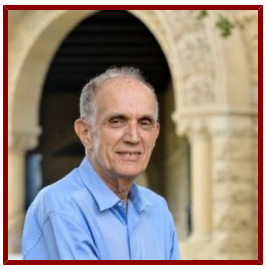
Stanford



Bradley Efron

Max H. Stein Professor and Professor of Statistics and of Biomedical Data Science, Emeritus

Curriculum Vitae available Online

CONTACT INFORMATION

- **Alternate Contact**

  Cindy Kirby - Administrative Associate

  Email ckirby@stanford.edu

  Tel (650) 725-2229

Bio

BIO

Brad is Max H. Stein Professor of Humanities and Sciences, Professor of Statistics, and Professor of Biostatistics with the Department of Biomedical Data Science in the School of Medicine; he serves as Co-director of the Mathematical and Computational Sciences Program. He has held visiting faculty appointments at Harvard, UC Berkeley, and Imperial College, London. A recipient of a 2005 National Medal of Science for his contributions to theoretical and applied statistics, especially the bootstrap sampling technique, in 2014 he was awarded the Guy Medal in Gold by the Royal Statistical Society. Together with David Cox of the University of Oxford, Efron was honored as a Laureate in the 2016 edition of the BBVA Foundation Frontiers of Knowledge Awards, “for revolutionizing statistics and making it into an indispensable tool for other sciences.”

ACADEMIC APPOINTMENTS

- Emeritus Faculty, Acad Council, Statistics
- Member, Stanford Cancer Institute

ADMINISTRATIVE APPOINTMENTS

- Professor of Biomedical Data Science, Stanford School of Medicine Department of Biomedical Data Science, (2015- present)
- Chairman, Stanford University Faculty Senate, (1998-1999)
- Chairman, Stanford University Department of Statistics, (1998-1999)
- Chairman, Stanford University Advisory Board, (1996-1997)
- Chairman, Stanford University Department of Statistics, (1993-1994)
- Chairman, Stanford University Department of Statistics, (1991-1994)
- Max H. Stein Professor of Humanities and Sciences, Stanford University, (1988- present)
- Associate Dean, Stanford University School of Humanities and Sciences, (1987-1990)
- Co-director, Stanford University Mathematical and Computational Science Program, (1980- present)
- Professor, Stanford University Department of Statistics, (1972- present)
- Professor of Biostatistics, Stanford School of Medicine Department of Health Research and Policy, (1972-2015)

- Visiting Scholar, Imperial College London Department of Mathematics, (1971-1972)
- Associate Professor, Stanford University Department of Statistics, (1968-1972)
- Visiting Lecturer, Harvard University Department of Statistics, (1967-1968)
- Assistant Professer, Stanford University Department of Statistics, (1964-1967)

LINKS

- Statistics Department Faculty Page: https://statistics.stanford.edu/people/bradley-efron

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

My main project during the last two years has been "Computer Age Statistical Inference", a book written in collaboration with Trevor Hastie. Our goal is to review the development of statistical thinking since the introduction of electronic computation in the 1950s. Individual chapters concern progress in important topic areas, emphasizing the interplay between computational methods and inferential ideas. The survival analysis chapter, for example, traces the steps from life tables, the Kaplan-Meier estimator, and the Mantel Haenszel log rank test to the proportional hazards model.

The book proceeds in three parts: Part 1 reviews classical inference, Bayesian, frequentist, and Fisherian. Part 2 covers developments from 1955 through 1995, empirical Bayes, James-Stein estimation, ridge regression, generalized linear models, jackknife and bootstrap methods, objective Bayes and MCMC, plus several other topics. Part 3 concerns 21st century topics, false discovery rates, sparse modeling and the lasso, support vector machines, neural networks, random forests, and other modern data analytic algorithms. First drafts of Parts 1 and 2 are now complete. Part 3 is in progress, and we hope to complete work in 2016.

The broader impact of my other work over the previous few years has been to establish both within and outside the field the practical importance of computer-intensive statistical methods, such as the bootstrap, shrinkage estimation, and local false discovery rates. Besides gaining traction themselves, these methods have stimulated parallel developments in other areas, such as MCMC algorithms for Bayesian calculations.

Publications

PUBLICATIONS

- **A Diagnostic Function for the Accuracy of Confidence Intervals** *STATISTICAL SCIENCE*
  Efron, B.
  2026; 41 (4): 793-810
- **Epithelial-mesenchymal Wnt crosstalk directs planar cell polarity in the developing cochlea.** *Nature communications*
  Kishimoto, I., David, A. P., Rose, K. P., Narasimhan, B., Efron, B., Billings, S. E., Su, E. L., Dong, W., Jan, T. A., Hertzano, R., Cheng, A. G.
  2026; 17 (1)
- **Epithelial-Mesenchymal Wnt Crosstalk Directs Planar Cell Polarity in the Developing Cochlea.** *bioRxiv : the preprint server for biology*
  Kishimoto, I., David, A. P., Rose, K. P., Narasimhan, B., Efron, B., Billings, S. E., Su, E. L., Dong, W., Jan, T. A., Hertzano, R., Cheng, A. G.
  2026
- **Preoperative Versus Perioperative Risk Factors for Delayed Pain and Opioid Cessation After Total Joint Arthroplasty: A Prospective Cohort Study.** *Pain and therapy*
  Hah, J. M., Vialard, J. D., Efron, B., Mackey, S. C., Carroll, I. R., Amanatullah, D. F., Narasimhan, B., Hernandez-Boussard, T.
  2023
- **Machine learning and the James-Stein estimator** *JAPANESE JOURNAL OF STATISTICS AND DATA SCIENCE*
  Efron, B.
  2023

