

**BIOGRAPHICAL SKETCH**

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NAME: Jeff Gill

eRA COMMONS USER NAME (credential, e.g., agency login): JGILL22

POSITION TITLE: Distinguished Professor

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
University of California, Los Angeles	BA	1984	Mathematics
Georgetown University, Washington DC	Masters	1988	Business Administration
American University, Washington, DC	Ph.D.	1996	Statistics, Government
Harvard University, Boston	Postdoctoral	1998	Statistics, Government

**A. Personal Statement**

I am currently Distinguished Professor in the Department of Government, Professor in the Department of Mathematics & Statistics, and a member of the Center for Behavioral Neuroscience at American University. I have done extensive work in the development of Bayesian hierarchical models, nonparametric Bayesian models, elicited prior development from expert interviews, as well in fundamental issues in statistical inference. I have extensive expertise in statistical computing, Markov chain Monte Carlo (MCMC) tools in particular. Most sophisticated Bayesian models for the social or medical sciences require complex, compute-intensive tools such as MCMC to efficiently estimate parameters of interest. I am an expert in these statistical and computational techniques and use them to contribute to empirical knowledge in the biomedical and social sciences. Current theoretical work builds logically on my prior applied work and adds opportunities to develop new hybrid algorithms for statistical estimation with multilevel specifications and complex time-series and spatial relationships, as well clustering detection within algorithms. Current applied work includes: blood and circulation physiology including how our bodies change these dynamics in times of stress such as injury, long-term mental health outcomes from children's exposure to war, pediatric head trauma, analysis of terrorism data, survey research methodologies, spatial analysis of social and biomedical conditions, and computational genetics.

**B. Positions and Honors****Employment**

- September 1996–June 2000: Assistant Professor, Political Science, California Polytechnic State University
- August 2000–May 2002: Assistant Professor, Department of Political Science, University of Florida
- August 2000–Present: Affiliate Professor, Department of Statistics, University of Florida
- May 2002–December 2003: Associate Professor, Department of Political Science, University of Florida
- January 2004–July 2007: Associate Professor, Department of Political Science, University of California–Davis
- July 2006–July 2007: Visiting Associate Professor, Department of Government, Harvard University
- July 2006–July 2007: Faculty Associate, Institute for Quantitative Social Science, Harvard University
- July 2007, promoted: Professor, Department of Political Science, University of California–Davis
- July 2007–2011: Director, Center for Applied Statistics, Washington University
- July 2007–June 2017: Professor, Department of Political Science, Washington University
- July 2011–June 2017: Professor, Division of Biostatistics, Washington University
- July 2011–June 2017: Professor, Department of Surgery, Washington University
- January 2014–June 2014: Visiting Professor, Department of Biostatistics, University of Minnesota
- January 2018–June 2018: Visiting Professor, Department of Government, Harvard University

## Honors and Awards

- 2008, elected: Fellow of the Society for Political Methodology
- 2009: Gosnell Prize for the best work in political methodology presented at a conference in the preceding year
- 2009-2011: President, Society for Political Methodology and APSA Political Methodology Section
- 2010: Teaching Award, University of Bern: Beste Gesamtnote / Beste Didaktiknote (best overall grade and best grade for didactics).
- 2010: Teaching Award, University of Bern: Hochste Fachkompetenz (highest competence).

## C. Contributions to Science

My contributions to science are centered around theoretical and applied work in statistics. I have been on the forefront of statistical computing for the biomedical and social sciences, and I have created new statistical tools to solve practical problems. This includes (i) introducing Bayesian methods to a general social and behavioral science audience, (ii) the development of a family of Dirichlet process prior models for random effects, (iii) the development of new Markov chain Monte Carlo procedures for estimating complex Bayesian models, (iv) implementation of Bayesian kriging models for spatial effects at the zip code level and above, and (v) the application of ordered outcomes model to pediatric neurocritical care data (vi) the development of entropy-based variance components. There is considerable overlap in these areas, which will be apparent below. The following groups of representative publications are non-exhaustive lists to support each of these areas, and are selected from 8 books and over 60 peer reviewed articles and chapters.

### 1. *Bayesian modeling, development and distribution to new audiences.*

The rise of Bayesian modeling in biomedical and social science applications has been a slow but successful trek. These interrelated fields are ideal for this statistical paradigm since: prior information abounds, models can be complicated and hierarchical (multilevel), and expressing results in strictly probabilistic terms gives clearer indication of scientific progress. My book on Bayesian methods is the leading text for the social sciences and is now in its third edition. In addition, I have a range of Bayesian articles for various applications in which I was a key contributor to the theory and methods.

