

Vita
August 12, 2005

Name: Peter Charles Doerschuk

Education

<i>Degree</i>	<i>Date</i>	<i>School</i>
BSEE	June 1977	Massachusetts Institute of Technology
MSEE	June 1979	Massachusetts Institute of Technology
EE	June 1979	Massachusetts Institute of Technology
Ph.D.	June 1985	Massachusetts Institute of Technology
M.D.	March 1987	Harvard Medical School

Ph.D. Thesis:

A Markov Chain Approach to Electrocardiogram Modeling and Analysis

Honorary Society Memberships

1. Eta Kappa Nu
2. Tau Beta Pi
3. Sigma Xi

Honors and Awards

1. National Merit Scholar, won a Searle Merit Scholarship, September 1974–June 1977.
2. Fannie and John Hertz Foundation Fellow, September 1977–January 1983.
3. M.D.-Ph.D. Program Fellow, Harvard University, January 1983–December 1986.
4. Recipient of the *Ruth and Joel Spira Outstanding Teaching Award*, School of Electrical and Computer Engineering, Purdue University, 1995.
5. Recipient of the *Honeywell Award for Excellence in Teaching*, School of Electrical and Computer Engineering, Purdue University, 1997.
6. Recipient of the *Eta Kappa Nu Outstanding Teaching Award*, School of Electrical and Computer Engineering, Purdue University, 1998.
7. Recipient of the *Eta Kappa Nu Outstanding Teaching Award*, School of Electrical and Computer Engineering, Purdue University, 2000.
8. Recipient of the *Department of Biomedical Engineering Faculty Service Award*, Purdue University, 2000.
9. *University Faculty Scholar*, Purdue University, 2002–2007.
10. *Fellow of the American Institute for Medical and Biological Engineering (AIMBE)*, 2003.
11. Recipient of *The Motorola Excellence in Teaching Award*, School of Electrical and Computer Engineering, Purdue University, 2004.
12. The MIT EECS M.Eng. thesis of Keyuan Xu, co-supervised with Professor George C. Verghese of MIT EECS while I was on sabbatical at MIT, won the *Ernst A. Guillemin Thesis Prize* for the best master's thesis in EECS at MIT, June, 2004.

Professional Experience

June 1975–August 1975	Research Associate, Bernard Wolnack and Associates, Chicago, IL.
June 1976–August 1976	Staff Engineer, Charles Stark Draper Laboratory, Inc., Cambridge, MA.
June 1977–August 1977	Staff Engineer, Scientific Systems, Inc., Cambridge, MA.
June 1978–August 1978	Staff Engineer, Scientific Systems, Inc., Cambridge, MA.
January 1987–December 1987	Resident in Pathology and Clinical Teaching Fellow in Pathology at Harvard Medical School, Department of Pathology, Brigham and Women’s Hospital, Boston, MA.
January 1988–July 1990	Postdoctoral Associate, Laboratory for Information and Decision Systems, Massachusetts Institute of Technology, Cambridge, MA.
August 1990–August 1996	Assistant Professor, School of Electrical and Computer Engineering, Purdue University, West Lafayette, IN.
August 1996–August 2001	Associate Professor, School of Electrical and Computer Engineering, Purdue University, West Lafayette, IN.
August 1998–August 2001	Associate Professor, Department of Biomedical Engineering, Purdue University, West Lafayette, IN.
August 2001–Present	Professor, School of Electrical and Computer Engineering and Department of Biomedical Engineering, Purdue University, West Lafayette, IN.
August 2004–June 2005	Visiting Professor (sabbatical leave), Health Sciences and Technology and Electrical Engineering and Computer Science, Massachusetts Institute of Technology, Cambridge, MA.

Research Grants and Contracts Received

1. Principal Investigator, Purdue Research Foundation—David Ross Grant: “Bayesian Signal Reconstruction and X-ray Crystallography,” Grant No. 6901856, January 1, 1992–December 31, 1993, \$19,800 total.
2. Principal Investigator, National Science Foundation: “Research Initiation Grant: Multidimensional Bayesian Signal Reconstruction Motivated by X-ray Crystallography,” Grant No. MIP-9110919, August 15, 1991–January 31, 1994, \$60,000 total.
3. Principal Investigator, Purdue Research Foundation—PRF Research Grant: “The Analysis of X-ray Scattering from Viruses,” Grant No. 6902182, February 21, 1994–February 20, 1996, \$20,400 total.
4. Principal Investigator, Purdue Research Foundation—Summer Faculty Grant: “Virus Structure from Solution X-ray Scattering Patterns,” Account No. 703-1071-0001, Summer 1995, \$5,000 total.
5. Principal Investigator, National Science Foundation: “3D Reconstruction of Viruses from X-ray Scattering Data,” Grant No. BIR-9513594, January 1, 1996–December 31, 1998, \$137,937 total.
6. Principal Investigator, National Science Foundation: “Supplement to BIR-9513594 for Purchase of Computer,” Grant No. BIR-9513594, May 23, 1996, \$7,301 total.
7. Principal Investigator, National Science Foundation: “Joint 3D Reconstruction from Cryo Electron Microscopy and Solution X-ray Scattering Data,” Grant No. DBI-9630497, February 15, 1997–January 31, 2000, \$176,112 total.