- **Discussion of "Confidence Intervals for Nonparametric Empirical Bayes Analysis" by Nikolaos Ignatiadis and Stefan Wager** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  2022; 117 (539): 1179-1180
- **Effect of Perioperative Gabapentin on Postoperative Pain Resolution and Opioid Cessation in a Mixed Surgical Cohort: A Randomized Clinical Trial (vol 153, pg 303, 2018)** *JAMA SURGERY*
  Hah, J., Mackey, S. C., Schmidt, P.
  2022
- **The changing impact of cytomegalovirus among hematopoietic cell transplant recipients during the past decade: A single institutional cohort study.** *Transplant infectious disease : an official journal of the Transplantation Society*
  Johnsrud, J. J., Nguyen, I. T., Domingo, W., Raval, A. D., Tang, Y., Narasimhan, B., Efron, B., Brown, J. W.
  2022
- **Resampling Plans and the Estimation of Prediction Error** *STATS*
  Efron, B.
  2021; 4 (4): 1091-1115
- **THE ASA PRESIDENT'S TASK FORCE STATEMENT ON STATISTICAL SIGNIFICANCE AND REPLICABILITY** *ANNALS OF APPLIED STATISTICS*
  Benjamini, Y., De Veaux, R. D., Efron, B., Evans, S., Glickman, M., Graubard, B., He, X., Meng, X., Reid, N., Stigler, S. M., Vardeman, S. B., Wikle, C. K., Wright, et al
  2021; 15 (3): 1084-1085
- **Prediction, Estimation, and Attribution** *INTERNATIONAL STATISTICAL REVIEW*
  Efron, B.
  2020; 88: S28–S59
- **The Effect of Ethanol Consumption on Composition and Morphology of Femur Cortical Bone in Wild-Type and ALDH2*2-Homozygous Mice.** *Calcified tissue international*
  Malkovskiy, A. V., Van Wassenhove, L. D., Goltsev, Y., Osei-Sarfo, K., Chen, C., Efron, B., Gudas, L. J., Mochly-Rosen, D., Rajadas, J.
  2020
- **deconvolveR: A G-Modeling Program for Deconvolution and Empirical Bayes Estimation** *JOURNAL OF STATISTICAL SOFTWARE*
  Narasimhan, B., Efron, B.
  2020; 94 (11): 1–20
- **Derivation and validation of a prognostic score for neonatal mortality in Ethiopia: a case-control study.** *BMC pediatrics*
  Mediratta, R. P., Amare, A. T., Behl, R., Efron, B., Narasimhan, B., Teklu, A., Shehibo, A., Ayalew, M., Kache, S.
  2020; 20 (1): 238
- **Prediction, Estimation, and Attribution** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  2020; 115 (530): 636–55
- **The automatic construction of bootstrap confidence intervals.** *Journal of computational and graphical statistics : a joint publication of American Statistical Association, Institute of Mathematical Statistics, Interface Foundation of North America*
  Efron, B., Narasimhan, B.
  2020; 29 (3): 608-619
- **The Automatic Construction of Bootstrap Confidence Intervals** *JOURNAL OF COMPUTATIONAL AND GRAPHICAL STATISTICS*
  Efron, B., Narasimhan, B.
  2020
- **Letermovir Prophylaxis Decreases Burden of CMV in Patients at High Risk for CMV Disease Following Hematopoietic Cell Transplant.** *Biology of blood and marrow transplantation : journal of the American Society for Blood and Marrow Transplantation*
  Johnsrud, J. J., Nguyen, I. T., Domingo, W. n., Narasimhan, B. n., Efron, B. n., Brown, J. W.
  2020
- **Rejoinder: Bayes, Oracle Bayes, and Empirical Bayes** *STATISTICAL SCIENCE*

Efron, B.
2019; 34 (2): 234–35

- **Bayes, Oracle Bayes and Empirical Bayes** *STATISTICAL SCIENCE*
  Efron, B.
  2019; 34 (2): 177–201

- **Proteomic analysis of monolayer-integrated proteins on lipid droplets identifies amphipathic interfacial alpha-helical membrane anchors.** *Proceedings of the National Academy of Sciences of the United States of America*
  Pataki, C. I., Rodrigues, J., Zhang, L., Qian, J., Efron, B., Hastie, T., Elias, J. E., Levitt, M., Kopito, R. R.
  2018

- **CURVATURE AND INFERENCE FOR MAXIMUM LIKELIHOOD ESTIMATES** *ANNALS OF STATISTICS*
  Efron, B.
  2018; 46 (4): 1664–92

- **SPECIAL SECTION IN MEMORY OF STEPHEN E. FIENBERG (1942-2016) AOAS EDITOR-IN-CHIEF 2013-2015** *ANNALS OF APPLIED STATISTICS*
  Gneiting, T., Asher, J., Carriquiry, A., Davis, R., Dawid, A., Efron, B., Haberman, S., Kou, S., Newton, M., Paddock, S., Prewitt, K., Raftery, A., Stein, et al
  2018; 12 (2): III-X

- **Anti-HER2 scFv-directed extracellular vesicle-mediated mRNA-based gene delivery inhibits growth of HER2-positive human breast tumor xenografts by prodrug activation.** *Molecular cancer therapeutics*
  Wang, J., Forterre, A. V., Zhao, J., Frimannsson, D. O., Delcayre, A., Antes, T. J., Efron, B., Jeffrey, S. S., Pegram, M. D., Matin, A. C.
  2018

- **Statistical thinking for 21st century scientists.** *Science advances*
  Cox, D. R., Efron, B.
  2017; 3 (6): e1700768