- Jeff Gill. *Bayesian Methods: A Social and Behavioral Sciences Approach*. Third Edition 2014, Second Edition 2007, First Edition 2000. **Chapman and Hall/CRC**.
- Minjung Kyung, Jeff Gill, Malay Ghosh, and George Casella. "Penalized Regression, Standard Errors, and Bayesian Lassos." **Bayesian Analysis**, 5, 369-412 (2010).
- Jeff Gill. "Critical Differences in Bayesian and Non-Bayesian Inference." In *Current Methodological Developments of Statistics in the Social Sciences*. Stanislav Kolenikov, Lori Thombs, and Douglas Steinley (eds.). 2010, 135-158. **John Wiley & Sons**.
- Jeff Gill and John Freeman. "Dynamic Elicited Priors for Updating Covert Networks." **Network Science**, Volume 1, Issue 01, 68-94 (April 2013).

### 2. *Generalized linear Dirichlet process random effects models.*

Dirichlet process priors were invented in the 1970s but researchers lacked the computational resources to implement them for realistic and informative models until this century. My work with coauthors has centered on using this approach to model random effect terms to produce better results in conventional regression settings when there are latent clusters in the data. For this body of literature I was co-PI (NSF) and a major contributing author along with George Casella and our postdoctoral research fellow.

- Jeff Gill and George Casella. "Nonparametric Priors For Ordinal Bayesian Social Science Models: Specification and Estimation." **Journal of the American Statistical Association**, 104, 453-464 (June 2009).
- Minjung Kyung, Jeff Gill and George Casella. "Estimation in Dirichlet Random Effects Models." **Annals of Statistics**, 38, 979-1009 (2010).
- Minjung Kyung, Jeff Gill and George Casella. "New Findings from Terrorism Data: Dirichlet Process Random Effects Models for Latent Groups." **Journal of the Royal Statistical Society, Series C**, 60:5, 701-721 (2011).

- Minjung Kyung, Jeff Gill and George Casella. "Sampling Schemes for Generalized Linear Dirichlet Process Random Effects Models." With Discussion and Rejoinder. **Statistical Methods and Applications**, 20:3, 259-290 (2012).

### 3. *Markov chain Monte Carlo (MCMC) algorithms and procedures.*

I have concentrated my theoretical work in statistics on the development of new MCMC tools to solve difficult estimation challenges, and to provide methodologies that improve how researchers implement stochastic simulation. The post 1990 development of MCMC revolutionized statistics and continues to be an important research area since it allows us to fit ever-increasingly complex model specifications. My contributions to authorship include development of theory, software implementation, and applications.

- Micah Altman, Jeff Gill and Michael P. McDonald. Numerical Issues in Statistical Computing for the Social Scientist (2003). **John Wiley & Sons**.
- Jeff Gill and George Casella. "Dynamic Tempered Transitions for Exploring Multimodal Posterior Distributions." **Political Analysis**, 12:4, 425-433 (Autumn 2004).
- Micah Altman, Jeff Gill, and Michael P. McDonald. "Accuracy: Tools for Accurate and Reliable Statistical Computing." **Journal of Statistical Software**, 21:1, (July 2007). (Abstract published in Journal of Computational Graphics and Statistics.)
- Jeff Gill. "Is Partial-Dimension Convergence a Problem for Inferences From MCMC Algorithms?" **Political Analysis**, 16:2, 153-178 (2008).

### 4. *Spatial modeling of human dispersion effects.*

Bayesian Spatial models are an ideal way to describe contagion effects such as diseases, attitudes, and behavioral effects. My work in this area has used Bayesian kriging along with a set of statistical computing innovations to produce a posterior "density blanket" over a modeled region that can be sliced-up with any geographical boundaries of interest. In this literature I developed theoretical positions, co-authored methodologies, and worked on software implementation.

- Jeff Gill. "Whose Variance is it Anyway? Interpreting Empirical Models with State-Level Data." **State Politics and Policy Quarterly**, 1:3, 313-338 (2001).
- R.B. Garabed, W.O. Johnson, J. Gill, A.M. Perez, and M.C. Thurmond. "Effects of Politics and Economics on Country-Level Foot-and-Mouth-Disease Status." **Journal of the Royal Statistical Society, Series A**, 171:3, 699-722 (2008).
- James A. Monogan and Jeff Gill. "Measuring State and District Ideology with Spatial Realignment." **Political Science Research and Methods**, 4:1, 97-121 (January 2016).