8. Principal Investigator, Amoco Production Company: “Seismic Data Segmentation,” Account No. 670 1285-3718, July 1, 1997–June 30, 1998, \$35,310 total.
9. Co-Principal Investigator (with: S.F. Badylak, J.D. Bourland, J.A. Nyenhuis, G.R. Wodicka, co-PIs), Intel Corporation: “High Performance Computation for Biomedical Engineering,” July 1, 1997–June 30, 2000, \$98,723 total (equally shared).
10. Co-Principal Investigator (with: J.P. Allebach, M.R. Bell, C.A. Bouman, E.K.P. Chong, E. J. Coyle, E.J. Delp, S.B. Gelfand, J.V. Krogmeier, M.P. Harper, L.H. Jamieson, N.B. Shroff, M.D. Zoltowski, co-PIs), Intel Corporation: “Intel Equipment for Processing and Communication Intensive Tasks that Enable New Networked Video, Image, and Speech Applications,” July 1, 1997–June 30, 2000, \$598,000 total (equally shared).
11. Co-Principal Investigator (with: H.G. Dietz, C. Post, S. Ramadhyani, A. Sameh, H.J. Siegel, co-PIs), Intel Corporation: “SuperCluster Architecture and Systems Software” July 1, 1997–June 30, 2000, \$399,914 total (equally shared).
12. Principal Investigator (with: S. B. Gelfand, co-PI), National Science Foundation: “KDI: Global Adaptive Optimization for Structural Biology and Other Complex Signal Reconstruction, Pattern Recognition, and System Design Problems,” Grant No. MCB-9873139, January 1, 1999–December 31, 2001, \$307,199 total (equally shared).
13. Co-Principal Investigator (with: S. B. Gelfand, PI), Army Research Office: “High Performance Parallel Computer for Global Optimization in Complex Signal Reconstruction, Pattern Recognition and System Design Problems,” Contract No. DAAD19-99-1-0015, March 1, 1999–February 29, 2000, \$176,276.10 total (equally shared).
14. Faculty Mentor (with: W. A. Cramer, PI) National Institutes of Health, “Molecular Biophysics Training Grant: Biophysical Study of Proteins, Nucleic Acids, and Viruses” Grant No. 2 T32 GM08296-11, July 1, 1999–June 30, 2004, \$940,097.00 total (graduate student fellowships, no fixed shares).
15. Co-Principal Investigator July 1, 1999–December 31, 2002, Principal Investigator January 1, 2003–completion (with: Nicholas A. Peppas, initial PI; Stephen F. Badylak, Edward J. Berbari, Kinam Park, J. Paul Robinson, Jennifer L. Sinclair, Charles H. Turner, Sherry L. Voytik-Harbin, George R. Wodicka, co-PIs), National Science Foundation: “IGERT: Training Program on Therapeutic and Diagnostic Devices,” Grant No. DGE-9972770, July 1, 1999–June 30, 2004, \$2,695,012.00 total (graduate student fellowships, no fixed shares).
16. Principal Investigator, Purdue Research Foundation—PRF Grant: “3D Reconstruction of Virus Particles from Cryo Electron Microscope Images of Mixtures of Particle Types Using High-Performance Computing,” Account No. 690-1285-3367, March 14, 2000–March 14, 2002, \$26,140 total.
17. Principal Investigator (with: S. B. Gelfand, co-PI), National Science Foundation: “CISE/CCR-Numerical, Symbolic, and Geometric Computation: Computation for structural biology: tools to enable dynamic 3-D reconstruction of time-varying viral structures,” Grant No. CCR-0098156, July 15, 2001–June 30, 2004, \$251,161 total (equally shared).
18. Principal Investigator (with: S. B. Gelfand, co-PI), National Science Foundation: “CISE Research Resources: Computer cluster to support computational biology and other nonlinear signal reconstruction and system design problems,” Grant No. EIA-0130538, September 15, 2001–August 31, 2002, \$58,369 from NSF plus \$29,185 cost sharing for a total of \$87,554 (jointly utilized equipment, no fixed shares).
19. Principal Investigator (with: S. B. Gelfand, co-PI), National Science Foundation: “ITR/AP (BIO) Computational tools for determining the 3-D static and dynamic structure of viruses,” Grant No. EIA-0112672, October 1, 2001–September 30, 2004, \$359,282 total (equally shared).
20. Principal Investigator (with S. B. Gelfand, co-PI) of Purdue portion, “Implantable System for Sensing Ethanol and other Biological Signals Relevant to Alcoholism,” National Institutes of Health, July 1, 2002–June 30, 2005, \$648,516 (equally shared). This is a multiinstitutional effort

spanning Purdue University, Indiana University School of Medicine, and University of Tennessee-Oak Ridge National Laboratory and including Flextronics, Inc. The overall Principal Investigator is Sean O'Connor (IUSOM). On 24 February 2004 a supplement of \$94,407.00 (equally shared) was received for the period September 27, 2002–February 28, 2005.