- **Improvement in treatment abandonment in pediatric patients with cancer in Guatemala.** *Pediatric blood & cancer*
  Alvarez, E., Seppa, M., Rivas, S., Fuentes, L., Valverde, P., Antillón-Klussmann, F., Castellanos, M., Sweet-Cordero, E. A., Messacar, K., Kurap, J., Bustamante, M., Howard, S. C., Efron, et al
  2017

- **Small-Volume Injections: Evaluation of Volume Administration Deviation From Intended Injection Volumes.** *Anesthesia and analgesia*
  Muffly, M. K., Chen, M. I., Claure, R. E., Drover, D. R., Efron, B., Fitch, W. L., Hammer, G. B.
  2017

- **Effect of Perioperative Gabapentin on Postoperative Pain Resolution and Opioid Cessation in a Mixed Surgical Cohort: A Randomized Clinical Trial.** *JAMA surgery*
  Hah, J. n., Mackey, S. C., Schmidt, P. n., McCue, R. n., Humphreys, K. n., Trafton, J. n., Efron, B. n., Clay, D. n., Sharifzadeh, Y. n., Ruchelli, G. n., Goodman, S. n., Huddleston, J. n., Maloney, et al
  2017

- **Empirical Bayes deconvolution estimates** *BIOMETRIKA*
  Efron, B.
  2016; 103 (1): 1-20

- **Exploring Value in Congenital Heart Disease: An Evaluation of Inpatient Admissions** *CONGENITAL HEART DISEASE*
  Shin, A. Y., Hu, Z., Jin, B., Lal, S., Rosenthal, D. N., Efron, B., Sharek, P. J., Sutherland, S. M., Cohen, H. J., McElhinney, D. B., Roth, S. J., Ling, X. B.
  2015; 10 (6): E278-E287

- **Allogeneic hematopoietic cell transplantation after failed autologous transplant for lymphoma using TLI and anti-thymocyte globulin conditioning** *BONE MARROW TRANSPLANTATION*
  Rezvani, A. R., Kanate, A. S., Efron, B., Chhabra, S., Kohrt, H. E., Shizuru, J. A., Laport, G. G., Miklos, D. B., Benjamin, J. E., JOHNSTON, L. J., Arai, S., Weng, W., Negrin, et al
  2015; 50 (10): 1286-1292

- **Number of Lymph Nodes Removed and Survival after Gastric Cancer Resection: An Analysis from the US Gastric Cancer Collaborative.** *Journal of the American College of Surgeons*
  Gholami, S., Janson, L., Worhunsky, D. J., Tran, T. B., Squires, M. H., Jin, L. X., Spolverato, G., Votanopoulos, K. I., Schmidt, C., Weber, S. M., Bloomston, M., Cho, C. S., Levine, et al
  2015; 221 (2): 291-9
- **Frequentist accuracy of Bayesian estimates** *JOURNAL OF THE ROYAL STATISTICAL SOCIETY SERIES B-STATISTICAL METHODOLOGY*
  Efron, B.
  2015; 77 (3): 617-646
- **Frequentist accuracy of Bayesian estimates.** *Journal of the Royal Statistical Society. Series B, Statistical methodology*
  Efron, B.
  2015; 77 (3): 617-646
- **Outcomes Following Cardiac Catheterization After Congenital Heart Surgery** *CATHETERIZATION AND CARDIOVASCULAR INTERVENTIONS*
  Siehr, S. L., Martin, M. H., Axelrod, D., Efron, B., Peng, L., Roth, S. J., Perry, S., Shin, A. Y.
  2014; 84 (4): 622-628
- **Outcomes following cardiac catheterization after congenital heart surgery.** *Catheterization and cardiovascular interventions*
  Siehr, S. L., Martin, M. H., Axelrod, D., Efron, B., Peng, L., Roth, S. J., Perry, S., Shin, A. Y.
  2014; 84 (4): 622-628
- **Estimation and Accuracy After Model Selection** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  2014; 109 (507): 991-1007
- **Estimation and Accuracy after Model Selection.** *Journal of the American Statistical Association*
  Efron, B.
  2014; 109 (507): 991-1007
- **Two Modeling Strategies for Empirical Bayes Estimation** *STATISTICAL SCIENCE*
  Efron, B.
  2014; 29 (2): 285-301
- **Two modeling strategies for empirical Bayes estimation.** *Statistical science : a review journal of the Institute of Mathematical Statistics*
  Efron, B.
  2014; 29 (2): 285-301
- **Confidence Intervals for Random Forests: The Jackknife and the Infinitesimal Jackknife** *JOURNAL OF MACHINE LEARNING RESEARCH*
  Wager, S., Hastie, T., Efron, B.
  2014; 15: 1625-1651
- **Confidence Intervals for Random Forests: The Jackknife and the Infinitesimal Jackknife.** *Journal of machine learning research : JMLR*
  Wager, S., Hastie, T., Efron, B.
  2014; 15 (1): 1625-1651
- **The Impact of Circadian Misalignment on Athletic Performance in Professional Football Players** *SLEEP*
  Smith, R. S., Efron, B., Mah, C. D., Malhotra, A.
  2013; 36 (12): 1999-2001
- **Mathematics. Bayes' theorem in the 21st century.** *Science*
  Efron, B.
  2013; 340 (6137): 1177-1178
- **Outcomes After Non-Myeloablative Allogeneic Hematopoietic Cell Transplantation with Total Lymphoid Irradiation and Anti-Thymocyte Globulin in Lymphoid Malignancies After Failed Autologous Transplantation** *BMT Tandem Meetings*
  Kanate, A. S., Efron, B., Chhabra, S., Kohrt, H., Shizuru, J. A., Laport, G. G., Miklos, D. B., Benjamin, J., Johnston, L., Arai, S., Weng, W., Negrin, R., Strober, et al
  ELSEVIER SCIENCE INC.2013: S154–S155

