PLS 597: The Politics of Measurement and the Measurement of Politics (Measurement Theory)

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Office Hours: Wednesday 1:30pm-3:30 and by appointment.

Introduction

Political scientists are often interested in explaining concepts that are difficult if not impossible to observe. Examples of unobservable concepts include political knowledge, political ideology, democracy, respect for human rights, or inequality in developing countries. A key challenge for political scientists and social scientists generally, is creating models that can explain these concepts while also capturing the uncertainty associated with their measurement.

This course will provide an introduction to measurement models generally with specific focus on Bayesian measurement models and measurement models that make use of text data and the relational data typical of social network analysis. The course will also emphasize the use of construct validity to assess new and existing measures in applied research. I motivate the development of the models introduced in this class with a discussion of the Bayesian perspective on the relationship between data and model parameters. This perspective is useful because it shifts the burden of validity from the primary source documentation and raw data to the model parameters that bind these diverse pieces of information together.

Though this class serves as an introduction to latent variable modeling specifically and measurement theory more generally, there is a lot of ground to cover and a lot fascinating research being done in political science and elsewhere. There are many articles, working papers, and books that could be on this syllabus that we do not have time to cover. I have tried to include much of this information in the suggested reading sections of this syllabus. We will also talk about much of this material during the final week or two of class.

Class Expectations

The class will meet twice a week for 1.5 hours. We will split our time across two or three distinct activities during each class period: (1) lecture, (2) discussion, and (3) programming. The *Class Schedule* section below provides details about each of these sections across the 15 weeks of the semester. Read all of the assigned materials and be prepared to discuss each piece at the assigned class meeting. There are six (or so) problem sets for the course that are each worth 10% of the final grade. Each problem set should take approximately 5-20 hours to complete. 20% of the grade comes from the data project. The remaining 20% of the course grade is for participation in the classroom discussions.

Assignments

1. **Discussion Reading**: There will be at least one discussion reading assigned per week. We will devote some of our time to discussing and assessing the measurement strategy employed by this article.

2. **Data project (individual version)**: 5-10 page written summary of latent variable estimates derived from a set of manifest variables and fully specified model. The paper should justify the link between the theory and the model parameterization, which links the manifest variable with the latent variable. Describe each manifest variable in detail and assess the construct validity of each individually and the construct validity of the latent variable itself. Make sure to assess the **translational validities**: Face validity and Content validity, and the **criterion-related validities**: Predictive validity, Concurrent validity, Convergent validity, Discriminant validity.

3. **Data project (group version)**: Complete a publication quality manuscript that motivates the use of a latent variable. The paper should fulfill all the requirements specified in the **Data project (individual version)** above. I expect that group projects will be submitted to at least one political science conference and should be submitted for journal review after additional revisions over the summer.

4. **Problem Sets 1-6**: Complete applied bi-weekly problem sets. I encourage students to work on these problem sets in groups. Each student must complete each problem set.

Due dates appear below in the *Class Schedule* section. Assignments are due at the beginning of the class in the week of the due date.

Acknowledgments

Elements of the syllabus and other class materials created for this class are based in part on the Bayesian Statistics class offered by Seth Hill at University of California, San Diego and the Measurement class offered by Keith Poole at UCSD and now the University of Georgia. Some additional material also comes from the Research Design (204A) course developed by David Lake and Mathew McCubbins at UCSD.

Text Books

Required Books

1. Bartholomew, David, Martin Knott, and Irini Moustakl. 2011. *Latent Variable Models and Factor Analysis: A Unified Approach*. 3rd Edition. Wily Series in Probability and Statistics.

2. Borsboom, Denny. 2005. *Measuring the Mind*. Cambridge: Cambridge University Press.

3. Gelman, Andrew and Jennifer Hill. 2007. *Data Analysis Using Regression and Multilevel/Hierarchical Models*. Cambridge: Cambridge University Press. R code and data files: http://www.stat.columbia.edu/~gelman/arm/software/

4. Wasserman, Stanley and Katherine Faust. 1994. *Social Network Analysis: Methods and Applications*. Cambridge: Cambridge University Press.

Suggested Books

We will read select portions of some of the titles listed here in addition to articles listed below. Additional supplementary books are also listed below.