21. Principal Investigator for Purdue portion, “Plant Viruses as Platforms for Biomaterials,” National Institute of Health, National Institute of Biomedical Imaging and Bioengineering, Grant No. 1R01EB000432-01, August 1, 2002–July 31, 2007, \$553,417 at Purdue. This is a multiinstitutional effort spanning Purdue University, The Scripps Research Institute, Montana State University, and University of Oklahoma. The overall Principal Investigator is John E. Johnson (TSRI).
22. Principal Investigator, “Gift in support of research and education,” Virtual Scopics, LLC, Purdue University Account No. 671-1285-4206, no expiration date, \$64,819.00.
23. Principal Investigator (with S. B. Gelfand, co-PI), National Science Foundation: “ITR: Collaborative Research: New Approaches to Experimental Design and Statistical Analysis of Genomic and Structural Biologic Data from Multiple Sources,” Grant No. CCR-0325544, October 1, 2003–September 30, 2008, \$792,031 total (equally shared). This grant is the lead component of an NSF Collaborative Research Grant that includes S. K. Mitter and D. P. Bertsekas (Massachusetts Institute of Technology, \$836,000) and B. Mishra (Courant Institute of Mathematical Sciences/NYU, \$572,239) for a total of \$2,200,270.

Professional Society Activities

- Organization: IEEE (Institute of Electrical and Electronics Engineers)
 Activity: Student Member (1979–1986), Member (1987–2003), Senior Member (2003–present)
 Member, IEEE Signal Processing Society *Image and Multidimensional Digital Signal Processing (IMDSP) Technical Committee* (2001–2006)
- Organization: American Physical Society
 Activity: Student Member (1982–1987), Member (1988–present)
- Organization: American Association for the Advancement of Science
 Activity: Member (1987–present)
- Organization: Optical Society of America
 Activity: Member (1991–present)

Ph.D. Thesis Supervision Completed

1. Chi-hsin Wu, Ph.D. (ECE), Deterministic Parallelizable Solutions for Bayesian Markov Random Field Estimation Problems, May 1994.
2. Shan Lu, Ph.D. (ECE), Nonlinear Speech Modeling with Applications to Speech Processing, December 1995.
3. Yibin Zheng, Ph.D. (ECE), Symmetry Constrained Signal Reconstruction from Spherically Averaged Fourier Transform Intensities, May 1996.
4. Wan-Chieh Pai, Ph.D. (ECE), A Modified Extended Kalman Filter Approach to Demodulation of AM-FM Signals and its Applications on Speech Signals, December 1998.
5. Yuh-Chin Chang, Ph.D. (ECE), Statistical Models for Image Restoration and Segmentation, August 2000.
6. Zhye Yin, Ph.D. (ECE), Maximum Likelihood 3-D Virus Reconstruction From Projections of Unknown Orientation and Cryo Electron Microscopy Application, August 2003.
7. Martin H. Plawecki, Ph.D. (BME), A Physiologically-Based Pharmacokinetic (PBPK) Model for Ethanol: Mathematical Foundations, Parameter Identification, and Other Applications, May 2005.

M.S. Thesis Supervision Completed

1. Shan Lu, M.S.E.E., Propagation Pathway and Phase Delay Estimation of Sound Transmitted Through Intact Human Lung, December 1992.

2. Wen Gao, M.S.E.E., 3D Reconstruction Of Virus Structure From Electron Micrographs, July 1998.
3. Cory J. Hoelting, M.S.E.E., Multi-Attribute Analysis of Seismic Data, May 2000.
4. Yili Zheng, M.S.E.E., Parallel implementations of 3-D reconstruction algorithms for cryo electron microscopy: A comparative study, August 2002.

M.S. and Ph.D. Thesis Students Currently Being Supervised

1. Jae-Joon Han, Ph.D., Stochastic nonlinear filtering problems for an ethanol biosensor. Joint with S. B. Gelfand.
2. Youngha Hwang, Ph.D., Reconstruction from Spherically-Averaged Fourier Transform Magnitude Information and Solution X-ray Scattering.
3. Junghoon Lee, Ph.D., Algorithms for Computing 3-D Reconstructions from Unoriented Projections.
4. Seunghee Lee, Ph.D., Helical Symmetry and 3-D Image Reconstruction.
5. Cory J. Prust, Ph.D., 3-D Image Reconstruction from Partially Oriented Projections.
6. Balaji Raghavan, Ph.D., Pattern Recognition and Ethanol Timeseries Analysis. Joint with S. B. Gelfand.
7. Yili Zheng, Ph.D., Systems Software for Distributed Parallel High-Performance Computing. Joint with R. Eigenmann.

