

Curriculum Vitae of James C. Spall

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–and–

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Synopsis

James C. Spall holds four distinct positions at the Johns Hopkins University (JHU):

1. Member of the Principal Professional Staff at the JHU Applied Physics Laboratory (JHU/APL).
2. Research Professor in the JHU Department of Applied Mathematics and Statistics at the (main) Homewood Campus in Baltimore.
3. Chair of the Applied and Computational Mathematics Program within the JHU Engineering and Applied Science Programs for Professionals (division of the JHU Whiting School of Engineering).
4. Co-Chair of the Data Science Program within the JHU Engineering and Applied Science Programs for Professionals.

Dr. Spall's technical and educational activities are focused on stochastic systems, statistical analysis, and computational algorithms in optimization and related areas. He has given many invited presentations at conferences, research labs, and universities and he has over 150 refereed publications. Dr. Spall's publications include multiple books and several highly cited papers in the IEEE or other journal literature, including the all-time most-cited paper in the *Johns Hopkins APL Technical Digest* (from over 1300 papers). His book, *Introduction to Stochastic Search and Optimization* (Wiley), is the most cited book in the general area of stochastic optimization (per Google Scholar).

Experience

1983–Present. Technical and Leadership Activities at JHU/APL.

Principal Professional Staff (1991–present), Senior Professional Staff (1983–1991). Dr. Spall has worked in diverse areas within the fields of statistics and control systems, and has worked in applications areas such as defense systems and transportation systems. He has published over 140 refereed papers on topics such as parameter estimation, adaptive control, small-sample data analysis, performance evaluation and testing, time series, optimization, and neural networks, and has edited and coauthored one book on dynamic models and has written (sole author) another book on stochastic optimization together with an accompanying solutions manual (see separate publications list below). He also holds two U.S. patents for inventions in control systems (both licensed to the

private sector). Dr. Spall has extensive experience leading and managing research and development projects. These projects include several funded by the U.S. Navy on advanced techniques for estimation in a large-scale defense system. The work in these projects involved the development of new statistical theory and the subsequent implementation in software and processing of actual system data. He has also been the principal investigator of many JHU/APL-funded Independent Research and Development projects. These projects represent basic research in the fields of statistics and control.

1996–Present. Academic Leadership and Educational Activities.

Academic leadership (two positions):

Chair of the Applied and Computational Mathematics (ACM) Program within the Engineering and Applied Science Programs for Professionals (EP), JHU Whiting School of Engineering (<https://ep.jhu.edu/ACM>). Oversee a program with approximately 25 part-time faculty and 180 graduate students (1999–present).

Co-Chair of the Data Science Program within EP (<https://ep.jhu.edu/DS>) (2016–present).

Research, teaching, and advising:

Research Professor in the JHU Department of Applied Mathematics and Statistics (2004–present). Ph.D. and M.S. student adviser or co-adviser for several graduate students (listed below). Teach graduate courses in the areas of stochastic algorithms, optimization, system identification, Monte Carlo simulation, and neural networks. Also, lecturer (1997–present) and adviser (1999–present) in the ACM Program. Instructor in the JHU/APL Strategic Education Program (1996–present; non-credit courses). Instructor for short course in the Applied Technology Institute, Inc. (<http://www.atcourses.com>) (2004–present; non-credit course).

1979–1982. Temporary Professional Positions.

U.S. Department of Transportation (NHTSA), General Motors Research Laboratory, and Research Assistant at MIT in support of the Massachusetts Port Authority.

Education

Ph.D., Systems Engineering, University of Virginia, 1983.

S.M., Technology and Policy Program (specialization and thesis in transportation systems), Massachusetts Institute of Technology, 1981.

B.S., Systems Engineering, Oakland University, 1979 (top graduate in School of Engineering).

Selected Honors

Professor Joel Dean Award for Excellence in Teaching by the JHU Department of Applied Mathematics and Statistics (given each year to one or more faculty who demonstrate an intense devotion to teaching and a talent for making mathematics more understandable), May 2017.

Dunning Professorship for collaboration between the Johns Hopkins School of Engineering and JHU/APL, 2004–present.

Innovation award for the Strategic Systems Business Area at JHU/APL for exceptional innovation in reliability estimation, November 2011.

Excellence in Teaching Award, Johns Hopkins University Engineering and Applied Science Programs for Professionals, 2006 (one of 3 awards for approximately 400 faculty).

Fellow of Institute of Electrical and Electronics Engineers (IEEE) (elected 2003).

Awards for best research paper at JHU/APL, 1988 and 2000.

Janney Fellowships for independent projects at JHU/APL, 1987 and 1999.

Several best presentation awards at the American Control Conference and American Statistical Association Annual Meeting (Joint Statistical Meetings).

R.W. Hart Prize as principal investigator of the outstanding 1990 Independent Research and Development project at JHU/APL (selected from 40 projects).

Best paper award at 1995 Military Operations Research Symposium (chosen from among 25 papers in the test and evaluation area).

Fellow of engineering honor society Tau Beta Pi (1979) (18 selected from approximately 200 national candidates).

Highest award to graduating senior by the Oakland University School of Engineering (1979).

Selected media mentions:

- Interviewed in *Amstat News* (monthly membership magazine of the American Statistical Association), April 2018, for article, [Master's and Doctoral Programs in Data Science and Analytics](#).
- Listed in [20 Data Science Professors to Know](#) (April 2017).
- "The Shaping of Oboe Reeds: Maybe it is Rocket Science," *The New York Times*, 21 October 1997 (feature article in "Science Times" section).
- Featured in "25 Smartest People in Baltimore," cover story in *Baltimore Magazine*, September 1996.

Selected Professional Service Activities

Member of JHU Whiting School of Engineering Graduate Committee (2003–2006 and 2017–present).

One of four inaugural Senior Editors for the *IEEE Transactions on Automatic Control* (2009–present; responsible for final publication decision on over 200 papers/year).

Topical Editor in stochastic optimization for *Encyclopedia of Operations Research and Management Science* (Wiley) (print version published 2011; online version updated on ongoing basis).

Review panelist for NSF Information and Intelligent Systems Division for proposals on "Big Data," 2012.

Program Chair for the 2007 IEEE Conference on Decision and Control (oversaw peer review process and scheduling for approximately 1700 submitted papers).

Area Editor for 2005 Joint IEEE Conference on Decision and Control/European Control Conference.

Vice Program Chair at 2001 and 2004 IEEE Conference on Decision and Control and 2002 American Control Conference.

Member of Program Committees for 1999 American Control Conference; 1999, 2006, and 2008 IEEE Conference on Decision and Control; 2003–2007 IEEE International Symposium on Intelligent Control; 2005 Mediterranean Control Conference; 2010 International Symposium on Mathematical Theory of Networks and Systems; 2011–2016 International Conference on Simulation and Modeling Methodologies, Technologies and Applications (SIMULTECH).

Member of IEEE Control Systems Society Technical Committee on Identification and Adaptive Control.

Associate Editor at Large for the *IEEE Transactions on Automatic Control* (2003–2009).
 Associate Editor for the *IEEE Transactions on Automatic Control* (1996–1999).
 Contributing Editor for the *Current Index to Statistics*, responsible for control engineering and related areas (1992–present).
 Member of Search Committee for JHU Associate Dean (to serve as Head of JHU Engineering and Applied Science Programs for Professionals) (2001).
 Editorial board for *Johns Hopkins APL Technical Digest* (1996–present).
 General Chair of the 4th APL Research and Development Symposium, November 1997.
 President of the Maryland Chapter of the American Statistical Association, 1998–2000.
 Member of JHU/APL Committee on Sabbatical Fellows and Professors (1998–2000).
 Organized and chaired invited sessions at the IEEE Conference on Decision and Control, American Control Conference, American Statistical Association Annual Meeting, International Statistical Institute Biennial Meeting, etc.
 Taught invited or contributed short courses (tutorials or workshops) at the American Control Conference, IEEE Conference on Decision and Control, American Statistical Association Annual Meeting, Summer Computer Simulation Conference, Neural Information Processing Symposium, and several other conferences.
 General Chair of the Mid-Atlantic Probability and Statistics Day, October 1988.
 Reviewer of papers for many journals and conferences and reviewer of proposals for NSF, DOE (U.S. Department of Energy), and NSERC (Canada) (1983–present).
 Mentor for high school and undergraduate students with interest in mathematics.