4. Albert, James H., and Val E. Johnson. 1999. *Ordinal Data Modeling*. New York: Springer-Verlag.

5. Allen, Mary J. and Wendy M. Yen. 1979. *Introduction to Measurement Theory*. Waveland Press, Inc.

6. Armstrong, David, Ryan Bakker, Royce Carroll, Christopher Hare, Keith Poole, and Howard Rosenthal. 2014. *Analyzing Spatial Models of Choice and Judgment with R*, New York: CRC Press. R code and data files: http://voteview.com/asmcjr.asp

7. Bolker, Ben. 2007. *Ecological Models and Data in R*. Princeton NJ: Princeton University Press. R code and data files: http://ms.mcmaster.ca/~bolker/emdbook/

8. Borg, Ingwer and Patrick Groenen. 2005. *Modern Multidimensional Scaling: Theory and Applications* (2nd Edition). New York: Springer-Verlag.

9. Coombs, Clyde. 1964. *A Theory of Data*. New York: John Wiley.

10. Gill, Jeff. 2008. *Bayesian Methods: A Social and Behavioral Science Approach* Second Edition. Chapman and Hall/CRC.

11. Hoff, Peter. 2009. *A First Course in Bayesian Statistical Methods*. Springer Texts in Statistics. R code and data files: http://www.stat.washington.edu/hoff/book.php

12. Jackman, Simon. 2009. *Bayesian Analysis for the Social Sciences*. Wiley. (selected chapters available from the instructor)

13. Kruschke, John K. . 2011. *Doing Bayesian Data Analysis: A Tutorial with R and BUGS*. Academic Press. R code and data files: https://sites.google.com/site/doingbayesiandataanalysis/

14. Lord, Frederic M. 1980. *Applications of Item Response Theory to Practical Testing Problems*. Hillsdale, NJ: Erlbaum Associates.

15. Lord, Frederic M., and Melvin R. Novick. 1968. *Statistical Theories of Mental Test Scores*. Reading, MA: Addison-Wesley.

16. Poole, Keith T. 2005. *Spatial Models of Parliamentary Voting*. Cambridge: Cambridge University Press. R code and data files:
http://voteview.com/spatial_models_of_parliamentary_voting.htm

17. Poole, Keith T., and Howard. Rosenthal. 1997. *A Political-Economic History of Roll Call Voting*. New York: Oxford University

18. Rasch, Georg. 1980. *Probabilistic Models for Some Intelligence and Attainment Tests*. Chicago: The University of Chicago Press.

19. Taagepera, Rein. 2008. *Making Social Sciences More Scientific*. Oxford University Press.

20. Trochim, William and James P. Donnelly. 2007. *The Research Methods Knowledge Base*, 3rd Edition. Cincinnati, OH, Atomic Dog Publishing.

21. Sijtsma, Klaas, and Ivo W. Molenaar. 2002. *Introduction to Nonparametric Item Response Theory*. Thousand Oaks, CA: Sage.

Class Schedule

Week 1: The Politics of Measurement and the Measurement of Politics

Lecture and Discussion Readings:

1. Adcock, Robert, and David Collier. 2001. ."Measurement Validity: A Shared Standard for Qualitative and Quantitative Research." *American Political Science Review* 95(3):529–546.

2. Brysk, Allison. 1994. "The Politics of Measurement: The Contested Count of the Disappearance in Argentina." *Human Rights Quarterly*, 16(4):676-692.

Suggested Readings:

3. Davenport, Christian *Media Bias, Perspective, and State Repression: The Black Panther Party*. Cambridge University Press.

4. Driscoll, Jesse and S. Naidu. "State-Building And Census Taking: The Political Economy of Population Data." working paper.

5. Lustik, Ian S. 1996. "History, Historiography, and Political Science: Multiple Historical Records and the Problem of Selection Bias." *American Political Science Review* 90(3):605-618.

6. Scott, James C. 1999. *Seeing Like a State*. Yale University Press.

Week 2: Introduction to Latent Variable Models

Lecture and Discussion Readings:

1. Borsboom, Denny. 2005. *Measuring the Mind*. Cambridge: Cambridge University Press. Ch 1.

2. Fariss, Christopher J. "Creating, Extending, and Validating Latent Variable Models of Human Rights and Repression." working paper.