EE 496 and 696 Project Supervision Completed

1. Gregory M. Molinaro, Computation of Statistics for Estimating Parameters in Markov Random Fields Used in Computational X-ray Crystallography, EE496, 1 credit, Fall 1992.
2. Stephanos D. Kotsakis, Monte Carlo Computation of Spatial Statistics in Markov Random Fields Modeling Electron Density in X-ray Crystallography, EE496, 1 credit, Fall 1992.
3. Gregory M. Molinaro, Monte Carlo Calculation of Statistics on Inter-site Distances in Three Dimensional Lattices, EE495, 3 credits, Spring 1993.
4. Stephanos D. Kotsakis, Bond Length Statistics in 3-D Lattices, EE496, 1 credit, Spring 1993.
5. Amar D. Patel, Feasibility of Simulink Interactive Simulation Software for EE440 Applications, EE495, 2 credits, Summer 1993.
6. Sanjay J. Castelino, An Optimization of C-Code to Generate Markov Random Fields, EE496, 1 credit, Fall 1993.
7. Lawrence M. Chambers, X-ray Crystallography Atomic Structure Display, EE495, 1 credit, Fall 1993.
8. Jung H. Kim, Visualization of 3D Markov Random Fields Modeling Electron Densities, EE495, 1 credit, Fall 1993.
9. Steven M. Gemelos, X-ray Crystallography Stochastic Analysis, EE495, 3 credits, Fall 1993.
10. Lawrence M. Chambers, X-ray Crystallography Atomic Structure Display, EE495, 1 credit, Spring 1994.
11. Sanjay J. Castelino, A Modification of Code to Generate Varying Symmetries of Markov Random Fields, EE496, 1 credit, Spring 1994.
12. Michelle L. Groff, Medical Tomography, EE496, 1 credit, Fall 1994.
13. Lap Wa Chan, Tomography Theory and Software, EE495, 2 credits, EE496, 1 credit, Spring 1995.
14. Yu Chen, Signal to Noise Ratio Calculations for Speech Coding, EE495, 2 credits, Spring 1995.
15. Shui Ping Mei, Analysis of Multispectral Images, EE496, 1 credit, Spring 1995.
16. Lap Wa Chan, 3D Graphics Software, EE495, 2 credits, Fall 1995.

17. Michael K. Qin, Texture Image Recognition Using Hypothesis Testing in the Frequency Domain, EE495, 2 credits, Fall 1995.
18. Jin Wang, Signals in 2-D Transform Domain Filtering, EE496, 1 credit, Fall 1995.
19. Sea Chen, 2D Tomography with Unknown Projection Orientations: Estimation of the Orientations, EE495, 1 credit, EE496, 1 credit, Spring 1996.
20. Vijay Adapala, Echo Cancellation in Speech Communication, EE495, 2 credits, Fall 1996.
21. Muhammad Naseem Aslam, Simulation for Communication Systems, EE495, 2 credits, Fall 1997.
22. Yuh-Chin Chang, Multiresolution Imaging, EE696, 3 credits, Spring 1998.
23. Tao Li, 3D Virus Reconstruction, EE696, 3 credits, Summer 1998.
24. J. Brandon Lafren, X-ray Scattering of Viruses, EE696, 3 credits, Fall 1998.
25. Jie Weng, Computer Investigation of Optimization Algorithms, EE496, 2 credits, Spring 1999.
26. Yuh-Chin Chang, Image restoration using recursive Markov random field models driven by Cauchy distributed noise, EE696, 3 credits, Fall 2000.
27. Bhavin Pandya, Locating virus particles in the “noisy” cryo electron microscope images, EE496, 1 credit, Spring 2001.
28. Nicholas R. Anderson, 3D Dynamic Graphics, EE496, 1 credit, Fall 2001.
29. Vinay R. Gahlawat, Curricular Practical Training, EE496, 1 credit, Fall 2001.
30. Kumaravelu D. Sokka, 3D Dynamic Graphics, EE496, 2 credit, Fall 2001.
31. Nicholas R. Anderson, Web 3D Virus Visualization, EE496, 1 credit, Spring 2002.
32. Vinay R. Gahlawat, Web 3D Virus Visualization, EE496, 1 credit, Spring 2002.
33. Bhavin K. Pandya, Web 3D Virus Visualization, EE496, 1 credit, Spring 2002.
34. Kumaravelu D. Sokka, Web 3D Virus Visualization, EE496, 1 credit, Spring 2002.
35. Darshan Prem Pungaliya, Matlab for Signals and Systems, EE496, 2 credits, Fall 2002.
36. Tin-Min (Grace) Cheng, Sensor Signal Processing, EE496, 1 credit, Spring 2003.
37. Michael James Parker, Computer Aided Instruction in Linear Systems, EE496, 2 credits, Spring 2003.
38. Darshan Prem Pungaliya, Sensor Signal Processing, EE496, 2 credits, Spring 2003.
39. Tin-Min (Grace) Cheng, Signal Processing for an Ethanol Sensor, EE496, 2 credit, Fall 2003.
40. Tin-Min (Grace) Cheng, Laboratory Development for EE440 *Transmission of Information*, EE496, 2 credit, Fall 2003.
41. Kadej (Gop) Suralertrungsun, Control of a Structural Biology Software System via Python Scripts and Parameter Database, 3 credit, Fall 2003.
42. Sak Mahasuverachai, Software Engineering for a Structural Biology System, 3 credit, Spring 2004.
43. Kadej (Gop) Suralertrungsun, Control of a Structural Biology Software System via Python Scripts and Parameter Database, 1 credit, Spring 2004.
44. Kyle R. Pattison, Communication System Laboratory Development, 1 credit, Spring 2004.