- **A 250-YEAR ARGUMENT: BELIEF, BEHAVIOR, AND THE BOOTSTRAP** *BULLETIN OF THE AMERICAN MATHEMATICAL SOCIETY*
  Efron, B.
  2013; 50 (1): 129-146
- **BAYESIAN INFERENCE AND THE PARAMETRIC BOOTSTRAP** *ANNALS OF APPLIED STATISTICS*
  Efron, B.
  2012; 6 (4): 1971-1997
- **Bayesian inference and the parametric bootstrap.** *The annals of applied statistics*
  Efron, B.
  2012; 6 (4): 1971-1997
- **Tweedie's Formula and Selection Bias** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  2011; 106 (496): 1602-1614
- **False discovery rates and copy number variation** *BIOMETRIKA*
  Efron, B., Zhang, N. R.
  2011; 98 (2): 251-271
- **Tweedie's Formula and Selection Bias.** *Journal of the American Statistical Association*
  Efron, B.
  2011; 106 (496): 1602-1614
- **THE BOOTSTRAP AND MARKOV-CHAIN MONTE CARLO** *JOURNAL OF BIOPHARMACEUTICAL STATISTICS*
  Efron, B.
  2011; 21 (6): 1052-1062
- **Correlated z-Values and the Accuracy of Large-Scale Statistical Estimates** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  2010; 105 (491): 1042-1055
- **Correlated z-values and the accuracy of large-scale statistical estimates.** *Journal of the American Statistical Association*
  Efron, B.
  2010; 105 (491): 1042-1055
- **The Future of Indirect Evidence.** *Statistical science : a review journal of the Institute of Mathematical Statistics*
  Efron, B.
  2010; 25 (2): 145-157
- **The Future of Indirect Evidence** *STATISTICAL SCIENCE*
  Efron, B., Greenland, S., Gelman, A., Kass, R. E.
  2010; 25 (2): 145-171
- **Imprecision of Creatinine-Based GFR Estimates in Uninephric Kidney Donors** *CLINICAL JOURNAL OF THE AMERICAN SOCIETY OF NEPHROLOGY*
  Tan, J. C., Ho, B., Busque, S., Blouch, K., Derby, G., Efron, B., Myers, B. D.
  2010; 5 (3): 497-502
- **ARE A SET OF MICROARRAYS INDEPENDENT OF EACH OTHER?** *ANNALS OF APPLIED STATISTICS*
  Efron, B.
  2009; 3 (3): 922-942
- **Empirical Bayes Estimates for Large-Scale Prediction Problems.** *Journal of the American Statistical Association*
  Efron, B.
  2009; 104 (487): 1015-1028
- **Empirical Bayes Estimates for Large-Scale Prediction Problems** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  2009; 104 (487): 1015-1028

- **SIMULTANEOUS INFERENCE: WHEN SHOULD HYPOTHESIS TESTING PROBLEMS BE COMBINED?** *ANNALS OF APPLIED STATISTICS*
  Efron, B.
  2008; 2 (1): 197-223
- **Comment: Microarrays, empirical Bayes and the two-groups model** *STATISTICAL SCIENCE*
  Benjamini, Y., Cai, T. T., Morris, C. N., Rice, K., Spiegelhalter, D., Efron, B.
  2008; 23 (1): 23-47
- **Microarrays, empirical Bayes and the two-groups model** *STATISTICAL SCIENCE*
  Efron, B.
  2008; 23 (1): 1-22
- **Prediction of early progression in recently diagnosed IgA nephropathy** *NEPHROLOGY DIALYSIS TRANSPLANTATION*
  Lemley, K. V., Lafayette, R. A., Derby, G., Blouch, K. L., Anderson, L., Efron, B., Myers, B. D.
  2008; 23 (1): 213-222
- **Size, power and false discovery rates** *ANNALS OF STATISTICS*
  Efron, B.
  2007; 35 (4): 1351-1377
- **ON TESTING THE SIGNIFICANCE OF SETS OF GENES** *ANNALS OF APPLIED STATISTICS*
  Efron, B., Tibshirani, R.
  2007; 1 (1): 107-129
- **Correlation and large-scale simultaneous significance testing** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  2007; 102 (477): 93-103
- **Minimum volume confidence regions for a multivariate normal mean vector** *JOURNAL OF THE ROYAL STATISTICAL SOCIETY SERIES B-STATISTICAL METHODOLOGY*
  Efron, B.
  2006; 68: 655-670
- **Signature patterns of gene expression in mouse atherosclerosis and their correlation to human coronary disease** *PHYSIOLOGICAL GENOMICS*
  Tabibiazar, R., Wagner, R. A., Ashley, E. A., King, J. Y., Ferrara, R., Spin, J. M., Sanan, D. A., Narasimhan, B., Tibshirani, R., Tsao, P. S., Efron, B., Quertermous, T.
  2005; 22 (2): 213-226
- **Impact of HIV-1 subtype and antiretroviral therapy on protease and reverse transcriptase genotype: Results of a global collaboration** *PLOS MEDICINE*
  Kantor, R., Katzenstein, D. A., Efron, B., CARVALHO, A. P., Wynhoven, B., Cane, P., Clarke, J., Sirivichayakul, S., Soares, M. A., Snoeck, J., Pillay, C., Rudich, H., Rodrigues, et al
  2005; 2 (4): 325-337
- **Mouse strain-specific differences in vascular wall gene expression and their relationship to vascular disease** *ARTERIOSCLEROSIS THROMBOSIS AND VASCULAR BIOLOGY*
  Tabibiazar, R., Wagner, R. A., Spin, J. M., Ashley, E. A., Narasimhan, B., Rubin, E. M., Efron, B., Tsao, P. S., Tibshirani, R., Quertermous, T.
  2005; 25 (2): 302-308
- **The 'miss rate' for the analysis of gene expression data** *BIOSTATISTICS*
  Taylor, J., Tibshirani, R., Efron, B.
  2005; 6 (1): 111-117
- **The estimation of prediction error: Covariance penalties and cross-validation** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  2004; 99 (467): 619-632
- **Least angle regression** *ANNALS OF STATISTICS*
  Efron, B., Hastie, T., Johnstone, I., Tibshirani, R.

