokal, Robert F. and F. Jame Rohlf

1995 *Biometry, Third Edition*. W.H. Freeman, New York. Chapter 8, Introduction to the Analysis of Variance (179-206).

Arkush, Elizabeth

2005 *Colla fortified sites: Warfare and regional power in the late Prehispanic Titicaca Basin, Peru*. Ph.D. Dissertation, Anthropology, UCLA (*excerpts*).

Neiman, F.D.

1993 Temporal patterning in house plans from the 17th-century Chesapeake. In *The Archaeology of the 17th Century Chesapeake*, edited by T.R. Reinhart and D.J. Pogue, pp. 251-283. Special Publication no. 30, Archaeological Society of Virginia.

3. [2.5] Spatial Autocorrelation and Correlograms

Fortin, Marie-Josée and Mark Dale

2005 *Spatial Analysis: A Guide for Ecologists*. Cambridge University Press, Cambridge. Chapter 1. Introduction (1-31); Chapter 3, Spatial analysis of sampled data, 3 - 3.3.4 (111-147).

4. [2.12] Trend surfaces.

Burrough, Peter A. and Rachel A. McDonnell

1998 *Principles of Geographic Information Systems*. Oxford University Press, Oxford. Chapter 5, Creating continuous surfaces from point data (98-111).

Bove, F.J.

1981 Trend surface analysis and the Lowland Classic Maya collapse, *American Antiquity* 46 (1981) 93-112.

Neiman, Fraser D.

1997 Conspicuous consumption as wasteful social advertising: A Darwinian perspective on spatial patterns in Classic Maya terminal monument dates. In *Rediscovering Darwin*:

Evolutionary Theory in Archaeological Explanation, edited by G. Clarke and M. Barton. Archaeological Papers of the American Anthropological Association, 7,

5. [2.19] Loess.

Cleveland, William S.

1993 *Visualizing Data*. Hobart Press, Summit, NJ. Chapter 3-3.9, Bivariate data, (87-145), Trivariate data, Chapter 4, (181-272).

6. [2.26] Kriging (and some other interpolation methods)

Burrough, Peter A. and Rachel A. McDonnell

1998 *Principles of Geographic Information Systems*. Oxford University Press, Oxford
Chapter 5, Creating continuous surfaces from point data (112-131).
Chapter 6, Optimal interpolation using geostatistics (132-161).

Lloyd, C.D. and P.M. Atkinson

2004 Archaeology and geostatistics. *Journal of Archaeological Science* 31:151-165.

Bocquet-Appel, J.P. and P.Y. Demars

2000 Neanderthal contraction and modern colonization of Europe. *Antiquity* 74:544-552.

[3.5] Spring Vacation

7. [3.12] Local measures of spatial autocorrelation.

Fortin, Marie-Josée and Mark Dale

2005 *Spatial Analysis: A Guide for Ecologists*. Chapter 3, Spatial analysis of sampled data, 3.4 Local spatial statistics (153-159).

Premo, L.S.

2005 Local spatial autocorrelation statistics quantify multi-scale patterns in distributional data: an example from the Maya Lowlands. *Journal of Archaeological Science* 31 :855–866.

Anselin, L.

1995 Local indicators of spatial association — LISA. *Geographical Analysis*, 27:93–115.

Recommended:

Ord, J.K. and A Getis

1995 Local spatial autocorrelation statistics: distributional issues and an application. *Geographical Analysis* 27: 286-306.

8. [3.19] Mantel regression.

Manley, Brian, F.G.

2004 *Multivariate Statistical Methods: A Primer, Third Edition*. CRC Press, New York. Chapter 5, Measuring and testing multivariate distances (59-74)

Fortin, Marie-Josée and Mark Dale

2005 *Spatial Analysis: A Guide for Ecologists*. Chapter 3, Spatial analysis of sampled data, 3.3.6 (147-153).

Braun, David P.

1985 Ceramic decorative diversity and Illinois Woodland regional integration. In *Decoding Prehistoric Ceramics*, edited by Ben A. Nelson, pp.128-153. Southern Illinois University Press Carbondale.

Neiman, Fraser D.

1995 Stylistic variation in evolutionary perspective: inferences from decorative diversity and interassemblage distance in Illinois Woodland ceramic assemblages. *American Antiquity* 60(1):7-36.

Pierce, Christopher

1999 Theory, measurement, and explanation: variable shapes in Poverty Point Objects. In *Unit Issues in Archaeology*, edited by Ann F. Ramenofsky and Anastasia Steffen, pp.163-190. Utah University Press, Salt Lake City.