3. Jackman, Simon. 2008. "Measurement." In *The Oxford Handbook of Political Methodology*, edited by Janet M. Box-Steffensmeier, Henry E. Brady, and David Collier. Oxford University Press.

Suggested Readings:

4. Bartholomew, David, Martin Knott, and Irini Moustakl. 2011. *Latent Variable Models and Factor Analysis: A Unified Approach*. 3rd Edition. Wily Series in Probability and Statistics.

5. Lord, Frederic M. 1980. *Applications of Item Response Theory to Practical Testing Problems*. Hillsdale, NJ: Erlbaum Associates.

6. Lord, Frederic M., and Melvin R. Novick. 1968. *Statistical Theories of Mental Test Scores*. Reading, MA: Addison-Wesley.

7. Rasch, Georg. 1980. *Probabilistic Models for Some Intelligence and Attainment Tests*. Chicago: The University of Chicago Press.

8. Trochim, William and James P. Donnelly. 2007.*The Research Methods Knowledge Base*, 3rd Edition. Cincinnati, OH, Atomic Dog Publishing. Ch 3: "The Theory of Measurement."

Week 3: Theories of Measurement and Latent Variable Models

The first problem set is due by the beginning of class this week.

Lecture and Discussion Readings:

1. Borsboom, Denny. 2005. *Measuring the Mind*. Cambridge: Cambridge University Press. Ch 3.

2. Hand, D. J., 1996. "Statistics and the Theory of Measurement." *Journal of the Royal Statistical Society. Series A (Statistics in Society)*. 159(3):445-492.

Week 4: Introduction to Probability and Models of Probabilitiy

Lecture and Discussion Readings:

1. Bolker, Ben. 2007. Ecological Models and Data in R. Princeton NJ: Princeton University Press. Ch.4.

Suggested Readings:

2. Kruschke, John K. 2011. "Doing Bayesian Data Analysis: A Tutorial with R and BUGS." Academic Press. Ch.2, Ch.3., and Ch.4.

Week 5: Probability Models Using STAN

Lecture and Discussion Readings:

1. Gelman, Andrew and Jennifer Hill. 2007. *Data Analysis Using Regression and Multilevel/Hierarchical Models*. Cambridge: Cambridge University Press. Ch.1, Ch.2.

Suggested Readings:

2. Carpenter, Bob, Andrew Gelman, Matt Hoffman, Daniel Lee, Ben Goodrich, Michael Betancourt, Marcus A. Mrubaker, Jiqiang Guo, Peter Li, and Allen Riddell. "Stan: A Probabilistic Programming Language." *Journal of Statistical Software*

3. Stan Development Team. 2015. "Stan Modeling Language: Users Guide and Reference Manual. Version 2.6.0." http://mc-stan.org/manual.html

Week 6: The Latent Variable Model Using STAN

The first draft of the data project is due.

Lecture and Discussion Readings:

1. Gelman, Andrew and Jennifer Hill. 2007. *Data Analysis Using Regression and Multilevel/Hierarchical Models*. Cambridge: Cambridge University Press. 2007. Ch.3, Ch.5, Ch.14, and Ch.18.

Week 7: Dynamic Versions of the Latent Variable Model

The second problem set is due by the beginning of class this week.

Lecture and Discussion Readings:

1. Martin, Andrew D. and Kevin M. Quinn. 2002. "Dynamic IDeal Point Estimation via Markov Chain Monte Carlo for the U.S. Supreme Court, 1953-1999." *Political Analysis* 10(2):134-153.

2. Schnakenberg, Keith E. and Christopher J. Fariss "Dynamic Patterns of Human Rights Practices." *Political Science Research and Methods* 2(1):1-31.

Suggested Readings:

3. Poole, Keith T. 2005. *Spatial Models of Parliamentary Voting*. Cambridge, UK: Cambridge University Press.

4. Poole, Keith T., and Howard. Rosenthal. 1991. "Patterns of Congressional Voting." *American Journal of Political Science* 35(1):228-278.

5. Poole, Keith T., and Howard. Rosenthal. 1997. *A Political-Economic History of Roll Call Voting*. New York: Oxford University Press.

Week 8: Additional Extensions to the Latent Variable Model

Lecture and Discussion Readings:

1. Caughey Devin and Christopher Warshaw. 2015. "Dynamic Estimation of Latent Opinion Using a Hierarchical Group-Level IRT Model." *Political Analysis* (Forthcoming).