Locations and Sponsors of Selected Invited Presentations

Boston University, Division of Systems Engineering, October 2003.
 Georgia Institute of Technology, Department of Mechanical Engineering, October 1995.
 Institute for Pure and Applied Mathematics (IPAM) (located at UCLA), February 2014.
 Johns Hopkins University (multiple seminars in Departments of Applied Mathematics and Statistics, Biostatistics, and Electrical and Computer Engineering), 1995, 1996, 1999, 2009, and 2013.
 NASA Glenn Research Center, June 2014.
 North Carolina State University, Operations Research Graduate Program, October 1998.
 RAND Corporation, Headquarters, Santa Monica, California, November 1992.
 University of California—San Diego, Center for Control Systems and Dynamics, January 2010.
 University of Chicago, Department of Statistics, November 1988.
 University of Illinois at Urbana-Champaign, Department of Department of Industrial and Enterprise Systems Engineering, April 2012.
 University of Maryland—College Park (multiple seminars in Departments of Applied Mathematics, Civil Engineering, and Electrical and Computer Engineering), 1994–1999.
 University of Virginia, Department of Systems and Information Engineering, April 1995.
 Wayne State University, Department of Mathematics, October 1995.
 Plenary speaker at Mid-Atlantic Probability and Statistics Day (1992, 1997, and 2007) and at National Institute of Standards and Technology (NIST) Performance Metrics Symposium (2004).

Many invited talks at conferences sponsored by IEEE, International Federation of Automatic Control, American Automatic Control Council, American Statistical Association, International Statistical Institute, SIAM, Neural Information Processing Systems (NIPS) Foundation, American Mathematical Society, and other organizations.

Selected Sources of Current and Past Support

U.S. Navy Strategic Systems Programs: Weapon System Accuracy Evaluation: 1983–present.

JHU Dunning Professorship to support time (20%) at JHU Homewood Campus, 2004–present.

JHU/Whiting School of Engineering: Applied and Computational Mathematics Program (Chairmanship), 1999–present.

JHU/APL Independent Research and Development (IRAD) Program: Various basic and applied research projects, 1988–2018 (most as Principal Investigator)

DARPA Advanced Simulation Technology Thrust Area: 1996–1999.

Maryland Applied Information Technology Initiative (MAITI): 1999–2000.

Office of Naval Research, Computational Methods in Decision Making (Principal Investigator): 2013–2016.

Graduate Student Supervision

As part of his involvement in research and educational activities, Dr. Spall works on a part-time basis to supervise the research work of graduate students. The doctoral and master’s students he has supervised are listed below (most recent listed first).

Doctoral Students

Shiqing Sun (current doctoral student). Objective assessment of “deep learning” for neural networks and evaluation of alternative methods for network training.

Jingyi Zhu (current doctoral student) (JHU–Applied Mathematics and Statistics). Research topic: Computable accuracy assessment for stochastic approximation with constant step sizes for use in tracking time-varying solutions.

Long Wang (current doctoral student) (JHU–Applied Mathematics and Statistics). Research interests: System identification, stochastic optimization and control systems.

Karla Hernández (JHU–Applied Mathematics and Statistics, Ph.D. 2017). Research topic: stochastic extension of deterministic cyclic optimization. Dissertation entitled “Cyclic Stochastic Optimization: Generalizations, Convergence, and Applications in Multi-Agent Systems,” available at <https://arxiv.org/abs/1707.06700>.

Qi Wang (JHU–Applied Mathematics and Statistics, Ph.D. 2013). Research topic: discrete stochastic optimization. Dissertation entitled “Optimization with Discrete Simultaneous Perturbation Stochastic Approximation Using Noisy Loss Function Measurements,” available at <http://arxiv.org/abs/1311.0042>.

Xumeng Cao (JHU–Applied Mathematics and Statistics, Ph.D. 2013). Research topic: observed versus expected Fisher information matrix for statistical inference purposes. Dissertation entitled “Relative Performance of Expected and Observed Fisher Information in Covariance Estimation for Maximum Likelihood Estimates,” available at <http://arxiv.org/abs/1305.1056>.

David W. Hutchison (JHU–Applied Mathematics and Statistics, Ph.D. 2009). Research topic: small-sample analysis of stochastic approximation algorithms. Dissertation title: “Stopping Times and Confidence Bounds for Small-Sample Stochastic Approximation Algorithms.”

Payman Sadegh (Technical University of Denmark, Ph.D. 1997). Research topic: statistical methods for optimal sensor placement (off-site supervisor; secondary to primary supervisor at Technical University of Denmark).

Nathan Kleinman (JHU–Mathematical Sciences, Ph.D. 1996). Research topic: Monte Carlo simulation-based optimization (co-advisor with Prof. Daniel Naiman).

Master’s Students

Ziyu Liu (JHU–Applied Mathematics and Statistics, M.S. 2018), Shihong Wei (JHU–Applied Mathematics and Statistics, M.S. 2018), Anqi Zhang (JHU–Financial Mathematics, M.S. 2018), and Tian Zhu (JHU–Financial Mathematics, M.S. 2018). Uncertainty calculation for state estimates in the particle filter.

Lingzhou Hong (JHU–Applied Mathematics and Statistics, M.S. 2017). Adaptive gains (step sizes) in stochastic approximation for slowly time-varying system and regime-switching system.

Guanbo Bian (JHU–Applied Mathematics and Statistics, M.S. 2017; Civil Engineering, Ph.D. 2017). Combining subsystem and full system data with applications in structural engineering: Reliability estimation for cold-formed steel shear wall.

Chen Feng, Kunbo Wang, and Kaining Yang (joint project for three students receiving Master’s degrees in Financial Mathematics, 2016). Finite-sample analysis of iterate averaging method for stochastic approximation; final paper at <http://dx.doi.org/10.1109/CISS.2017.7926146>.

Xilei Zhao (JHU–Applied Mathematics and Statistics, M.S. 2017; Civil Engineering, Ph.D. 2017). M.S. thesis student. Estimation of travel times in urban transportation networks. Master’s thesis title: “Modeling Transportation Networks and Urban Traffic Dynamics: A Markovian Framework,” May 2017.

Qian Ke (JHU–Applied Mathematics and Statistics, M.S. 2016). Reliability analysis with time-varying components and/or subsystems.

Lingyao Meng (JHU–Financial Mathematics, M.S. 2015). Exploring the applicability of the simultaneous perturbation-based Hessian methods to addressing the difficulties in obtaining the Fisher information matrix in expectation–maximization (EM) algorithm (ongoing). M.S. final report: “Method for Computation of the Fisher Information Matrix in the Expectation–Maximization Algorithm,” <https://arxiv.org/abs/1608.01734>.

Yan Zhou (JHU–Applied Mathematics and Statistics, M.S. 2018) and Mengdan Zhang (JHU–Applied Mathematics and Statistics, M.S. 2017; Computer Science, M.S. 2017). Application of discrete simultaneous perturbation stochastic approximation (DSPSA) towards developing optimal public health strategies for containing the spread of influenza given limited societal resources (ongoing).

Yafang Chen (JHU–Financial Mathematics, M.S. 2015). Analysis of discrete SPSA and extension to mixed continuous and discrete parameter problems. M.S. final report: “Integrated Simultaneous Perturbation Stochastic Approximation for Stochastic Optimization Problems with Mixed Discrete and Continuous Variables.”