2004; 32 (2): 407-451

- **Large-scale simultaneous hypothesis testing: The choice of a null hypothesis** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  2004; 99 (465): 96-104
- **Transcriptional adaptation of Mycobacterium tuberculosis within macrophages: Insights into the phagosomal environment** *JOURNAL OF EXPERIMENTAL MEDICINE*
  Schnappinger, D., Ehrt, S., Voskuil, M. I., Liu, Y., Mangan, J. A., Monahan, I. M., Dolganov, G., Efron, B., Butcher, P. D., Nathan, C., Schoolnik, G. K.
  2003; 198 (5): 693-704
- **Second thoughts on the bootstrap** *STATISTICAL SCIENCE*
  Efron, B.
  2003; 18 (2): 135-140
- **Recent trends in National Institutes of Health funding of surgical research** *122nd Annual Meeting of the American-Surgical-Association*
  Rangel, S. J., Efron, B., Moss, R. L.
  LIPPINCOTT WILLIAMS & WILKINS.2002: 277–87
- **Smoothers and the C-p, generalized maximum likelihood, and extended exponential criteria: A geometric approach** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Kou, S. C., Efron, B.
  2002; 97 (459): 766-782
- **Empirical Bayes methods and false discovery rates for microarrays** *GENETIC EPIDEMIOLOGY*
  Efron, B., Tibshirani, R.
  2002; 23 (1): 70-86
- **Pre-validation and inference in microarrays.** *Statistical applications in genetics and molecular biology*
  Tibshirani, R. J., Efron, B.
  2002; 1: Article1-?
- **The two-way proportional hazards model** *JOURNAL OF THE ROYAL STATISTICAL SOCIETY SERIES B-STATISTICAL METHODOLOGY*
  Efron, B.
  2002; 64: 899-909
- **Empirical Bayes analysis of a microarray experiment** *160th Annual Meeting of the American-Statistical-Association*
  Efron, B., Tibshirani, R., Storey, J. D., Tusher, V.
  AMER STATISTICAL ASSOC.2001: 1151–60
- **Infectious complications among 620 consecutive heart transplant patients at Stanford University Medical Center** *10th International Symposium on Infections in the Immunocompromised*
  Montoya, J. G., Giraldo, L. F., Efron, B., Stinson, E. B., Gamberg, P., Hung, S., Giannetti, N., Miller, J., Remington, J. S.
  OXFORD UNIV PRESS INC.2001: 629–40
- **Infectious complications among 620 consecutive heart transplant patients at Stanford University Medical Center** *10th International Symposium on Infection in the Immunocompromised Host*
  Montoya, J. G., Giraldo, L. F., Efron, B., Stinson, E. B., Gamberg, P., Hunt, S., Giannetti, N., Miller, J., Remington, J. S.
  CELL PRESS.2001: 629–U6
- **A meta-analysis of peritoneal drainage versus laparotomy for perforated necrotizing enterocolitis** *31st Annual Meeting of the Section-on-Surgery of the American-Academy-of-Pediatrics*
  Moss, R. L., Dimmitt, R. A., Henry, M. C., Geraghty, N., Efron, B.
  W B SAUNDERS CO-ELSEVIER INC.2001: 1210–13
- **Statistical modeling: The two cultures - Comments and rejoinders** *STATISTICAL SCIENCE*
  Cox, D. R., Efron, B., Hoadley, B., Parzen, E., Breiman, L.
  2001; 16 (3): 216-231
- **Selection criteria for scatterplot smoothers** *ANNALS OF STATISTICS*
  Efron, B.