2. Fariss, Christopher J. 2014. "Respect for Human Rights has Improved Over Time: Modeling the Changing Standard of Accountability." *American Political Science Review* 108(2):297-318.

3. Quinn, Kevin M. 2004. "Bayesian Factor Analysis for Mixed Ordinal and Continuous Responses." *Political Analysis* 12(4):338-353.

4. Jesse, Stephen A. "Don't Know Responses, Personality and the Measurement of Political Knowledge." working paper.

Suggested Readings:

5. Albert, James H., and Val E. Johnson. 1999. *Ordinal Data Modeling*. New York: Springer-Verlag.

6. Armstrong, David, Ryan Bakker, Royce Carroll, Christopher Hare, Keith Poole, and Howard Rosenthal. 2014. *Analyzing Spatial Models of Choice and Judgment with R*, New York: CRC Press.

7. Barberá, Pablo. 2015. "Birds of the Same Feather Tweet Together. Bayesian Ideal Point Estimation Using Twitter Data." *Political Analysis* 23(1):76-91.

8. Bonica, Adam. 2012. "Ideology and Interests in the Political Marketplace." *American Journal of Political Science* 57(2):294-311.

9. Clinton, Joshua, Simon Jackman, and Douglas Rivers. 2004. "The Statistical Analysis of Roll Call Data." *American Political Science Review* 98(2):355-370.

10. Fariss, Christopher J. "Uncertain Events: A Dynamic Latent Variable Model of Human Rights Respect and Government Killing with Binary, Ordered, and Count Outcomes." working paper.

11. Martin, Andrew D. 2003. "Bayesian Inference for Heterogeneous Event Counts." *Sociological Methods and Research* 32: 30-63.

12. Mislevy, Robert. 1991. "Randomization-based Inference about Latent Variables from Complex Samples." *Psychometrika* 56(2):177-196.

13. Pemstein, Daniel, Stephen A. Meserve, and James Melton. 2010. "Democratic Compromise: A Latent Variable Analysis to Ten Measure of Regime Type." *Political Analysis* 18(4):426-449.

14. Sijtsma, Klaas, and Ivo W. Molenaar. 2002. *Introduction to Nonparametric Item Response Theory*. Thousand Oaks, CA: Sage.

15. Treier, Shawn, and Simon Jackman. 2008. "Democracy as a Latent Variable." *American Journal of Political Science* 52(1):201-217.

Week 9: Text as Data

The third problem set is due by the beginning of class this week.

Lecture and Discussion Readings:

1. Grimmer, Justin and Brandon M. Stewart. 2013. "Text as Data: The Promise and Pitfalls of Automatic Content Analysis Methods for Political Texts." *Political Analysis* 21(3):267-297.

2. Mikhaylov, Slava, Michael Laver, and Kenneth R. Benoit. 2012."Coder Reliability and Misclassification in the Human Coding of Party Manifestos." *Political Analysis* 20(1): 78-91.

Suggested Readings:

3. Hopkins, Daniel J and Gary King. 2010. "A method of automated nonparametric content analysis for social science." *American Journal of Political Science* 54(1):229-247.

4. King, Gary, Patrick Lam, and Margaret E. Roberts. 2014. "Computer-Assisted Keyword and Document Set Discovery from Unstructured Text." working paper.

5. Quinn, Kevin M. and Burt L. Monroe, Michael Colaresi, Michael H. Crespin, Dragomir R. Radev. 2010. "How to Analyze Political Attention with Minimal Assumptions and Costs." *American Journal of Political Science* 54(1):209-228.

6. Schwartz, H. Andrew, Johannes C. Eichstaedt, Margaret L. Kern, Lukasz Dziurzynski, Stephanie M. Ramones, Megha Agrawal, Achal Shah, Michal Kosinski, David Stillwell, Martin E. P. Seligman, and Lyle H. Ungar"Personality, Gender, and Age in the Language of Social Media: The Open-Vocabulary Approach." *PLoS ONE* 8(9):e73791.

Week 10: Latent Variable Models of Text

Lecture and Discussion Readings:

1. Laver, Michael, Kenneth Benoit, and John Garry. 2003. "Extracting Policy Positions from Political Texts Using Words as Data." *American Political Science Review* 97(2):311-331.