Shenghan Guo (JHU–Financial Mathematics, M.S. 2014). Formal comparison of accuracy of two well-known methods for computing observed Fisher information matrix (Hessian matrix of the negative log-likelihood function or sample average of outer products of gradient vector of log-likelihood function). M.S. final report: “Comparison of Accuracy for Methods to Approximate Fisher Information in the Scalar Case,” <http://arxiv.org/abs/1501.00218>.

Sonjoy Das (JHU–Applied Mathematics and Statistics, M.S. 2007). Master’s thesis title: “Efficient Calculation of Fisher Information Matrix: Monte Carlo Approach Using Prior Information.”

Memberships

American Statistical Association

IEEE (Fellow)

Sigma Xi

Tau Beta Pi (Fellow)

PUBLICATIONS, PATENTS, AND THESES OF JAMES C. SPALL

Books

- Spall, J. C. (2003), *Introduction to Stochastic Search and Optimization: Estimation, Simulation, and Control*, Wiley, Hoboken, NJ (618 pages). <http://www.jhuapl.edu/ISSO>
- Spall, J. C. (2018), “Solutions Manual for *Introduction to Stochastic Search and Optimization: Estimation, Simulation, and Control*” (293 pages).
- Spall, J. C. (editor and coauthor) (1988), *Bayesian Analysis of Time Series and Dynamic Models*, Marcel Dekker, New York (now CRC Press) (576 pages).

Journal Articles and Refereed Book Chapters (recent articles and chapters under review are listed separately in “Articles Submitted and/or Accepted” below)

- Hill, S. D. and Spall, J. C. (2018), “Stationarity and Convergence of the Metropolis-Hastings Algorithm,” *IEEE Control Systems Magazine*, to appear October 2018.
- Spall, J. C. (2014), “Identification for Systems with Binary Subsystems,” *IEEE Transactions on Automatic Control*, vol. 59(1), pp. 3–17. <http://dx.doi.org/10.1109/TAC.2013.2275664>
- Hill, S. D., Spall, J. C., and Maranzano, C. J. (2013), “Inequality-Based Reliability Estimates for Complex Systems,” *Naval Research Logistics*, vol. 60(5), pp. 367–374. <http://dx.doi.org/10.1002/nav.21539>
- Hutchison, D. W. and Spall, J. C. (2013), “Stochastic Approximation,” in *Encyclopedia of Operations Research and Management Science* (3rd ed.) (S. I. Gass and M. C. Fu, eds.) Springer–Verlag, New York (invited article), pp. 1470–1476. <http://dx.doi.org/10.1007/978-1-4419-1153-7>
- Spall, J. C. (2012), “Cyclic Seesaw Process for Optimization and Identification,” *Journal of Optimization Theory and Applications*, vol. 154(1), pp. 187–208. <http://dx.doi.org/10.1007/s10957-012-0001-1>
- Spall, J. C. (2012), “Stochastic Optimization,” in *Handbook of Computational Statistics: Concepts and Methods* (2nd ed.) (J. Gentle, W. Härdle, and Y. Mori, eds.), Springer–Verlag, Heidelberg, Chapter 7, pp. 173–201 (invited article; update of 2004 article below). http://dx.doi.org/10.1007/978-3-642-21551-3_7
- Spall, J. C. (2010), “Factorial Design for Efficient Experimentation: Generating Informative Data for System Identification,” *IEEE Control Systems Magazine*, vol. 30(5), pp. 38–53. <http://dx.doi.org/10.1109/MCS.2010.937677>
- Cao, X. and Spall, J. C. (2010), “Comparison of Expected and Observed Fisher Information in Variance Calculations for Parameter Estimates,” *Johns Hopkins APL Technical Digest*, vol. 28(3), pp. 294–295.
- Das, S., Spall, J. C., and Ghanem, R. (2010), “Efficient Monte Carlo Computation of Fisher Information Matrix Using Prior Information,” *Computational Statistics and Data Analysis*, vol. 54(2), pp. 272–289. <http://dx.doi.org/10.1016/j.csda.2009.09.018>
- Spall, J. C. (2009), “Feedback and Weighting Mechanisms for Improving Jacobian Estimates in the Adaptive Simultaneous Perturbation Algorithm,” *IEEE Transactions on Automatic Control*, vol. 54(6), pp. 1216–1229. <http://dx.doi.org/10.1109/TAC.2009.2019793>
- Wang, I.-J. and Spall, J. C. (2008), “Stochastic Optimisation with Inequality Constraints Using Simultaneous Perturbations and Penalty Functions,” *International Journal of Control*, vol. 81(8), pp. 1232–1238. <http://dx.doi.org/10.1080/00207170701611123>

- Song, Q., Spall, J. C., Soh, Y. C., and Ni, J. (2008), “Robust Neural Network Tracking Controller Using Simultaneous Perturbation Stochastic Approximation,” *IEEE Transactions on Neural Networks*, vol. 19(5), pp. 817–835.
- Das, S., Ghanem, R., and Spall, J. C. (2008), “Asymptotic Sampling Distribution for Polynomial Chaos Representation from Data: A Maximum Entropy and Fisher Information Approach,” *SIAM Journal on Scientific Computing*, vol. 30(5), pp. 2207–2234.
<http://dx.doi.org/10.1137/060652105>
- Spall, J. C., Hill, S. D., and Stark, D. R. (2006), “Theoretical Framework for Comparing Several Stochastic Optimization Approaches,” in *Probabilistic and Randomized Methods for Design Under Uncertainty* (G. Calafiore and F. Dabbene, eds.), Springer-Verlag, London, Chapter 3, pp. 99–117 (invited article). http://dx.doi.org/10.1007%2F1-84628-095-8_3
- Spall, J. C. (2005), “Monte Carlo Computation of the Fisher Information Matrix in Nonstandard Settings,” *Journal of Computational and Graphical Statistics*, vol. 14(4), pp. 889–909.
<http://dx.doi.org/10.1198/106186005X78800>
- Spall, J. C. (2005), “The Applied and Computational Mathematics Program at the Johns Hopkins University,” *Johns Hopkins APL Technical Digest*, vol. 26, pp. 219–223.
- Maryak, J. L. and Spall, J. C. (2005), “Simultaneous Perturbation Optimization for Efficient Image Restoration,” *IEEE Transactions on Aerospace and Electronic Systems*, vol. 41, pp. 356–361.
- Spall, J. C. (2004), “Stochastic Optimization,” in *Handbook of Computational Statistics* (J. Gentle, W. Härdle, and Y. Mori, eds.), Springer-Verlag, New York, Chapter II.6, pp. 169–197 (invited article).
- Maryak, J. L., Spall, J. C., and Heydon, B. D. (2004), “Use of the Kalman Filter for Inference in State-Space Models with Unknown Noise Distributions,” *IEEE Transactions on Automatic Control*, vol. 49, pp. 87–90.
- Spall, J. C. (2003), “Estimation via Markov Chain Monte Carlo,” *IEEE Control Systems Magazine*, vol. 23(2), pp. 34–45. <http://dx.doi.org/10.1109/MCS.2003.1188770>
- Zhu, X. and Spall, J. C. (2002), “A Modified Second-Order SPSA Optimization Algorithm for Finite Samples,” *International Journal of Adaptive Control and Signal Processing*, vol. 16, pp. 397–409.
- Spall, J. C. (2002), “Uncertainty Bounds in Parameter Estimation with Limited Data,” in *Modeling Uncertainty: An Examination of Stochastic Theory, Methods, and Applications* (M. Dror, P. L’Ecuyer, and F. Szidarovszky, eds.), Kluwer Academic, Norwell, MA, pp. 685–709 (invited article). http://dx.doi.org/10.1007/0-306-48102-2_27
- Spall, J. C. (2000), “Adaptive Stochastic Approximation by the Simultaneous Perturbation Method,” *IEEE Transactions on Automatic Control*, vol. 45, pp. 1839–1853 (this paper received the award for outstanding research publication at JHU/APL, 2000).
<http://dx.doi.org/10.1109/TAC.2000.880982>
- Kleinman, N., Spall, J. C., and Naiman, D. Q. (1999), “Simulation-Based Optimization using Stochastic Approximation with Common Random Numbers,” *Management Science*, vol. 45, pp. 1570–1578. <http://dx.doi.org/10.1287/mnsc.45.11.1570>
- Spall, J. C. (1999), “Stochastic Optimization: Stochastic Approximation and Simulated Annealing,” in *Encyclopedia of Electrical and Electronics Engineering* (J. G. Webster, ed.), Wiley, New York, vol. 20, pp. 529–542 (invited article).
- Newman, F. C., Biondo, A. C., Mandelberg, M. D., Croucher, A. R., Spall, J. C., Matthews, C. C., and Warfield, J. T. (1999), “Towards Enhanced Environmental Effects Representations in Advanced Computer Simulations,” *Johns Hopkins APL Technical Digest*, vol. 20, pp. 443–455.