2001; 29 (2): 470-504

- **The bootstrap and modern statistics** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  2000; 95 (452): 1293-1296
- **HIV-1 genotypic resistance patterns predict response to saquinavir-ritonavir therapy in patients in whom previous protease inhibitor therapy had failed** *ANNALS OF INTERNAL MEDICINE*
  Zolopa, A. R., Shafer, R. W., Warford, A., Montoya, J. G., Hsu, P., KATZENSTEIN, D., Merigan, T. C., Efron, B.
  1999; 131 (11): 813-?
- **Nonparametric methods for doubly truncated data** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B., Petrosian, V.
  1999; 94 (447): 824-834
- **Clinical resistance patterns and responses to two sequential protease inhibitor regimens in saquinavir and reverse transcriptase inhibitor-experienced persons** *5th Conference on Retroviruses and Opportunistic Infections*
  Lawrence, J., Schapiro, J., Winters, M., Montoya, J., Zolopa, A., Pesano, R., Efron, B., Winslow, D., Merigan, T. C.
  UNIV CHICAGO PRESS.1999: 1356–64
- **Resistance mutations to zidovudine and saquinavir in patients receiving zidovudine plus saquinavir or zidovudine and zalcitabine plus saquinavir in AIDS Clinical Trials Group 229** *JOURNAL OF INFECTIOUS DISEASES*
  Schapiro, J. M., Lawrence, J., Speck, R., Winters, M. A., Efron, B., COOMBS, R. W., Collier, A. C., Merigan, T. C.
  1999; 179 (1): 249-253
- **The problem of regions** *ANNALS OF STATISTICS*
  Efron, B., Tibshirani, R.
  1998; 26 (5): 1687-1718
- **R.A. Fisher in the 21st century - Invited paper presented at the 1996 R.A. Fisher lecture** *STATISTICAL SCIENCE*
  Efron, B.
  1998; 13 (2): 95-114
- **Risk for retinitis in patients with AIDS can be assessed by quantitation of threshold levels of cytomegalovirus DNA burden in blood** *JOURNAL OF INFECTIOUS DISEASES*
  Rasmussen, L., Zipeto, D., Wolitz, R. A., Dowling, A., Efron, B., Merigan, T. C.
  1997; 176 (5): 1146-1155
- **A predictive morphometric model for the obstructive sleep apnea syndrome** *ANNALS OF INTERNAL MEDICINE*
  Kushida, C. A., Efron, B., Guilleminault, C.
  1997; 127 (8): 581-?
- **Effect of therapeutic immunization with recombinant gp160 HIV-1 vaccine on HIV-1 proviral DNA and plasma RNA: Relationship to cellular immune responses** *JOURNAL OF ACQUIRED IMMUNE DEFICIENCY SYNDROMES*
  Kundu, S. K., KATZENSTEIN, D., Valentine, F. T., Spino, C., Efron, B., Merigan, T. C.
  1997; 15 (4): 269-274
- **Improvements on cross-validation: The .632+ bootstrap method** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B., Tibshirani, R.
  1997; 92 (438): 548-560
- **The length heuristic for simultaneous hypothesis tests** *BIOMETRIKA*
  Efron, B.
  1997; 84 (1): 143-157
- **Circadian rhythms and enhanced athletic performance in the National Football League** *SLEEP*
  Smith, R. S., Guilleminault, C., Efron, B.
  1997; 20 (5): 362-365
- **Using specially designed exponential families for density estimation** *ANNALS OF STATISTICS*
  Efron, B., Tibshirani, R.

1996; 24 (6): 2431-2461

- **Bootstrap confidence intervals** *STATISTICAL SCIENCE*
  DiCiccio, T. J., Efron, B.
  1996; 11 (3): 189-212
- **Bootstrap confidence levels for phylogenetic trees** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Efron, B., Halloran, E., Holmes, S.
  1996; 93 (14): 7085-7090
- **The effect of high-dose saquinavir on viral load and CD4(+) T-cell counts in HIV-infected patients** *ANNALS OF INTERNAL MEDICINE*
  Schapiro, J. M., Winters, M. A., Stewart, F., Efron, B., Norris, J., Kozal, M. J., Merigan, T. C.
  1996; 124 (12): 1039-1050
- **Empirical Bayes methods for combining likelihoods** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  1996; 91 (434): 538-550
- **TESTING ISOTROPY VERSUS CLUSTERING OF GAMMA-RAY BURSTS** *ASTROPHYSICAL JOURNAL*
  Efron, B., Petrosian, V.
  1995; 449 (1): 216-223
- **ON THE CORRELATION OF ANGULAR POSITION WITH TIME OF OCCURRENCE OF GAMMA-RAY BURSTS** *ASTROPHYSICAL JOURNAL*
  Petrosian, V., Efron, B.
  1995; 441 (1): L37-L38
- **DIDANOSINE RESISTANCE IN HIV-INFECTED PATIENTS SWITCHED FROM ZIDOVUDINE TO DIDANOSINE MONOTHERAPY** *ANNALS OF INTERNAL MEDICINE*
  Kozal, M. J., Kroodsma, K., Winters, M. A., Shafer, R. W., Efron, B., Katzenstein, D. A., Merigan, T. C.
  1994; 121 (4): 263-268
- **MISSING DATA, IMPUTATION, AND THE BOOTSTRAP - REJOINDER** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  1994; 89 (426): 478-479
- **SURVIVAL ANALYSIS OF THE GAMMA-RAY BURST DATA** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B., Petrosian, V.
  1994; 89 (426): 452-462
- **MISSING DATA, IMPUTATION, AND THE BOOTSTRAP** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  1994; 89 (426): 463-475
- **BAYES AND LIKELIHOOD CALCULATIONS FROM CONFIDENCE-INTERVALS** *BIOMETRIKA*
  Efron, B.
  1993; 80 (1): 3-26
- **A SIMPLE TEST OF INDEPENDENCE FOR TRUNCATED DATA WITH APPLICATIONS TO REDSHIFT SURVEYS** *ASTROPHYSICAL JOURNAL*
  Efron, B., Petrosian, V.
  1992; 399 (2): 345-352
- **MORE ACCURATE CONFIDENCE-INTERVALS IN EXPONENTIAL-FAMILIES** *BIOMETRIKA*
  DICICCIO, T., Efron, B.
  1992; 79 (2): 231-245
- **POISSON OVERDISPERSION ESTIMATES BASED ON THE METHOD OF ASYMMETRIC MAXIMUM-LIKELIHOOD** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  1992; 87 (417): 98-107