Undergraduate Research Assistants

1. Christopher James Owens, Summer 1999.
2. Boon-Siang Choo, Summer 1999.

Student Organization Involvement

1. *Eta Kappa Nu* Advisor (1999–present)

Courses Developed

1. EE695D “Advanced Biomedical System Identification,” offered Fall 1999 (9 students for credit).

Courses “In Charge Of”

1. EE301 Signals and Systems (1997–present). This is a junior-level undergraduate linear systems course covering both time- and frequency-domain concepts.
2. EE440 Transmission of Information (1998–present). This is a senior-level undergraduate analog and digital communication systems course emphasizing the statistical characterization of the performance of communication systems.

School of Electrical and Computer Engineering Committee Activities

1. Social Committee: member (1991–1993)
2. Curriculum Committee: member (1992–1995, 1997–2000, 2001–present)
3. Biomedical Engineering Area Committee: member (1990–present), area chair (1995–present)
4. Communications and Signal Processing Area Committee: member (1990–present)
5. Graduate Admissions Committee: member (1997–1998, 2002–present)
6. Electrical and Computer Engineering Head Search Committee: member (2001–2002)
7. Electrical and Computer Engineering Head’s Advisory Committee: member (2002–present)
8. Electrical and Computer Engineering Building Planning Committee: member (2003–present)

Department of Biomedical Engineering Committee Activities

1. Admissions Director, Interdisciplinary Graduate Program in Biomedical Engineering (1998–2002).
2. Admissions Director, Department of Biomedical Engineering (1999–2002).
3. Graduate Coordinator, Department of Biomedical Engineering (1999–present).
4. Faculty Search Committee, member (1999–present).

Engineering-Wide Committee Activities

1. Council Member, Division of Interdisciplinary Engineering Studies (1997–present).
2. Member, Subcommittee for Review of Plans of Study, Division of Interdisciplinary Engineering Studies (2000–present).
3. Engineering Dean Search Committee, member (2001).

University-Wide Committee Activities

1. Reviewer, Executive Vice President for Academic Affairs 1997-1998 Re-investment Program.
2. Graduate Council Ad Hoc Committee on Postdoctoral Education (1998–present).
3. Combined Degree Committee (Indiana University, Purdue University, IUPUI) (1999–present)
4. Combined Degree Fellowship Sub-Committee (Indiana University, Purdue University, IUPUI) (2000–present)
5. Department Of Earth and Atmospheric Sciences, Faculty Search Committee for Geophysics (1999–2000).

Other Administrative Activities

1. Graduate student recruiting, National Society of Black Engineers 27th Annual National Convention and Career Fair, March 15–17, 2001, Indianapolis IN.
2. Graduate student recruiting, National Society of Black Engineers 28th Annual National Convention and Career Fair, March 28–30, 2002, Orlando, FL.

Research Book Contributions and Books Published

1. Yibin Zheng and Peter C. Doerschuk, "3D Virus Structures from Model-Based Inverse Problems," in *System Theory: Modeling, Analysis and Control*, T. E. Djaferis and I. C. Schick (eds), Kluwer Academic Publishers, Boston, 2000, pp. 287-300 (ISBN 0-7923-8618-3).
2. Ozcan Ozturk, Peter C. Doerschuk, Saul B. Gelfand, "Determining 3-D Structure of Spherical Viruses by Global Optimization," in *Case Studies in Global Optimization* Panos M. Pardalos (ed.), in the series "Nonconvex Optimization and Its Applications," Kluwer Academic Publishers, to appear.