- Spall, J. C., Maryak, J. L., and Asher, M. S. (1998), "Neural Network Approach to Locating Acoustic Emission Sources in Nondestructive Evaluation," *Journal of Sound and Vibration*, vol. 211, pp. 133–143.
- Sadegh, P. and Spall, J. C. (1998), "Optimal Random Perturbations for Stochastic Approximation with a Simultaneous Perturbation Gradient Approximation," *IEEE Transactions on Automatic Control*, vol. 43, pp. 1480–1484. <http://dx.doi.org/10.1109/9.720513> (Correction to references: vol. 44, 1999, pp. 231–232. <http://dx.doi.org/10.1109/9.720513>)
- Spall, J. C. and Cristion, J. A. (1998), "Model-Free Control of Nonlinear Systems with Discrete Time Measurements," *IEEE Transactions on Automatic Control*, vol. 43, pp. 1198–1210. <http://dx.doi.org/10.1109/9.718605>
- Spall, J. C. (1998), "An Overview of the Simultaneous Perturbation Method for Efficient Optimization," *Johns Hopkins APL Technical Digest*, vol. 19(4), pp. 482–492. <http://www.jhuapl.edu/spsa/Pages/References-Intro.htm>
- Spall, J. C. (1998), Review of Book "Stochastic Approximation Algorithms and Applications" (by H. J. Kushner and G. G. Yin), *IEEE Transactions on Automatic Control*, vol. 43, pp. 753–755 (selected for reprinting in the *Proceedings of the IEEE*, 1999, vol. 87, pp. 688–690).
- Spall, J. C. (1998), "Implementation of the Simultaneous Perturbation Algorithm for Stochastic Optimization," *IEEE Transactions on Aerospace and Electronic Systems*, vol. 34, pp. 817–823. <http://dx.doi.org/10.1109/7.705889>
- Spall, J. C. and Chin, D. C. (1997), "Traffic-Responsive Signal Timing for System-Wide Traffic Control," *Transportation Research, Part C*, vol. 5, pp. 153–163 (preliminary version is Preprint 97-0454 for 1997 Transportation Research Board Annual Meeting).
- Spall, J. C. (1997), "System Understanding and Statistical Uncertainty Bounds from Limited Test Data," *Johns Hopkins APL Technical Digest*, vol. 18(4), pp. 473–483 (a preliminary version of this paper was chosen as the best paper in the Test and Evaluation Working Group at the 63rd Military Operations Research Society Symposium, Annapolis, MD, June 1995). <http://www.jhuapl.edu/techdigest/TD/td1804/spall.pdf>
- Cesar-Spall, K. and Spall, J. C. (1997), "Regression Analysis as an Aid in Making Oboe Reeds," *Journal of Testing and Evaluation* (published by ASTM), vol. 25, pp. 439–444 (a full-length article discussing this paper was published in the *New York Times*, 21 October 1997).
- Spall, J. C. and Cristion, J. A. (1997), "A Neural Network Controller for Systems with Unmodeled Dynamics with Applications to Wastewater Treatment," *IEEE Transactions on Systems, Man, and Cybernetics—B*, vol. 27, pp. 369–375. <http://dx.doi.org/10.1109/3477.584945>
- Spall, J. C. (1997), "A One-Measurement Form of Simultaneous Perturbation Stochastic Approximation," *Automatica*, vol. 33, pp. 109–112.
- Spall, J. C. (1995), "The Kantorovich Inequality for Error Analysis of the Kalman Filter with Unknown Noise Distributions," *Automatica*, vol. 31, pp. 1513–1517.
- Spall, J. C. and Nelson, J. B. (1995), Review of Book "Numerical Methods for Stochastic Processes" (by N. Bouleau and D. Lepingle), *Technometrics*, vol. 37, pp. 236–237.
- Maryak, J. L., Spall, J. C., and Silberman, G. L. (1995), "Uncertainties for Recursive Estimators in Nonlinear State-Space Models, with Applications to Epidemiology," *Automatica*, vol. 31(12), pp. 1889–1892. [http://dx.doi.org/10.1016/0005-1098\(95\)00109-9](http://dx.doi.org/10.1016/0005-1098(95)00109-9)
- Spall, J. C. and Cristion, J. A. (1994), "Nonlinear Adaptive Control Using Neural Networks: Estimation with a Smoothed Simultaneous Perturbation Gradient Approximation," *Statistica Sinica*, vol. 4, pp. 1–27 (invited submission from the American Mathematical Society Research Conference on Multivariate Time Series, Seattle, WA, July 1991).

- Hill, S. D. and Spall, J. C. (1994), "Sensitivity of a Bayesian Analysis to the Prior Distribution," *IEEE Transactions on Systems, Man, and Cybernetics*, vol. 24, pp. 216–221.
- Spall, J. C. (1993), "The Distribution of Nonstationary Autoregressive Processes Under General Noise Conditions," *Journal of Time Series Analysis*, vol. 14, pp. 317–330 (correction: vol. 14, 1993, p. 550).
- Spall, J. C. and Maryak, J. L. (1992), "A Feasible Bayesian Estimator of Quantiles for Projectile Accuracy from Non-i.i.d. Data," *Journal of the American Statistical Association*, vol. 87, pp. 676–681.
- Spall, J. C. (1992), "Guest Editor's Introduction" (to special issue on "Statistical Modeling at APL"), *Johns Hopkins APL Technical Digest*, vol. 13, pp. 284–285.
- Spall, J. C. (1992), "Multivariate Stochastic Approximation Using a Simultaneous Perturbation Gradient Approximation," *IEEE Transactions on Automatic Control*, vol. 37(3), pp. 332–341. <http://dx.doi.org/10.1109/9.119632>
- Spall, J. C. (1991), "The Kalman Filter and BLUP," invited discussion on "That BLUP is a Good Thing: The Estimation of Random Effects," by G. K. Robinson, *Statistical Science*, vol. 6, pp. 39–41.
- Spall, J. C. and Garner, J. P. (1990), "Parameter Identification for State-Space Models with Nuisance Parameters," *IEEE Transactions on Aerospace and Electronic Systems*, vol. 26(6), pp. 992–998. <http://dx.doi.org/10.1109/7.62251>
- Spall, J. C. and Chin, D. C. (1990), "First-Order Data Sensitivity Measures with Applications to a Multivariate Signal-Plus-Noise Problem," *Computational Statistics and Data Analysis*, vol. 9, pp. 297–307. [http://dx.doi.org/10.1016/0167-9473\(90\)90111-T](http://dx.doi.org/10.1016/0167-9473(90)90111-T)
- Spall, J. C. and Hill, S. D. (1990), "Least-Informative Bayesian Prior Distributions for Finite Samples Based on Information Theory," *IEEE Transactions on Automatic Control*, vol. 35(5), pp. 580–583. <http://dx.doi.org/10.1109/9.53528>
- Maryak, J. L. and Spall, J. C. (1990), "Weak Convergence and the Exponential Rate of Concentration for Posterior Density Functions," *Statistics and Probability Letters*, vol. 10, pp. 273–278.
- Spall, J. C. (1989), "Effect of Imprecisely Known Nuisance Parameters on Estimates of Primary Parameters," *Communications in Statistics: Theory and Methods*, vol. 18(1), pp. 219–237.
- Spall, J. C. (1988), "Bayesian Error Isolation for Models of Large-Scale Systems," *IEEE Transactions on Automatic Control*, vol. 33(4), pp. 341–347 (this paper received the award for outstanding research publication at JHU/APL, 1988). <http://dx.doi.org/10.1109/9.192188>
- Spall, J. C. (1988), "The Effect of the Sample on the Posterior Probability in Bayesian Analysis," *Communications in Statistics: Theory and Methods*, vol. 17, pp. 1811–1827.
- Spall, J. C. (1988), "An Overview of Key Developments in Dynamic Modeling and Estimation," in *Bayesian Analysis of Time Series and Dynamic Models* (J. C. Spall, ed.), Marcel Dekker, New York, pp. xv–xxvii.
- Hill, S. D. and Spall, J. C. (1988), "Shannon Information-Theoretic Priors for State Space Model Parameters," in *Bayesian Analysis of Time Series and Dynamic Models* (J. C. Spall, ed.), Marcel Dekker, New York, Chapter 18, pp. 509–524.
- Maryak, J. L. and Spall, J. C. (1987), "Conditions for the Insensitivity of the Posterior Distribution to the Choice of Prior Distribution," *Statistics and Probability Letters*, vol. 5, pp. 401–407.
- Spall, J. C. (1986), "An Approximation for Analyzing a Broad Class of Implicitly and Explicitly Defined Estimators," *Communications in Statistics: Theory and Methods*, vol. 15, pp. 3747–3762.