### 5. *Ordered results models for clinical outcomes.*

Researchers often default clinical outcomes to survival/non-survival definitions. We know that this often not the complete story and this why this level of granularization often produces poor model fit. I have developed and advocated for specifying ordinal outcomes when the data support a range of patient destinations, and argued that many model specifications in this area miss multilevel effects from different levels of data aggregation. This results in better model results and a greater understanding of demographic, etiological, and clinical effects on patient results. In this literature I work mainly on the data and statistical components, but I also understand and contribute to clinical discussions.

- Jose A. Pineda, MD, Jeffrey R. Leonard, MD, Ioanna G. Mazotas, MD, Michael Noetzel, MD, David D. Limbrick, MD, Martin S. Keller, MD, Jeff Gill, PhD, and Allan Doctor, MD. "Effect of Implementation of a Paediatric Neurocritical Care Programme On Outcomes After Severe Traumatic Brain Injury: A Cohort Study." **Lancet-Neurology**, 12:1, 45-52 (2013).
- Jeff Gill and Gary King. "What to do When Your Hessian is Not Invertible: Alternatives to Model Respecification in Nonlinear Estimation." **Sociological Methods and Research**, 33:1, 54-87 (April 2004).
- Jeff Gill and Andrew Womack. "The Multilevel Model Framework." In The SAGE Handbook of Multilevel Modeling. Marc A. Scott, Jeffrey S. Simonoff, and Brian D. Marx (eds.). 2013, 3-20, **Sage**.

Complete List of Published Work is available at my [website](#).

## D. Additional Information: Research Support and/or Scholastic Performance

### Ongoing Research Support

1. **National Science Foundation, Methodology, Measurement, and Statistics (MMS).** “Smooth National Measurement of Public Opinion across Boundaries and Levels: A View from the Bayesian Spatial Approach.” Co-Principal Investigator (with James E. Monogan III, University of Georgia). Total grant award amount: \$212,841. Award period: August 2016 to August 2018.
2. **Eunice Kennedy Shriver National Institute of Child Health & Human Development (NIH).** “Development and Evaluation of a Bedside Guideline Engine for Severe Traumatic Brain Injury.” Grant Number: 1R21HD086784-01A1. Award amount: \$217,656. Award period: 9/1/17 to 8/31/18. Co-Investigator, Biostatistics Core Director.
3. **Department of Defense Joint Program Committee 6 (JPC-6), Combat Casualty Care (CCC) Research Program and the Congressionally Directed Medical Research Programs (CDMRP).** “Novel Artificial Erythrocyte for In-Field Resuscitation of Hemorrhagic Shock” (PI Allan Doctor). Co-Investigator for Biostatistics and Analysis. Award amount: \$3,000,000. Award period: September 2017 to September 2020. Co-Investigator, Biostatistics Core Director.
4. **National Institutes of Health, National Heart, Lung and Blood Institute.** “ErythroMer: Nanoscale BioSynthetic Red Cell Substitute” (1R42HL135965-01A1, PI Allan Doctor). Co-Investigator for Biostatistics and Analysis. Award amount: \$1,765,325 to KaloCyte, Inc. (NIH Prime), \$78,225 (WU Annual Directs). Award period: January 2017 to January 2020. Co-Investigator, Biostatistics Core Director. award amount: \$9,248,284. Award Period: July 2011 to December 2016.

### Completed Research Support

1. **National Science Foundation, Political Science & Methodology, Measurement, and Statistics (MMS).** “Workshop On Methodological Challenges Across the Social, Behavioral, and Economic Sciences; NSF; Arlington, VA–February, 2015.” Principal Investigator. Total grant award amount: \$72,214. Award Period: January 2015 to January 2016.
2. **National Institutes of Health, National Cancer Institute,** to establish at Washington University a Transdisciplinary Research in Energetics and Cancer (TREC) Center for “A Multilevel Approach to Energy Balance and Cancer Across the Lifecourse,” Co-Investigator/Core Leader for the Bioinformatics Core (Core D). Total grant \$9,248,284. Award Period: July 2011 to July 2016. Biostatistics Core Director.
3. **National Science Foundation, Methodology, Measurement, and Statistics (MMS).** “Collaborative Research: Identifying Structure in Social Data Models using Markov Chain Monte Carlo Algorithms.” DMS1026165 and SES-1028329. Co-PI with George Casella (University of Florida, Statistics). Award amount: \$189,276. Award period: October 2010 to October 2014.
4. **National Science Foundation, Political Science & Methodology, Measurement, and Statistics (MMS).** “Support for Conferences and Mentoring Activities in Political Methodology (supports the Society for Political Methodology conference activities).” SES-1120976. Co-PI with Robert Franzese (University of Michigan, Political Science). Award amount: \$188,034. Award period: September 2011 to August 2013.
5. **National Science Foundation, Mathematical Social and Behavioral Sciences (MSBS).** “Adaptive Nonparametric Markov Chain Monte Carlo Algorithms for Social Data Models with Nonparametric Priors,” DMS0631632 and SES-0631588. Co-PI with George Casella (University of Florida, Statistics). Award amount: \$350,000. Award period: January 2007 to January 2009.