9. [3.26] Empirical-Bayes Estimation and Spatial Smoothing.

Robertson, Ian

1999 Spatial and Multivariate Analysis, Random Sampling Error, and Analytical Noise: Empirical Bayesian Methods at Teotihuacan, Mexico. *American Antiquity* 64(1):137-152.

Iversen, Gudmund R.

1984 Bayesian Statistical Inference. Sage Publications, Newbury Park, CA.. pp.7-33.

Bailey, Trevor C. and Anthony C. Gatrell

1995 *Interactive Data Analysis*. Prentice Hall, Harlow. Chapter 8. Further methods for area data (298-308).

Martuzzi M and P. Elliott

1996 Empirical Bayes estimation of small area prevalence of non-rare conditions, *Statistics in Medicine* 15: 1867–1873.

10. [4.2] Correspondence Analysis

Shennan, Stephen

1997 *Quantifying Archaeology*, Second Edition. Edinburgh University Press, Edinburgh. Chapter 13, Correspondence analysis and other multivariate techniques. (pp. 308-360).

Smith, Karen Y. and Fraser D. Neiman

2007 Frequency Seriation, Correspondence Analysis, and Woodland-Period Ceramic Assemblage Variation in the Deep South. *Southeastern Archaeology*.

Duff, Andrew

1996 Ceramic Microseriation: Types or Attributes? *American Antiquity* 61(1): 89-101.

Recommended:

Ter Braak, Cajo F.

1985 Correspondence analysis of incidence and abundance data: properties in terms of a unimodal response model. *Biometrics*, 41, 859-873.

11. [4.9] Correspondence Analysis and Bayesian Spatial Smoothing

Baxter, Micheal J.

- 1994 *Exploratory Multivariate Analysis in Archaeology*. Edinburgh University Press, Edinburgh. Chapter 5, Correspondence analysis-- the main ideas (pp.100-109), Chapter 6, Correspondence analysis – extentions (pp.110-139)

Legendre, Pierre and Louis Legendre

- 1998 *Numerical Ecology*. Elsevier. Amsterdam. Chapter 9.4-4 and 9.4-5 Correspondence analysis (pp.462-475).

Neiman, Fraser D. and Karen Y. Smith

- 2005 How can Bayesian smoothing and correspondence analysis help us decipher occupational histories of late-eighteenth-century slave quarter sites at Monticello? Poster presented at the Society for American Archaeology Meetings.
<http://www.monticello.org/archaeology/publications/2005-SAAposter-NeimanSmith/index.html>

Kintigh, Keith

- 1990 Intrasite spatial analysis: a commentary on major methods. In *Mathematics and Information Science in Archaeology: A Flexible Framework*. Edited by Albertus Voorrips. Studies in Modern Archaeology 3: 165-200. Holos, Bonn.

Recommended:

Robertson, Ian

- 2001 *Mapping the Social Landscape of an Early Urban Center: Sociospatial Variation at Teotihuacan*. Ph.D. Dissertation, Anthropology, Arizona State University.

12. [4.16] Point Patterns: Kernel Density Estimation and K functions.

Bailey, Trevor C. and Anthony C. Gatrell

- 1995 *Interactive Spatial Data Analysis*. Prentice Hall, Harlow. Chapter 3. Introductory methods for point patterns (75-115).

Beardah, C & Baxter, M

- 1996 The archaeological use of kernel density estimates. *Internet Archaeology* 1
http://intarch.ac.uk/journal/issue1/beardah_index.html

Bevan, Andrew and James Connolly

- 2006 Multiscalar approaches to settlement pattern analysis. In *Confronting Scale in Archaeology: Issues of Theory and Practice*, edited by Gary Lock and Brian Molyneaux, pp. 217-234. Springer, New York.

Sheather, Simon J

- 2004 Density Estimation. *Statistical Science* 19:588-597

13. [4.23] Spatial regression: autoregressive and moving-average models.

Rogerson, Peter A.

2006 *Statistical Methods for Geography*, Second Edition. Sage, London. Chapter 11, Some spatial aspects of regression (244-257).

Fotheringham, A. Stewart, Chris Brunsdon, and Martin Charlton

2000 *Quantitative Geography: Perspectives on Spatial Data Analysis*. Sage, London. Chapter 7, Regression and Geostatistical Models (162-183).

14. [4.29] Presentations.