- Spall, J. C. (1985), “Validation of State-Space Models from a Single Realization of Non-Gaussian Measurements,” *IEEE Transactions on Automatic Control*, vol. 30, pp. 1212–1214.
- Spall, J. C. (1985), “An Implicit Function Based Procedure for Analyzing Maximum Likelihood Estimates from Nonidentically Distributed Data,” *Communications in Statistics: Theory and Methods*, vol. 14, pp. 1719–1730.
- Spall, J. C. (1984), “Isolating Sources of Errors in Models of Dynamic Systems,” in *Developments in Science and Technology* (edited at the Johns Hopkins University, Applied Physics Laboratory, Laurel, Maryland), pp. 60–62. <http://handle.dtic.mil/100.2/ADA229872>
- Spall, J. C. and Wall, K. D. (1984), “Asymptotic Distribution Theory for the Kalman Filter State Estimator,” *Communications in Statistics: Theory and Methods*, vol. 13, pp. 1981–2003. <http://dx.doi.org/10.1080/03610928408828808>

Articles Submitted and/or Accepted

- Guo, S. and Spall, J. C. (2018), “Relative Accuracy of Two Methods for Approximating Observed Fisher Information,” in *Data-Driven Filter and Control Design: Methods and Applications* (C. Novara and S. Formentin, eds.), IET Press, London (invited article), submitted.
- Zhu, J. and Spall, J. C. (2018), “Probabilistic Bounds in Tracking a Jump Process,” *Proceedings of the IEEE Conference on Decision and Control*, Miami, FL, 17–19 December 2018, accepted (invited paper).
- Maranzano, C. J. and Spall, J. C. (2018), “Maximum Likelihood Reliability Estimation from Subsystem and Full System Tests: Method Overview and Illustrative Examples,” *Johns Hopkins APL Technical Digest*, submitted.
- Zhao, X. and Spall, J. C. (2018), “Modeling Transportation Networks Using Integrated Route and Link Data,” *IEEE Transactions on Intelligent Transportation Systems*, submitted.
- Hernández, K. and Spall, J. C. (2018), “Generalization of Result of Fabian on the Asymptotic Normality of Stochastic Approximation,” *Automatica*, conditionally accepted.
- Lam, X. and Spall, J. C. (2017), “Relative Performance of Expected and Observed Fisher Information for Covariance Matrices of Estimates,” *Journal of Multivariate Analysis*, submitted.
- Hutchison, D. W., Spall, J. C., and Hou, Y. (2018), “Stopping Stochastic Approximation in Finite Samples,” *Automatica*, provisionally accepted.
- Brown, I. K., Cooper, J., Norouzi, F., Alston, J., Zhao, X., and Spall, J. C. (2019), “Reducing Data Dependence of Traffic Links: An Optimization Approach,” *Transportation Research Record*, submitted.

Partial List of Conference Articles Appearing in Proceedings Volumes (Most are Refereed)

- Wang, L., Zhu, J., and Spall, J. C. (2018), “Mixed Simultaneous Perturbation Stochastic Approximation for Gradient-Free Optimization with Noisy Measurements,” *Proceedings of the American Control Conference*, Milwaukee, WI, 27–29 June 2018, pp. 3774–3779.
- Wang, L., Bian, G., Spall, J. C., and Schafer, B. W. (2018), “Combining Subsystem and Full System Data with Application to Cold-Formed Steel Shear Wall,” *Proceedings of the American Control Conference*, Milwaukee, WI, 27–29 June 2018, pp. 272–277.
- Zhao, X. and Spall, J. C. (2018), “A Markovian Framework for Modeling Dynamic Network Traffic,” *Proceedings of the American Control Conference*, Milwaukee, WI, 27–29 June 2018, pp. 6166–6621.

- Wang, L. and Spall, J. C. (2017), “Beyond the Identification of Reliability for System with Binary Subsystems,” *Proceedings of the American Control Conference*, Seattle, WA, 24–26 May 2017, pp. 158–163.
- Meng, L. and Spall, J. C. (2017), “Efficient Computation of the Fisher Information Matrix in the EM Algorithm,” *Proceedings of the 51st Annual Conference on Information Sciences and Systems*, Baltimore, MD, 22–24 March 2017. <http://dx.doi.org/10.1109/CISS.2017.7926126>
- Zhu, J. and Spall, J. C. (2016), “Tracking Capability of Stochastic Gradient Algorithm with Constant Gain,” *Proceedings of the IEEE Conference on Decision and Control*, Las Vegas, NV, 12–14 December 2016, pp. 4522–4527 (invited paper).
<http://dx.doi.org/10.1109/CDC.2016.7798957>
- Botts, C. H., Spall, J. C., and Newman, A. J. (2016), “Multi-Agent Surveillance and Tracking Using Cyclic Stochastic Gradient,” *Proceedings of the American Control Conference*, Boston, MA, 6–8 July 2016, pp. 270–275. <http://dx.doi.org/10.1109/ACC.2016.7524927>
- Zhao, X. and Spall, J. C. (2016), “Estimating Travel Time in Urban Traffic by Modeling Transportation Network Systems with Binary Subsystems,” *Proceedings of the American Control Conference*, Boston, MA, 6–8 July 2016, pp. 803–808.
<http://dx.doi.org/10.1109/ACC.2016.7525012>
- Hernández, K. and Spall, J. C. (2016), “Asymptotic Normality and Efficiency Analysis of the Cyclic Seesaw Stochastic Optimization Algorithm,” *Proceedings of the American Control Conference*, Boston, MA, 6–8 July 2016, pp. 7255–7260.
<http://dx.doi.org/10.1109/ACC.2016.7526818>
- Rastogi, P., Zhu, J., and Spall, J. C. (2016), “Efficient Implementation of Enhanced Adaptive Simultaneous Perturbation Algorithms,” *Proceedings of the 50th Annual Conference on Information Sciences and Systems*, Princeton, NJ, 16–18 March 2016, pp. 298–303.
<https://doi.org/10.1109/CISS.2016.7460518>
- Chung, T. H. and Spall, J. C. (2015), “Integrated Stochastic Optimization and Statistical Experimental Design for Multi-Robot Target Tracking,” *Proceedings of the Winter Simulation Conference* (L. Yilmaz et al., eds.), Huntington Beach, CA, 6–9 December 2015, pp. 2463–2474.
- Hernández, K. and Spall, J. C. (2015), “System Identification for Multi-Sensor Data Fusion,” *Proceedings of the American Control Conference*, Chicago, IL, 1–3 July 2015, pp. 3931–3936.
- Zhu, J. and Spall, J. C. (2015), “Error Bound Analysis of the Least-Mean-Squares Algorithm in Linear Models,” *Proceedings of the 49th Annual Conference on Information Sciences and Systems*, Baltimore, MD, 18–20 March 2015. <http://dx.doi.org/10.1109/CISS.2015.7086870>
- Peterson, C. K., Newman, A. J., and Spall, J. C. (2014), “Simulation-Based Examination of the Limits of Performance for Decentralized Multi-Agent Surveillance and Tracking of Undersea Targets,” in *Signal Processing, Sensor Fusion, and Target Recognition XXIII* (I. Kadar, ed.), *Proceedings of SPIE*, paper 9091-15, Baltimore, MD, 5–9 May 2014.
<http://dx.doi.org/10.1117/12.2050628>
- Hernández, K. and Spall, J. C. (2014), “Cyclic Stochastic Optimization with Noisy Function Measurements,” *Proceedings of the American Control Conference*, 4–6 June 2014, Portland, OR, pp. 5204–5209. <http://dx.doi.org/10.1109/ACC.2014.6859444>
- Wang, Q. and Spall, J. C. (2014), “Discrete Simultaneous Perturbation Stochastic Approximation for Resource Allocation in Public Health,” *Proceedings of the American Control Conference*, Portland, OR, 4–6 June 2014, pp. 3639–3644. <http://dx.doi.org/10.1109/ACC.2014.6859387>