- **JACKKNIFE-AFTER-BOOTSTRAP STANDARD ERRORS AND INFLUENCE FUNCTIONS** *JOURNAL OF THE ROYAL STATISTICAL SOCIETY SERIES B-METHODOLOGICAL*
  Efron, B.
  1992; 54 (1): 83-127
- **STATISTICAL-DATA ANALYSIS IN THE COMPUTER-AGE** *SCIENCE*
  Efron, B., Tibshirani, R.
  1991; 253 (5018): 390-395
- **COMPLIANCE AS AN EXPLANATORY VARIABLE IN CLINICAL-TRIALS - REJOINDER** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B., Feldman, D.
  1991; 86 (413): 25-26
- **COMPLIANCE AS AN EXPLANATORY VARIABLE IN CLINICAL-TRIALS** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B., Feldman, D.
  1991; 86 (413): 9-17
- **REGRESSION PERCENTILES USING ASYMMETRIC SQUARED ERROR LOSS** *STATISTICA SINICA*
  Efron, B.
  1991; 1 (1): 93-125
- **AN ANCILLARITY PARADOX WHICH APPEARS IN MULTIPLE LINEAR-REGRESSION - DISCUSSION** *ANNALS OF STATISTICS*
  Efron, B.
  1990; 18 (2): 502-503
- **FISHERS INFORMATION IN TERMS OF THE HAZARD RATE** *ANNALS OF STATISTICS*
  Efron, B., Johnstone, I. M.
  1990; 18 (1): 38-62
- **MORE EFFICIENT BOOTSTRAP COMPUTATIONS** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  1990; 85 (409): 79-89
- **COMPUTER-INTENSIVE STATISTICAL-INFERENCE - A CITATION CLASSIC COMMENTARY ON BOOTSTRAP METHODS - ANOTHER LOOK AT THE JACKKNIFE BY EFRON,B.** *CURRENT CONTENTS/PHYSICAL CHEMICAL & EARTH SCIENCES*
  Efron, B.
  1989: 16-16
- **PROGNOSTIC INDICATORS OF LAPAROTOMY FINDINGS IN CLINICAL STAGE-I-II SUPRADIAPHRAGMATIC HODGKINS-DISEASE** *JOURNAL OF CLINICAL ONCOLOGY*
  LEIBENHAUT, M. H., Hoppe, R. T., Efron, B., Halpern, J., Nelsen, T., Rosenberg, S. A.
  1989; 7 (1): 81-91
- **APPLICATION OF THE BOOTSTRAP STATISTICAL-METHOD TO THE TAU-DECAY-MODE PROBLEM** *PHYSICAL REVIEW D*
  Hayes, K. G., PERL, M. L., Efron, B.
  1989; 39 (1): 274-279
- **3 EXAMPLES OF COMPUTER-INTENSIVE STATISTICAL-INFERENCE** *SANKHYA-THE INDIAN JOURNAL OF STATISTICS SERIES A*
  Efron, B.
  1988; 50: 338-362
- **THEORETICAL COMPARISON OF BOOTSTRAP CONFIDENCE-INTERVALS - DISCUSSION** *ANNALS OF STATISTICS*
  Efron, B.
  1988; 16 (3): 969-972
- **COMPUTER-INTENSIVE METHODS IN STATISTICAL REGRESSION** *SIAM REVIEW*
  Efron, B.
  1988; 30 (3): 421-449

- **BOOTSTRAP CONFIDENCE-INTERVALS - GOOD OR BAD** *PSYCHOLOGICAL BULLETIN*
  Efron, B.
  1988; 104 (2): 293-296
- **LOGISTIC-REGRESSION, SURVIVAL ANALYSIS, AND THE KAPLAN-MEIER CURVE** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  1988; 83 (402): 414-425
- **EMPIRICAL BAYES CONFIDENCE-INTERVALS BASED ON BOOTSTRAP SAMPLES - COMMENT** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  1987; 82 (399): 754-754
- **DID SHAKESPEARE WRITE A NEWLY-DISCOVERED POEM** *BIOMETRIKA*
  Thisted, R., Efron, B.
  1987; 74 (3): 445-455
- **BETTER BOOTSTRAP CONFIDENCE-INTERVALS** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  1987; 82 (397): 171-185
- **JACKKNIFE, BOOTSTRAP AND OTHER RESAMPLING METHODS IN REGRESSION-ANALYSIS - DISCUSSION** *ANNALS OF STATISTICS*
  Efron, B.
  1986; 14 (4): 1301-1304
- **DOUBLE EXPONENTIAL-FAMILIES AND THEIR USE IN GENERALIZED LINEAR-REGRESSION** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  1986; 81 (395): 709-721
- **HOW BIASED IS THE APPARENT ERROR RATE OF A PREDICTION RULE** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  1986; 81 (394): 461-470
- **TESTING FOR INDEPENDENCE IN A 2-WAY TABLE - NEW INTERPRETATIONS OF THE CHI-SQUARE STATISTIC - REJOINDER** *ANNALS OF STATISTICS*
  Diaconis, P., Efron, B.
  1985; 13 (3): 905-913
- **BOOTSTRAP CONFIDENCE-INTERVALS FOR A CLASS OF PARAMETRIC PROBLEMS** *BIOMETRIKA*
  Efron, B.
  1985; 72 (1): 45-58
- **TESTING FOR INDEPENDENCE IN A 2-WAY TABLE - NEW INTERPRETATIONS OF THE CHI-SQUARE STATISTIC** *ANNALS OF STATISTICS*
  Diaconis, P., Efron, B.
  1985; 13 (3): 845-874
- **COMPARING NON-NESTED LINEAR-MODELS** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  1984; 79 (388): 791-803
- **ESTIMATING THE ERROR RATE OF A PREDICTION RULE - IMPROVEMENT ON CROSS-VALIDATION** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  1983; 78 (382): 316-331
- **COMPUTER-INTENSIVE METHODS IN STATISTICS** *SCIENTIFIC AMERICAN*
  Diaconis, P., Efron, B.
  1983; 248 (5): 116-?