2. Roberts, Margaret E, Brandon Stewart, and Dustin Tingley. "Navigating the Local Modes of Big Data: The Case of Topic Models." In *Data Analytics in Social Science, Government, and Industry*, New York: Cambridge University Press.

Suggested Readings:

4. Blei, David M. 2012. "Probabilistic topic models." *Communications of the ACM* 55(4):77-84.

5. Lauderdale, Benjamin E and Tom S Clark. 2014. "Scaling politically meaningful dimensions using texts and votes." *American Journal of Political Science*

6. Roberts, Margaret E., Brandon M. Stewart, Dustin Tingley, Christopher Lucas, Jetson Leder-Luis, Shana Kushner Gadarian, Bethany Albertson, David G. Rand . Forthcoming. "Structural Topic Models for Open-Ended Survey Responses." *American Journal of Political Science*

Week 11: Related Models of Scale Development and Assessment

The fourth problem set is due by the beginning of class this week.

Lecture Readings:

1. Bartholomew, David, Martin Knott, and Irini Moustakl. 2011. *Latent Variable Models and Factor Analysis: A Unified Approach*. 3rd Edition. Wily Series in Probability and Statistics. Ch.1.

2. Borsboom, Denny. 2005. *Measuring the Mind*. Cambridge: Cambridge University Press. Ch.4 and Ch.2

3. van Schuur, Wijbrandt H. 2003. "Mokken Scale Analysis: Between the Guttman Scale and Parametric Item Response Theory." *Political Analysis* 11(2): 139-63.

Suggested Readings:

3. Aldrich, John H. and Richard D. McKelvey. 1977. "A Method of Scaling with Applications to the 1968 and 1972 Presidential Elections." *American Political Science Review* 71:111-130.

4. Bond, Robert M., and Solomon Messing. Forthcoming. "Quantifying Social Media's Political Space: Estimating Ideology from Publicly Revealed Preferences on Facebook." *American Political Science Review*.

5. Borg, Ingwer and Patrick Groenen. 2005. *Modern Multidimensional Scaling: Theory and Applications* (2nd Edition). New York: Springer-Verlag. (See especially, Ch.1, Ch.2, Ch.4, and Ch.20).

6. Guttman, Louis. 1944. "A basis for scaling qualitative data." *American Sociological Review* 9:139-150.

7. Hare, Christopher, David A. Armstrong II, Ryan Bakker, Royce Carroll, and Keith T. Poole. Forthcoming. "Using Bayesian Aldrich-McKelvey Scaling to Study Citizens' Ideological Preferences and Perceptions." *American Journal of Political Science*.

8. Likert, Rensis. 1932. "A Technique for the Measurement of Attitudes." *Archives of Psychology* 22:5-55.

9. Londregan, John B. 2000. "Estimating Legislators' Preferred Points." *Political Analysis* 8:35-36.

10. Lupu, Yonatan. 2013. The Informative Power of Treaty Commitment: Using the Spatial Model to Address Selection Effects. *American Journal of Political Science* 57(4):912-925.

11. Lupu, Yonatan. Forthcoming. "Why Do States Join Some Universal Treaties but not Others? An Analysis of Treaty Commitment Preferences." *Journal of Conflict Resolution*.

12. Palfrey, Thomas R. and Keith T. Poole. 1987. "The Relationship Between Information, Ideology, and Voting Behavior." *American Journal of Political Science* 31:511-530.

13. Poole, Keith T. 1998. "Recovering a Basic Space From a Set of Issue Scales." *American Journal of Political Science* 42:954-993.

14. Rabinowitz, George. 1975. "An Introduction to Nonmetric Multidimensional Scaling." *American Journal of Political Science* 19:343-390.

15. Rusk, Jerrold G. and Herbert F. Weisberg. 1972. "Perceptions of Presidential Candidates." *Midwest Journal of Political Science* 16(3):388-410.

16. Shepard, Roger N. 1987. "Toward a Universal Law of Generalization for Psychological Science." *Science* 237:1317-1323.

17. Thurstone, Louis L. 1927. "The method of paired comparisons for social values." *Journal of Abnormal and Social Psychology* 21:384-400.