- Spall, J. C. (2013), "Parameter Estimation for Systems with Binary Subsystems," *Proceedings of the American Control Conference*, Washington, DC, 17–19 June 2013, pp. 83–88.
- Wang, Q. and Spall, J. C. (2013), "Rate of Convergence Analysis of Discrete Simultaneous Perturbation Stochastic Approximation Algorithm," *Proceedings of the American Control Conference*, Washington, DC, 17–19 June 2013, pp. 4778–4783.
<http://dx.doi.org/10.1109/ACC.2013.6580576>
- Spall, J. C. (2013), "Maximum Likelihood-Based Estimation of Parameters in Systems with Binary Subsystems," *Proceedings of the 47th Annual Conference on Information Sciences and Systems*, Baltimore, MD, 20–22 March 2013.
- Spall, J. C. (2012), "Asymptotic Normality and Uncertainty Bounds for Reliability Estimates from Subsystem and Full System Tests," *Proceedings of the American Control Conference*, Montréal, Canada, 27–29 June 2012, pp. 56–61 (chosen as the best paper in the session, "Stochastic Systems"). <http://dx.doi.org/10.1109/ACC.2012.6315429>
- Cao, X. and Spall, J. C. (2012), "Relative Performance of Expected and Observed Fisher Information in Covariance Estimation for Maximum Likelihood Estimates," *Proceedings of the American Control Conference*, Montréal, Canada, 27–29 June 2012, pp. 1871–1876.
<http://dx.doi.org/10.1109/ACC.2012.6315584>
- Das, S., Spall, J. C., and Ghanem, R. (2012), "Sensor Configuration and Optimization for Detection of Micro-Anomalies in Structural Materials," *Proceedings of the 53rd AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference*, Honolulu, HI, 23–26 April 2012. <http://dx.doi.org/10.2514/6.2012-1363>
- Spall, J. C. (2011), "Cyclic Seesaw Optimization and Identification," *Proceedings of the Joint IEEE Conference on Decision and Control and European Control Conference*, Orlando, FL, 12–15 December 2011, pp. 4442–4447.
- Maranzano, C. J. and Spall, J. C. (2011), "Framework for Estimating System Reliability from Full System and Subsystem Tests with Dependence on Dynamic Inputs," *Proceedings of the Joint IEEE Conference on Decision and Control and European Control Conference*, Orlando, FL, 12–15 December 2011, pp. 6666–6671.
- Wang, Q. and Spall, J. C. (2011), "Discrete Simultaneous Perturbation Stochastic Approximation on Loss Functions with Noisy Measurements," *Proceedings of the American Control Conference*, San Francisco, CA, 29 June–1 July 2011, pp. 4520–4525.
<http://dx.doi.org/10.1109/ACC.2011.5991407>
- Hill, S. D., Spall, J. C., and Maranzano, C. J. (2011), "Inequality-Based Reliability Estimates for Complex Systems," *Proceedings of the American Control Conference*, San Francisco, CA, 29 June–1 July 2011, pp. 48–53.
- Spall, J. C. (2011), "Cyclic Seesaw Optimization with Applications to State-Space Model Identification," *Proceedings of the 45th Annual Conference on Information Sciences and Systems*, Baltimore, MD, 23–25 March 2011. <http://dx.doi.org/10.1109/CISS.2011.5766196>
- Spall, J. C. (2010), "Convergence Analysis for Maximum Likelihood-Based Reliability Estimation from Subsystem and Full System Tests," *Proceedings of the IEEE Conference on Decision and Control*, Atlanta, GA, 15–17 December 2010, pp. 2017–2022.
- Maranzano, C. J. and Spall, J. C. (2010), "Implementation and Application of Maximum Likelihood Reliability Estimation from Subsystem and Full System Tests," *Proceedings of the Performance Metrics for Intelligent Systems (PerMIS) Workshop*, Baltimore, MD, 28–30 September 2010, paper WED-AM1-3.

- Maranzano, C. J. and Spall, J. C. (2010), "Robust Test Design for Reliability Estimation with Modeling Error when Combining Full System and Subsystem Tests," *Proceedings of the American Control Conference*, Baltimore, MD, 30 June–2 July 2010, pp. 3741–3746.
- Cao, X. and Spall, J. C. (2009), "Preliminary Results on Relative Performance of Expected and Observed Fisher Information," *Proceedings of the Joint IEEE Conference on Decision and Control and Chinese Control Conference*, Shanghai, P.R. China, 16–18 December 2009, pp. 1538–1543.
- Hutchison, D. W. and Spall, J. C. (2009), "Stopping Small-Sample Stochastic Approximation," *Proceedings of the American Control Conference*, St. Louis, MO, 10–12 June 2009, pp. 26–31.
- Spall, J. C. (2009), "System Reliability Estimation and Confidence Regions from Subsystem and Full System Tests," *Proceedings of the American Control Conference*, St. Louis, MO, 10–12 June 2009, pp. 5067–5072.
- Spall, J. C. (2008), "Reliability Estimation and Confidence Regions from Subsystem and Full System Tests via Maximum Likelihood," *Proceedings of the Performance Metrics for Intelligent Systems (PerMIS) Workshop*, NIST, Gaithersburg, MD, 19–21 August 2008, paper TUE-AM1-2.
- Spall, J. C. (2008), "Improved Methods for Monte Carlo Estimation of the Fisher Information Matrix," *Proceedings of the American Control Conference*, Seattle, WA, 11–13 June 2008, pp. 2395–2400. <http://dx.doi.org/10.1109/ACC.2008.4586850>
- Das, S., Spall, J. C., and Ghanem, R. (2007), "An Efficient Calculation of Fisher Information Matrix: Monte Carlo Approach Using Prior Information," *Proceedings of the IEEE Conference on Decision and Control*, New Orleans, LA, 12–14 December 2007, pp. 963–968 (invited paper).
- Hill, S. D. and Spall, J. C. (2007), "Variance of Upper Bounds in Inequality-Based Reliability," *Proceedings of the American Control Conference*, New York, NY, 11–13 July 2007, pp. 2320–2321.
- Newman, A. J., Spall, J. C., Mitzel, G. M., Porter, D. W., Walton, W. C. et al. (2007) "DTCWC Upstream Data Fusion: Feature-Based Fusion, Sensor Bias Compensation, and Northern Edge 2006 Field Demonstration," *Proceedings of the 2007 MSS National Symposium on Sensor and Data Fusion*, McLean, VA, June 2007, paper SE05.
- Spall, J. C. (2006), "Convergence Analysis for Feedback- and Weighting-Based Jacobian Estimates in the Adaptive Simultaneous Perturbation Algorithm," *Proceedings of the IEEE Conference on Decision and Control*, San Diego, California, 13–15 December 2006, pp. 5669–5674.
- Spall, J. C. (2006), "Feedback and Weighting Mechanisms for Improving Jacobian (Hessian) Estimates in the Adaptive Simultaneous Perturbation Algorithm," *Proceedings of the American Control Conference*, Minneapolis, MN, 14–16 June 2006, pp. 3086–3091.
- Spall, J. C. (2006), "Seesaw Method for Combining Parameter Estimates," *Proceedings of the American Control Conference*, Minneapolis, MN, 14–16 June 2006, pp. 5154–5159.
- Hutchison, D. W. and Spall, J. C. (2005), "A Method for Stopping Nonconvergent Stochastic Approximation Processes," *Proceedings of the Joint IEEE Conference on Decision and Control and European Control Conference*, Seville, Spain, 12–15 December 2005, pp. 6620–6625 (paper ThA10.2) (invited paper).
- Spall, J. C. (2004), "Cramér-Rao Bounds and Monte Carlo Calculation of the Fisher Information Matrix in Difficult Problems," *Proceedings of the American Control Conference*, Boston, MA, 29 June–2 July 2004, pp. 3140–3145.