- **TRANSFORMATION THEORY - HOW NORMAL IS A FAMILY OF DISTRIBUTIONS** *ANNALS OF STATISTICS*
  Efron, B.
  1982; 10 (2): 323-339
- **MAXIMUM-LIKELIHOOD AND DECISION-THEORY** *ANNALS OF STATISTICS*
  Efron, B.
  1982; 10 (2): 340-356
- **CENSORED-DATA AND THE BOOTSTRAP** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  1981; 76 (374): 312-319
- **THE JACKKNIFE ESTIMATE OF VARIANCE** *ANNALS OF STATISTICS*
  Efron, B., Stein, C.
  1981; 9 (3): 586-596
- **NONPARAMETRIC ESTIMATES OF STANDARD ERROR - THE JACKKNIFE, THE BOOTSTRAP AND OTHER METHODS** *BIOMETRIKA*
  Efron, B.
  1981; 68 (3): 589-599
- **MINIMUM CHI-SQUARE, NOT MAXIMUM-LIKELIHOOD** *ANNALS OF STATISTICS*
  Berkson, J., Efron, B., Ghosh, J. K., Lecam, L., Pfanzagl, J., Rao, C. R.
  1980; 8 (3): 457-487
- **COMPUTERS AND THE THEORY OF STATISTICS - THINKING THE UNTHINKABLE** *SIAM REVIEW*
  Efron, B.
  1979; 21 (4): 460-480
- **HOW BROAD IS CLASS OF NORMAL SCALE MIXTURES** *ANNALS OF STATISTICS*
  Efron, B., Olshen, R. A.
  1978; 6 (5): 1159-1164
- **ASSESSING ACCURACY OF MAXIMUM LIKELIHOOD ESTIMATOR - OBSERVED VERSUS EXPECTED FISHER INFORMATION** *BIOMETRIKA*
  Efron, B., Hinkley, D. V.
  1978; 65 (3): 457-482
- **GEOMETRY OF EXPONENTIAL FAMILIES** *ANNALS OF STATISTICS*
  Efron, B.
  1978; 6 (2): 362-376
- **REGRESSION AND ANOVA WITH ZERO-ONE DATA - MEASURES OF RESIDUAL VARIATION** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  1978; 73 (361): 113-121
- **CONTROVERSIES IN FOUNDATIONS OF STATISTICS** *AMERICAN MATHEMATICAL MONTHLY*
  Efron, B.
  1978; 85 (4): 231-246
- **RADIATION-INDUCED INHIBITION OF COMPENSATORY RENAL GROWTH IN WEANLING MOUSE KIDNEY** *RADIOLOGY*
  Donaldson, S. S., MOSKOWITZ, P. S., CANTY, E. L., Efron, B.
  1978; 128 (2): 491-495
- **STEINS PARADOX IN STATISTICS** *SCIENTIFIC AMERICAN*
  Efron, B., Morris, C.
  1977; 236 (5): 119-127
- **EFFICIENCY OF COXS LIKELIHOOD FUNCTION FOR CENSORED DATA** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  1977; 72 (359): 557-565

- **ESTIMATING NUMBER OF UNSEEN SPECIES - HOW MANY WORDS DID SHAKESPEARE KNOW** *BIOMETRIKA*
  Efron, B., Thisted, R.
  1976; 63 (3): 435-447
- **NECESSARY ANALYSIS AND ADAPTIVE INFERENCE - COMMENT** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  1976; 71 (353): 111-112
- **FAMILIES OF MINIMAX ESTIMATORS OF MEAN OF A MULTIVARIATE NORMAL DISTRIBUTION** *ANNALS OF STATISTICS*
  Efron, B., Morris, C.
  1976; 4 (1): 11-21
- **MULTIVARIATE EMPIRICAL BAYES AND ESTIMATION OF COVARIANCE MATRICES** *ANNALS OF STATISTICS*
  Efron, B., Morris, C.
  1976; 4 (1): 22-32
- **REREADING FISHER,RA** *ANNALS OF STATISTICS*
  Savage, L. J., Efron, B., EISENHART, C., FINETTI, B. D., Fraser, D. A., Godambe, V. P., Good, I. J., KEMPTHORNE, O., Stigler, S. M.
  1976; 4 (3): 441-500
- **BIASED VERSUS UNBIASED ESTIMATION** *ADVANCES IN MATHEMATICS*
  Efron, B.
  1975; 16 (3): 259-277
- **POSSIBLE PROGNOSTIC USEFULNESS OF ASSESSING SERUM-PROTEINS AND CHOLESTEROL IN MALIGNANCY** *CANCER*
  Chao, F. C., Efron, B., Wolf, P.
  1975; 35 (4): 1223-1229
- **DEFINING CURVATURE OF A STATISTICAL PROBLEM (WITH APPLICATIONS TO 2ND ORDER EFFICIENCY)** *ANNALS OF STATISTICS*
  Efron, B.
  1975; 3 (6): 1189-1217
- **EFFICIENCY OF LOGISTIC REGRESSION COMPARED TO NORMAL DISCRIMINANT-ANALYSIS** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B.
  1975; 70 (352): 892-898
- **DATA-ANALYSIS USING STEINS ESTIMATOR AND ITS GENERALIZATIONS** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B., Morris, C.
  1975; 70 (350): 311-319
- **STEINS ESTIMATION RULE AND ITS COMPETITORS - EMPIRICAL BAYES APPROACH** *JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION*
  Efron, B., Morris, C.
  1973; 68 (341): 117-130
- **FORCING A SEQUENTIAL EXPERIMENT TO BE BALANCED** *NATIONAL CANCER INSTITUTE MONOGRAPHS*
  Efron, B.
  1973: 571-572
- **COMBINING POSSIBLY RELATED ESTIMATION PROBLEMS** *JOURNAL OF THE ROYAL STATISTICAL SOCIETY SERIES B-METHODOLOGICAL*
  Efron, B., Morris, C.
  1973; 35 (3): 379-421
- **EMPIRICAL BAYES ON VECTOR OBSERVATIONS - EXTENSION OF STEINS METHOD** *BIOMETRIKA*
  Efron, B., Morris, C.
  1972; 59 (2): 335-347