Serial Journal Publications

1. Peter C. Doerschuk, Donald E. Gustafson, and Alan S. Willsky, "Upper Extremity Limb Function Discrimination Using EMG Signal Analysis," *IEEE Transactions on Biomedical Engineering*, vol. BME-30, no. 1, pp. 18-29, January 1983.
2. Peter C. Doerschuk, Robert R. Tenney, and Alan S. Willsky, "Modeling Electrocardiograms Using Interacting Markov Chains," *International Journal of Systems Science*, vol. 21, no. 2, pp. 257-283, 1990.
3. Peter C. Doerschuk, Robert R. Tenney, and Alan S. Willsky, "Event Based Estimation of Interacting Markov Chains with Applications to Electrocardiogram Analysis," *International Journal of Systems Science*, vol. 21, no. 2, pp. 285-304, 1990.
4. Peter C. Doerschuk, "Bayesian Signal Reconstruction, Markov Random Fields, and X-ray Crystallography," *Journal of the Optical Society of America Series A*, vol. 8, no. 8, pp. 1207-1221, August 1991.
5. Peter C. Doerschuk, "Adaptive Bayesian Signal Reconstruction with A Priori Model Implementation and Synthetic Examples for X-ray Crystallography," *Journal of the Optical Society of America Series A*, vol. 8, no. 8, pp. 1222-1232, August 1991.
6. Peter C. Doerschuk, "Bayesian Reconstruction of Signals Invariant Under a Space Group Symmetry From Fourier Transform Magnitudes," *IEEE Transactions on Image Processing*, vol. 3, no. 4, pp. 438-449, July 1994.
7. Shan Lu, Peter C. Doerschuk, George R. Wodicka, "Parametric Phase Delay Estimation of Sound Transmitted Through Intact Human Lung," *Medical & Biological Engineering & Computing*, vol. 33, no. 3, pp. 293-298, May 1995.
8. Chi-hsin Wu, Peter C. Doerschuk, "Cluster Approximations for the Deterministic Computation of Bayesian Estimators Based on Markov Random Fields," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 17, no. 3, pp. 275-293, March 1995.
9. Chi-hsin Wu, Peter C. Doerschuk, "Tree Approximations to Markov Random Fields," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 17, no. 4, pp. 391-402, April 1995.
10. Samir Patel, Shan Lu, Peter C. Doerschuk, George R. Wodicka, "Sonic Phase Delay from Trachea to Chest Wall: Spatial and Inhaled Gas Dependence," *Medical & Biological Engineering & Computing*, vol. 33, no. 4, pp. 571-574, July 1995.
11. Yibin Zheng, Peter C. Doerschuk, "Symbolic Symmetry Verification for Harmonic Functions Invariant Under Polyhedral Symmetries," *Computers in Physics*, vol. 9, no. 4, pp. 433-437, July/August 1995.
12. Chi-hsin Wu, Peter C. Doerschuk, "Texture-based Segmentation Using Markov Random Field Models and Approximate Bayesian Estimators Based on Trees," *Journal of Mathematical Imaging and Vision*, vol. 5, no. 4, pp. 277-286, December 1995 (Invited).
13. Peter C. Doerschuk, "Cramer-Rao Bounds for Discrete-Time Nonlinear Filtering Problems," *IEEE Transactions on Automatic Control*, vol. 40, no. 8, pp. 1465-1469, August 1995.
14. Yibin Zheng, Peter C. Doerschuk, John E. Johnson, "Determination of Three-dimensional Low-resolution Viral Structure from Solution X-ray Scattering Data," *Biophysical Journal*, vol. 69, no. 2, pp. 619-639, August 1995.

15. Shan Lu, Peter C. Doerschuk, "Nonlinear Modeling and Processing of Speech Based on Sums of AM-FM Formant Models," *IEEE Transactions on Signal Processing*, vol. 44, no. 4, pp. 773–782, April 1996.
16. Yibin Zheng, Peter C. Doerschuk, "Explicit Orthonormal Fixed Bases for Spaces of Functions that are Totally Symmetric Under the Rotational Symmetries of a Platonic Solid," *Acta Crystallographica*, vol. A52, pp. 221–235, 1996.
17. Wai Ying Kan, James V. Krogmeier, Peter C. Doerschuk, "Model-Based Vehicle Tracking from Image Sequences with an Application to Road Surveillance," *Optical Engineering*, vol. 35, no. 6, pp. 1723–1729, June 1996.
18. Yibin Zheng, Peter C. Doerschuk, "Iterative Reconstruction of 3-D Objects From Averaged Fourier Transform Magnitude: Solution and Fiber X-ray Scattering Problems," *Journal of the Optical Society of America Series A*, vol. 13, no. 7, pp. 1483–1494, July 1996.
19. Shan Lu, Peter C. Doerschuk, "Performance Bounds for Nonlinear Filters," *IEEE Transactions on Aerospace and Electronic Systems*, vol. 33, no. 1, pp. 316–318, January 1997.
20. Yibin Zheng, Peter C. Doerschuk, "3D Image Reconstruction from Averaged Fourier Transform Magnitude by Parameter Estimation," *IEEE Transactions on Image Processing*, vol. 7, no. 11, pp. 1561–1570, November 1998.
21. Ann E. Rundell, Raymond A. DeCarlo, Harm HogenEsch, Peter C. Doerschuk, "The humoral immune response to *Haemophilus influenzae* Type b: A mathematical model based on T-zone and germinal center B-cell dynamics," *J. Theoretical Biology*, vol. 194, pp. 341–381, 1998.
22. Yibin Zheng, Peter C. Doerschuk, and John E. Johnson, "Symmetry-constrained 3D interpolation of viral x-ray crystallography data," *IEEE Transactions on Signal Processing*, vol. 48, no. 1, pp. 214–222, January 2000.
23. Wan-Chieh Pai and Peter C. Doerschuk, "Statistical AM-FM models, extended Kalman filter demodulation, Cramer-Rao bounds, and speech analysis," *IEEE Transactions on Signal Processing*, vol. 48, no. 8, pp. 2300–2313, August 2000.
24. Yibin Zheng and Peter C. Doerschuk, "Explicit computation of orthonormal symmetrized harmonics with application to the identity representation of the icosahedral group," *SIAM Journal on Mathematical Analysis*, vol. 32, no. 3, pp. 538–554, 2000.
25. Peter C. Doerschuk and John E. Johnson, "Ab initio reconstruction and experimental design for cryo electron microscopy," *IEEE Transactions on Information Theory*, vol. 46, no. 5, pp. 1714–1729, August 2000.
26. Yuh-Chin Chang, Srinivas R. Kadaba, Peter C. Doerschuk, Saul B. Gelfand, "Image restoration using recursive Markov random field models driven by Cauchy distributed noise," *IEEE Signal Processing Letters*, vol. 8, no. 3, pp. 65–66, March 2001.
27. Zhye Yin, Yili Zheng, and Peter C. Doerschuk, "An ab initio algorithm for low-resolution 3-D reconstructions from cryoelectron microscopy images," *Journal of Structural Biology*, vol. 133, no. 2/3, pp. 132–142, February/March 2001.
28. Po-Han Chen, Yuh-Chin Chang, Luh-Maan Chang, Peter C. Doerschuk "Application of Multiresolution Pattern Classification to Steel Bridge Coating Assessment," *J. Comp. in Civ. Engrg.*, vol. 16, no. 4, pp. 244–251, October 2002.
29. Zhye Yin, Yili Zheng, Peter C. Doerschuk, Padmaja Natarajan, and John E. Johnson, "A statistical approach to computer processing of cryo electron microscope images: virion classification and 3-D reconstruction," *J. Structural Biology*, vol. 144, pp. 24–50, 2003.
30. Zhye Yin, Peter C. Doerschuk, and Saul B. Gelfand, "Model calculations for joint pattern recognition and signal reconstruction in cryo electron microscopy," *Communications in Information and Systems*, vol. 4, no. 1, pp. 73–88, 2004. Special Issue in honor of the 70th birthday of Professor Sanjoy K. Mitter.