- Song, Q, Spall, J. C., and Soh, Y. C. (2003), "Robust Neural Network Tracking Controller Using Simultaneous Perturbation Stochastic Approximation," *Proceedings of the IEEE Conference on Decision and Control*, Maui, Hawaii, 9–12 December 2003, pp. 6194–6199.
- Wang, I.-J. and Spall, J. C. (2003), "Stochastic Optimization with Inequality Constraints Using Simultaneous Perturbations and Penalty Functions," *Proceedings of the IEEE Conference on Decision and Control*, Maui, Hawaii, 9–12 December 2003, pp. 3808–3813.
- Stark, D. R. and Spall, J. C. (2003), "Rate of Convergence in Evolutionary Computation," *Proceedings of the American Control Conference*, Denver, CO, 4–6 June 2003, pp. 1932–1937.
- Spall, J. C. (2003), "Monte Carlo-Based Computation of the Fisher Information Matrix in Non-Standard Settings," *Proceedings of the American Control Conference*, Denver, CO, 4–6 June 2003, pp. 3797–3802 (chosen as the best paper in the session, "Probabilistic Approaches to Identification and Model Validation").
- Spall, J. C. (2002), "Estimation via Markov Chain Monte Carlo," *Proceedings of the American Control Conference*, Anchorage, AK, 8–10 May 2002, pp. 2559–2564 (invited paper).
- Stark, D. R. and Spall, J. C. (2001), "Computable Bounds on the Rate of Convergence in Evolutionary Computation," *Proceedings of the American Control Conference*, Arlington, VA, 25–27 June 2001, pp. 918–922.
- Spall, J. C. (1999), "The Information Matrix in Control: Computation and Some Applications," *Proceedings of the IEEE Conference on Decision and Control*, Phoenix, AZ, 7–10 December 1999, pp. 2367–2372 (invited paper).
- Spall, J. C., Hill, S. D., and Stark, D. R. (1999), "Some Theoretical Comparisons of Evolutionary Computation and Other Optimization Approaches," *Proceedings of the Congress on Evolutionary Computation*, Washington, DC, 6–9 July 1999, pp. 1398–1405.
- Spall, J. C. (1999), "Adaptive Model Fitting with Time-Varying Input Variables," *Proceedings of the American Control Conference*, San Diego, CA, June 1999, pp. 1435–1440.
- Wang, I.-J. and Spall, J. C. (1999), "Simultaneous Perturbation Stochastic Approximation Algorithm Based on Penalty Functions," *Proceedings of the American Control Conference*, San Diego, CA, 2–4 June 1999, pp. 393–399 (invited paper).
- Chin, D. C., Spall, J. C., and Smith, R. H. (1999), "Evaluation of System-Wide Traffic Signal Control Using Stochastic Optimization and Neural Networks," *Proceedings of the American Control Conference*, San Diego, CA, 2–4 June 1999, pp. 2188–2194 (also Transportation Research Board 77th Annual Meeting, January 1998, Preprint 98-1230).
- Spall, J. C. (1998), "Adaptive Stochastic Approximation by the Simultaneous Perturbation Method," *Proceedings of the IEEE Conference on Decision and Control*, Tampa, FL, December 1998, pp. 3872–3879.
- Spall, J. C. (1998), "Resampling-Based Calculation of the Information Matrix in Nonlinear Statistical Models," *Proceedings of the 4th Joint Conference on Information Sciences*, Raleigh, NC, October 1998, vol. 4, pp. 35–39 (invited paper).
- Hill, S. D. and Spall, J. C. (1998), "Inequality-Based Reliability Estimates for Complex Systems," *Proceedings of the American Control Conference*, Philadelphia, PA, 24–26 June 1998, pp. 1177–1179.
- Sadegh, P. and Spall, J. C. (1998), "Optimal Sensor Configuration in Complex Systems," *Proceedings of the American Control Conference*, Philadelphia, PA, 24–26 June 1998, pp. 3575–3579.

- Spall, J. C. (1997), "Accelerated Second-Order Stochastic Optimization Using Only Function Measurements," *Proceedings of the IEEE Conference on Decision and Control*, San Diego, CA, December 1997, pp.1417–1424.
- Spall, J. C. (1997), "An Overview of the Simultaneous Perturbation Method for Efficient Optimization," *Proceedings of the ASCE International Conference on Airport Modeling and Simulation*, Arlington, VA, August 1997, pp. 141–154 (invited paper).
- Maryak, J. L., Spall, J. C., and Heydon, B. D. (1997), "Use of the Kalman Filter for Inference in State-Space Models with Unknown Noise Distributions," *Proceedings of the American Control Conference*, Albuquerque, NM, June 1997, pp. 2127–2132.
- Spall, J. C., Asher, M. S., and Maryak, J. L. (1996), "A Neural Network Approach to Nondestructive Evaluation of Complex Structures, with Applications to Highway Bridges," *Proceedings of the International Conference on Neural Networks*, Washington, DC, June 1996, pp. 2154–2159.
- Spall, J. C. (1995), "Uncertainty Bounds for Parameter Identification with Small Sample Sizes," *Proceedings of the IEEE Conference on Decision and Control*, New Orleans, LA, 13–15 December 1995, pp. 3504–3515.
- Spall, J. C. (1995), "Stochastic Version of Second-Order (Newton-Raphson) Optimization using Only Function Measurements," *Proceedings of the 13th IFAC World Congress*, vol. D, San Francisco, CA, pp. 399–404.
- Spall, J. C. (1994), "A Second Order Stochastic Approximation Algorithm Using Only Function Measurements," *Proceedings of the IEEE Conference on Decision and Control*, Orlando, FL, December 1994, pp. 2472–2477.
- Spall, J. C. and Chin, D. C. (1994), "A Model-Free Approach to Optimal Signal Light Timing for Traffic Control," *Proceedings of the IEEE Conference on Decision and Control*, Orlando, FL, December 1994, pp. 1868–1875. <http://dx.doi.org/10.1109/CDC.1994.411110>
- Spall, J. C. (1994), "Developments in Stochastic Optimization Algorithms with Gradient Approximations Based on Function Measurements," *Proceedings of the Winter Simulation Conference* (J. D. Tew, M. S. Manivannan, D. A. Sadowski and A. F. Seila, eds.), Orlando, FL, pp. 207–214.
- Maryak, J. L., Spall, J. C., and Silberman, G. L. (1994), "Error Distribution and Confidence Bounds for Recursive Estimators in Nonlinear State-Space Models," *Proceedings of the American Control Conference*, Baltimore, MD, June 1994, pp. 1434–1439.
- Spall, J. C. and Cristion, J. A. (1993), "Model-Free Control of General Discrete-Time Systems," *Proceedings of the IEEE Conference on Decision and Control*, San Antonio, TX, December 1993, pp. 2792–2797.
- Spall, J. C., Silberman, G. L., and Maryak, J. L. (1992), "Confidence Bounds for the Estimation Error in Adaptive Kalman-Type Filters," *Proceedings of the American Statistical Association, Business and Economic Statistics Section*, Boston, MA, August 1992, pp. 112–117.
- Spall, J. C. and Cristion, J. A. (1992), "Direct Adaptive Control of Nonlinear Systems Using Neural Networks and Stochastic Approximation," *Proceedings of the IEEE Conference on Decision and Control*, Tucson, AZ, December 1992, pp. 878–883.
- Spall, J. C. and Cristion, J. A. (1991), "Efficient Weight Estimation in Neural Networks for Adaptive Control," *Proceedings of the American Control Conference*, Boston, MA, June 1991, pp. 16–20 (also in *Proceedings of the Test Technology Symposium IV*, Laurel, MD, 1991, sponsored by U. S. Army).