18. Thurstone, Louis L. 1928. "Attitudes can be measured." *American Journal of Sociology* 33:529-554.

19. Trochim, William and James P. Donnelly. 2007. *The Research Methods Knowledge Base*, 3rd Edition. Cincinnati, OH, Atomic Dog Publishing. Ch 5: "Scales and Indexes."

20. Weisberg, Herbert F. and and Jerrold G. Rusk. 1970. "Dimensions of Candidate Evaluation." *American Political Science Review* 64:1167-1185.

21. Weisberg, Herbert F. 1974. "Dimensionland: An Excursion into Spaces." *American Journal of Political Science* 18:743-776.

Week 12: Relational Models of Data

Lecture and Discussion Readings:

1. Coombs, Clyde. 1964. *A Theory of Data*. New York: John Wiley. Ch 1.

2. Wasserman, Stanley and Katherine Faust. 1994. *Social Network Analysis: Methods and Applications* Cambridge: Cambridge University Press. Ch.1

Suggested Readings:

3. Fariss, Christopher J. and Keith E. Schnakenberg. 2014. "Measuring Mutual Dependence Between State Repressive Actions." *Journal of Conflict Resolution* 58(6):1003-1032.

Week 13: Measurements of Social Network Structures (part 1)

The fifth problem set is due by the beginning of class this week.

Lecture and Discussion Readings:

1. Wasserman, Stanley and Katherine Faust. 1994. *Social Network Analysis: Methods and Applications* Cambridge: Cambridge University Press. Ch.2, Ch.3, and Ch.4.

Week 14: Measurements of Social Network Structures (part 2)

Lecture and Discussion Readings:

1. Christakis, Nicholas A. and James H. Fowler. 2012. "Social contagion theory: examining dynamic social networks and human behavior." *Statistics in Medicine* 32(4):556-577.

2. Granovetter, Mark S. 1973. "The Strength of Weak Ties." *American Journal of Sociology* 78(6):1360-1380.

3. Padgett, John F. and Christopher K. Ansell. 1993. "Robust Action and the Rise of the Medici, 1400-1434. *American Journal of Sociology* 98(6):1259-1319.

Suggested Readings:

3. Fowler, James H. 2006. Connecting the Congress: A Study of Cosponsorship Networks *Political Analysis* 14(4):456-487.

4. Fowler, James H. and Nicholas A. Christakis. 2010. "Cooperative Behavior Cascades in Human Social Networks." *PNAS 107* (12): 5334-5338.

5. Fowler, James H. and Sangick Jeon. 2008. "The Authority of Supreme Court Precedent." *Social Networks* 30:16-30.

6. Hoff, Peter D, Adrian E Raftery and Mark S Handcock. 2002. "Latent space approaches to social network analysis." *Journal of the American Statistical Association* 97(460):1090-1098.

7. Lorenzo Coviello, James H. Fowler, Massimo Franceschetti. 2014. "Words on the Web: Noninvasive Detection of Emotional Contagion in Online Social Networks." *Proceedings of the IEEE* 102(12):1911-1921.

8. Lupu, Yonatan and Vincent Traag. 2013. "Trading Communities, the Networked Structure of International Relations and the Kantian Peace." *Journal of Conflict Resolution* 57(6):1011-1042.

9. Lupu, Yonatan and Erik Voeten. 2012. "Precedent in International Courts: A Network Analysis of Case Citations by the European Court of Human Rights." *British Journal of Political Science* 42:413-439.

10. Siegel, David. 2013. "Social Networks and the Mass Media." *American Political Science Review* 107(4):786-805.

Week 15: Construct Validity, Conclusion Validity, and the Philosophy of Science

The sixth problem set is due by the beginning of class this week.

Lecture and Discussion Readings:

1. Borsboom, Denny. 2005. *Measuring the Mind*. Cambridge: Cambridge University Press. Ch.5 and Ch.6.

2. Blei, David M. 2014. "Build, compute, critique, repeat: data analysis with latent variable models." *Annual Review of Statistics and Its Application* 1:203-232.

3. Gelman, Andrew and Cosma Rohilla Shalizi. 2012. "Philosophy and the practice of Bayesian statistics." *British Journal of Mathematical and Statistical Psychology* 66(1):8-38.