### Scholastic Performance: Service to the Discipline

A great deal of my service has been promoting Bayesian ideas and inference through various organizations. I am a member of the Founding Committee of the Bayesian Education Research and Practice Section of the International Society for Bayesian Analysis. This also includes regular participation ISBA, ISM-APRM, and other Bayesian forums worldwide. I am an active member in the Bayesian Statistical Science section as well. However, my main focus has been to advocate for Bayesian approaches for the social sciences where the types of data regularly encountered are ideal for Bayesian inference (one observed dataset, modest sample sizes, rich sources of prior information, and difficult modeling challenges). In this regard, my Bayesian text can be considered to be a service effort, combined with many national and international talks on related subjects.

I have been President, Vice President, and Member at Large, as well as serving on numerous committees for the Society for Political Methodology. This is the premier institution for applied statisticians dealing with political science data and problems. In addition, I was elected a Fellow of the Society for Political Methodology in the Inaugural Class of 2008. Our journal is *Political Analysis*, which is a statistics journal and remarkably one of the top impact factor journals in political science. I was associate editor 2003-007. I am currently editor in chief until 2021.

In terms of promoting general social science statistics research, I was a member of the Technical Advisory Group for the NSF PRIME grant, (David Rindskopf and William Shadish PIs, DGE-1438925. 2014-2015). I am an editor for the Chapman & Hall/CRC *Statistics in the Social and Behavioral Sciences* (July 2012–Present). I organized the St. Louis Area Methods Meeting (SLAMM) (April 18, 2008; April 24, 2009; April 16-17, 2010, April 15, 2011; April 27, 2012; April 24, 2015; April 29, 2016).

I believe strongly in distributing data and code for others to use for replication and extension purposes. This includes: the CRAN Package, `hot.deck` that performs multiple hot-deck imputation of categorical and continuous variables in a data frame (with Skyler Cranmer, Natalie Jackson, Andreas Murr, Dave Armstrong), the CRAN Package `superdiag` that provides all of the common MCMC convergence diagnostics with one R command (with Tsung Han Tsai), the CRAN Package `g1mdm` which is S-Plus/R code for Dirichlet process priors with ordinal outcomes (with George Casella), the CRAN Package, `bam`, for Bayesian modeling, S-Plus/R code for Markov chain tempered transitions (with George Casella), the CRAN Package `accuracy` with tools for testing and improving accuracy of statistical results (with Micah Altman and Michael P. McDonald), S-Plus/R code for: Importance Sampling, GSRLS/SWLS procedures, and generating multivariate normals, C Language Source code for Building Survey Subsets, Gauss code for the Gill-Murray generalized Cholesky Decomposition, and the Schnabel-Eskow generalized Cholesky Decomposition.

### **Scholastic Performance: Teaching and Training**

My teaching consists of statistics courses for social science PhD students and medical school residents and fellows. These rotating offerings include Bayesian hierarchical models, generalized linear models, survival analysis, statistical computing, and nonparametrics. I was an instructor in the *Essex Summer School in Social Science Data Analysis and Collection* (2008-2016), and I was an instructor in the *University of Michigan ICPSR Summer Program in Quantitative Methods of Social Research* (2001-2007). These are the most important statistics training programs worldwide for social science PhD students.

I have trained and placed 21 applied and theoretical statistics graduate students at the University of Florida, the University of California–Davis, and at Washington University in St. Louis as either committee chair or committee member. I have also been on dissertation committees at the University of Bern, Carnegie Mellon University and Mannheim University. All have been placed in tenure track positions. Focusing on those PhD committees that I have chaired, Lee Walker (Florida) is now a program officer at the NSF, Skyler Cranmer (UCD) is currently tenured with an endowed chair at Ohio State, Xun Pang (Washington University) went to Princeton University in a tenure track position and is now a full Professor at Tsinghua University with her own applied statistics center, Dominik Hangartner is a senior professor at ETH Zurich, and Andrew Womack is an assistant professor in the Department of Statistics at Indiana University. Other students and their current positions are listed on my Vitae.