- Spall, J. C. (1990), "A New Stochastic Approximation Method with Applications to Estimation and System Identification," *Proceedings of the American Statistical Association, Business and Economic Statistics Section*, Anaheim, CA, August 1990, pp. 32–41 (invited paper).
- Maryak, J. L. and Spall, J. C. (1989), "Some Preliminary Results on Computable Berry–Esseen Bounds for Maximum Likelihood Estimates," *Proceedings of the American Statistical Association, Business and Economic Statistics Section*, Washington, DC, August 1989, pp. 357–361.
- Spall, J. C. (1989), "Bayesian Computation for Large-Dimensional Models: A Methodology for Isolating Modeling Errors," *Bulletin of the International Statistical Institute* (Book 2), Paris, France, August–September 1989, pp. 352–353.
- Garner, J. P. and Spall, J. C. (1989), "Identification of State-Space Parameters in the Presence of Uncertain Nuisance Parameters," *Proceedings of the American Control Conference*, Chicago, IL, June 1989, pp. 1226–1230.
- Spall, J. C. (1988), "A Stochastic Approximation Algorithm for Large-Dimensional Systems in the Kiefer-Wolfowitz Setting," *Proceedings of the IEEE Conference on Decision and Control*, Austin, TX, December 1988, pp. 1544–1548. <http://dx.doi.org/10.1109/CDC.1988.194588>
- Spall, J. C. (1988), "Some Preliminary Results on Inference and Confidence Intervals in Non-Gaussian State-Space Models," *Proceedings of the American Statistical Association, Business and Economic Statistics Section*, New Orleans, LA, August 1988, pp. 97–100 (invited paper).
- Hill, S. D. and Spall, J. C. (1987), "Noninformative Bayesian Priors for Large Samples Based on Shannon Information Theory," *Proceedings of the IEEE Conference on Decision and Control*, Los Angeles, CA, December 1987, pp. 1690–1693 (invited paper).
- Maryak, J. L. and Spall, J. C. (1987), "Bayesian Estimation of Quantiles of Circular Error from Non-i.i.d. Data," *Proceedings of the American Statistical Association, Business and Economic Statistics Section*, San Francisco, CA, August 1987, pp. 427–430.
- Spall, J. C. (1987), "A Stochastic Approximation Technique for Generating Maximum Likelihood Parameter Estimates," *Proceedings of the American Control Conference*, Minneapolis, MN, June 1987, pp. 1161–1167.
<http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=4789489&isnumber=4789284>
- Spall, J. C. (1986), "The Posterior Probability as a Function of Subsets of Data," *Proceedings of the American Statistical Association, Business and Economic Statistics Section*, August 1986, pp. 135–139.
- Maryak, J. L. and Spall, J. C. (1986), "On the Sensitivity of Posterior to Prior in Bayesian Analysis," *Proceedings of the American Statistical Association, Business and Economic Statistics Section*, Chicago, IL, August 1986, pp. 131–134.
- Koch, M. I. and Spall, J. C. (1986), "An Efficient Multistep Stochastic Approximation Algorithm," *Proceedings of the American Control Conference*, Seattle, WA, June 1986, pp. 1629–1632.
- Spall, J. C. (1985), "Effect of Uncertain Ancillary Parameters on Maximum Likelihood Estimates in Dynamic Models," *Proceedings of the IEEE Conference on Decision and Control*, Ft. Lauderdale, FL, December 1985, pp. 1920–1925 (invited paper).
- Maryak, J. L., Spall, J. C., and Hill, S. D. (1985), "Noninformative Bayesian Priors for a Class of Dynamic Models," *Proceedings of the American Statistical Association, Business and Economic Statistics Section*, Las Vegas, NV, August 1985, pp. 201–206.
- Spall, J. C. (1985), "A Closed Form Approximation to Implicitly Defined Maximum Likelihood Estimates," *Proceedings of the American Statistical Association, Business and Economic Statistics Section*, Las Vegas, NV, August 1985, pp. 195–200.

- Spall, J. C. and Koch, M. I. (1985), "An Approach to Isolating Sources of Errors in Invalid State-Space Models Based on Stochastic Approximation," *Proceedings of the American Control Conference*, Boston, MA, June 1985, pp. 1350–1356.
- Spall, J. C., Koch, M. I., and Maryak, J. L. (1984), "On Detecting Sources of Parameter Errors in Invalid Linear Dynamic Models," *Proceedings of the American Statistical Association, Business and Economic Statistics Section*, Philadelphia, PA, August 1984, pp. 572–576.
- Spall, J. C. (1984), "Validation of State-Space Models in Non-Gaussian Systems," *Proceedings of the American Control Conference*, San Diego, CA, June 1984, pp. 1072–1076.
- Spall, J. C. and Wall, K. D. (1982), "On Hypothesis Testing and Model Validation Employing State Estimation," *Proceedings of the IEEE International Large Scale Systems Symposium*, Virginia Beach, VA, October 1982, pp. 418–422.

Publications and Research Web Sites

- <http://www.jhuapl.edu/ISSO>: Supporting site for *Introduction to Stochastic Search and Optimization*. Contains general information, book updates, PowerPoint slides (over 250), MATLAB files, and data sets. Online beginning April 2003; most recent significant update April 2012.
- <http://www.jhuapl.edu/SPSA>: Supporting site for simultaneous perturbation stochastic approximation (SPSA) algorithm. Contains general information, links to over 300 references, MATLAB code, and online video. Online beginning March 2001; most recent significant update April 2012.

U. S. Patents

- "Method and Apparatus for Model-Free Optimal Signal Timing for System-Wide Traffic Control," J. C. Spall, inventor, U. S. Patent No. 5,668,717, 15 September 1997.
- "Method for Model-Free Control of General Discrete-Time Systems," J. C. Spall and J. A. Cristion, inventors, U. S. Patent No. 5,513,098, 30 April 1996.

Theses

- "Nonparametric Testing of State-Space Models of Dynamic Systems," Ph.D. dissertation, University of Virginia, Department of Systems Engineering, May 1983.
- "Strategies for Improving Boston's Competitiveness with Other Ports," S.M. thesis, Massachusetts Institute of Technology, Technology and Policy Program, January 1981.