Suggested Readings:

3. Andrews, Mark and Thom Baguley. 2012. "Prior approval: The growth of Bayesian methods in psychology." *British Journal of Mathematical and Statistical Psychology* 66(1):1-7.

4. Borsboom, Denny and Brian D. Haig. 2012. "How to practice Bayesian statistics outside the Bayesian church: What philosophy for Bayesian statistical modeling?." *British Journal of Mathematical and Statistical Psychology* 66(1):39-44.

5. Kruschke, John K. 2012. "Posterior predictive checks can and should be Bayesian: Comment on Gelman and Shalizi, 'Philosophy and the practice of Bayesian statistics.'" *British Journal of Mathematical and Statistical Psychology* 66(1):45-56.

6. Mayo, Deborah G. 2012. "The error-statistical philosophy and the practice of Bayesian statistics: Comments on Gelman and Shalizi: 'Philosophy and the practice of Bayesian statistics.'" *British Journal of Mathematical and Statistical Psychology* 66(1):57-64.

7. Senn, Stephen. 2012. "Comment on Gelman and Shalizi." *British Journal of Mathematical and Statistical Psychology* 66(1):65-67.

8. Morey, Richard D., Jan-Willem Romeijn and Jeffrey N. Rouder. 2012. "The humble Bayesian: Model checking from a fully Bayesian perspective." *British Journal of Mathematical and Statistical Psychology* 66(1):68-75.

9. Gelman, Andrew and Cosma Shalizi. 2012. "Rejoinder to discussion of Philosophy and the practice of Bayesian statistics." *British Journal of Mathematical and Statistical Psychology* 66(1):76-80.

Week 16: Finals Week

The group or individual measurement projects are due by the scheduled final exam time this week.

Week 16+: Selected Additional Articles

This class presents a lot of material about measurement. It is not a class about social network analysis, text analysis, Bayesian statistics, "big data.", or the development of algorithms. We have considered text books and articles that use all these tools. There are many articles across the subfields and outside of political science that we have not considered that are helpful for those interested in exploring these other topics in more depth. In this section, I've added a few more articles that political scientists should consider when trying to understand the developments of these different fields over the last few decades. Also see the suggested reading sections above for much more. I will add additional information and modify these sections as I continue to work in these areas and teach this course.

1. Gill, Jeff, and Lee D. Walker. 2005. "Elicited Priors for Bayesian Model Specifications in Political Science Research." *Journal of Politics* 67:841-872.

2. Western, Bruce. 1998. "Causal Heterogeneity in Comparative Research: A Bayesian Hierarchical Modeling Approach." *American Journal of Political Science* 42:1233-1259.

3. Western, Bruce, and Simon Jackman. 1994. "Bayesian Inference for Comparative Research." *American Political Science Review* 88:412-423.

Academic Dishonesty

The Department of Political Science, along with the College of the Liberal Arts and the University, takes violations of academic dishonesty seriously. Observing basic honesty in one's work, words, ideas, and actions is a principle to which all members of the community are required to subscribe.

All course work by students is to be done on an individual basis unless an instructor clearly states that an alternative is acceptable. Any reference materials used in the preparation of any assignment must be explicitly cited. Students uncertain about proper citation are responsible for checking with their instructor.

In an examination setting, unless the instructor gives explicit prior instructions to the contrary, whether the examination is in class or take home, violations of academic integrity shall consist but are not limited to any attempt to receive assistance from written or printed aids, or from any person or papers or electronic devices, or of any attempt to give assistance, whether the one so doing has completed his or her own work or not.

Lying to the instructor or purposely misleading any Penn State administrator shall also constitute a violation of academic integrity.

In cases of any violation of academic integrity it is the policy of the Department of Political Science to follow procedures established by the College of the Liberal Arts. More information on academic integrity and procedures followed for violation can be found at:
http://laus.la.psu.edu/current-students/academics/academic-integrity/college-policies

Note to students with disabilities: Penn State welcomes students with disabilities into the University's educational programs. If you have a disability-related need for reasonable academic adjustments in this course, contact the Office for Disability Services. For further information regarding policies, rights and responsibilities please visit the Office for Disability Services (ODS) Web site at: www.equity.psu.edu/ods/

Instructors should be notified as early in the semester as possible regarding the need for reasonable accommodations.