31. Tianwei Lin, Wilfried Schildkamp, Keith Brister, Peter C. Doerschuk, Maddury Somayazulu, Ho-kwang Mao, and John E. Johnson, "The mechanism of high pressure induced ordering in a macromolecular crystal," *Acta Crystallographica D*, vol. D61, pp. 737–743, 2005.

Conference Proceedings and Presentations

1. D. E. Gustafson, A. S. Willsky, S. K. Mitter, A. Akant, J.-Y. Wang, P. C. Doerschuk, M. E. Womble, M. C. Lancaster, J. H. Triebwasser, "A Prototype System for Automated Interpretation of Vectorcardiograms," *Proceedings of the 1977 Joint Automatic Control Conference*, June 22–24, 1977, San Francisco, CA (New York: Institute of Electrical and Electronics Engineers, 1977), pp. 776–781.
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4. Peter C. Doerschuk, Toshio M. Chin, and Alan S. Willsky, "Modeling of Cardiac Rhythms—A Signal Processing Perspective," 15th Annual Conference of the International Society for Computerized Electrocardiology, Virginia Beach, VA, April 22–27, 1990; *Journal of Electrocardiology*, vol. 23 (Supplement), pp. 102–110, 1991.
5. Peter C. Doerschuk, "Bayesian Signal Reconstruction from Fourier Transform Magnitude and X-ray Crystallography," *SPIE 36th Annual International Symposium on Optical Applied Science and Engineering*, San Diego, CA, July 21–26, 1991; *Stochastic and Neural Methods in Signal Processing, Image Processing, and Computer Vision*, Su-Shing Chen (Editor), *Proc. SPIE*, vol. 1569, pp. 70–79 (1991).
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7. Peter C. Doerschuk, "Signal Reconstruction from Fourier Transform Magnitude Using Markov Random Fields in X-ray Crystallography," *Proceedings: IEEE 1992 International Conference on Acoustics, Speech, and Signal Processing*, San Francisco, CA, March 23–26, 1992, vol. 4, pp. 141–144.
8. Peter C. Doerschuk, "X-ray Crystallography as a Bayesian Signal Reconstruction Problem," Optical Society of America, *Signal Recovery and Synthesis IV*, New Orleans, LA, April 14–16, 1992, 1992 Technical Digest Series Volume 11, pp. 28–30 (Invited).
9. Saul B. Gelfand, Peter C. Doerschuk, Mohamed Nahhas-Mohandes, "Simulated Annealing Algorithms for Continuous Optimization," *Transactions of the Tenth Army Conference on Applied Mathematics and Computing*, July 1992, ARO Report 93–1, pp. 273–281.
10. Saul B. Gelfand, Peter C. Doerschuk, M. Nahhas-Mohandes, "Continuous-State Simulated Annealing Algorithms: Theory and Application," *SPIE 37th Annual International Symposium on Optical Applied Science and Engineering*, San Diego, CA, July 19–24, 1992; *Neural and Stochastic Methods in Image and Signal Processing*, Su-Shing Chen (Editor), *Proc. SPIE*, vol. 1766, pp. 235–245 (1992).
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18. Chi-hsin Wu, Peter C. Doerschuk, "Spatial Pattern Classification for Optical Agricultural Remote Sensing," *SPIE's International Symposium on Optics, Imaging, and Instrumentation*, San Diego, CA, July 24–29, 1994; *Applications of Digital Image Processing XVII*, A. G. Tescher (Editor), *Proc. SPIE*, vol. 2298, pp. 489–496 (1994).
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23. Peter C. Doerschuk, "X-ray Crystallographic Imaging," *Proceedings: First IEEE International Conference on Image Processing*, Austin, TX, November 13–16, 1994, vol. 3, pp. 538–542 (Special Session on "Medical Imaging Modalities").
24. Yibin Zheng, Peter C. Doerschuk, John E. Johnson, "Symmetry as A Priori Information: Low-resolution Reconstruction of Viral Structure from Solution X-ray Scattering Data," Optical Society of America, *Signal Recovery and Synthesis V*, Salt Lake City, UT, March 12–17, 1995, *1995 Technical Digest Series*, vol. 11, pp. 17–19.
25. Chi-hsin Wu, Peter C. Doerschuk, "Markov Random Fields as A Priori Information for Image Restoration," Optical Society of America, *Signal Recovery and Synthesis V*, Salt Lake City, UT, March 12–17, 1995, *1995 Technical Digest Series*, vol. 11, pp. 95–97.

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33. Yibin Zheng, Peter C. Doerschuk, John E. Johnson, "3D Low-resolution Reconstruction of Viral Structure from Solution X-ray Scattering Data," *American Crystallographic Association Annual Meeting*, Montreal, Canada, July 23–28, 1995; *American Crystallographic Association Series 2*, vol. 23, abstract W155, July 23–28, 1995.
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36. Wai Ying Kan, James V. Krogmeier, Peter C. Doerschuk, "Detection and Tracking of Highway Vehicles in Image Sequences," IEEE Signal Processing Society and IS&T, The Society for Image Science and Technology, *Proceedings of the Ninth Workshop on Image and Multidimensional Signal Processing*, Belize City, Belize, March 3–6, 1996, pp. 136–137.
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38. Yibin Zheng, Peter C. Doerschuk, "3D Reconstruction of Partially Known Viral Structures from Solution X-ray Scattering Data," *Proceedings of the IEEE 1996 International Conference on Acoustics, Speech, and Signal Processing*, Atlanta, Georgia, May 7–10, 1996, vol. 4, pp. 2076–2079.

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41. Yibin Zheng, Peter C. Doerschuk, and John E. Johnson, "Determination of 3D Viral Structure from Solution X-ray Scattering," *International Union of Crystallography XVII Congress and General Assembly*, Seattle, Washington, August 8–17, 1996, Supplement to *Acta Crystallographica* vol. A52, Abstract PS14.01.10, p. C-485.
42. Yibin Zheng, Peter C. Doerschuk, John E. Johnson, "Icosahedral Harmonics and the Determination of Spherical Virus Structure," *American Society for Biochemistry and Molecular Biology Fall Symposium: Computational Biology Methods in Biomolecular Imaging*, October 25–28, 1996, Whistler, British Columbia, Canada, Abstract 32.
43. Wen Gao, Yibin Zheng, Peter C. Doerschuk, "Nonlinear Reconstruction Problems Arising in Viral Structure Determination from X-ray and Electron Microscopy Data," *1997 IEEE/EURASIP Workshop on Nonlinear Signal and Image Processing*, September 8–10, 1997, Grand Hotel, Mackinac Island, Michigan, USA; Paper no. 421, 5 pages, no page numbers (CD ROM Proceedings).
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49. Wen Gao and Peter C. Doerschuk "Reconstruction problems in 3D for viral cryo electron microscopy," *Proceedings: 1998 IEEE International Conference on Image Processing*, Chicago, IL, October 4–7, 1998, vol. 2, pp. 706–708.
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51. Peter C. Doerschuk, "Modeling viruses and processing data with icosahedral harmonics," *Workshop on Small-Angle X-ray Scattering and Diffraction in Biology*, Stanford Synchrotron Radiation Laboratory, Stanford Linear Accelerator Center, Stanford University, Palo Alto, CA, October 21, 1998, 6 pages, no page numbers (Invited).

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53. Peter C. Doerschuk, "Computation of virus structure from solution x-ray scattering and other forms of biophysical data," *Purdue Research Foundation Bio-Imaging Workshop*, January 16, 1999. No proceedings.
54. Wen Gao, Yibin Zheng, and Peter C. Doerschuk, "Inverse Problems Arising in Viral Structure Determination from X-ray and Electron Microscopy Data," *1999 IEEE Information Theory Workshop on Detection, Estimation, Classification and Imaging (DECI)*, Santa Fe, New Mexico, February 24–26, 1999, p. 16 (Invited).
55. Yuh-Chin Chang, Srinivas R. Kadaba, Peter C. Doerschuk, Saul B. Gelfand, Recursive Image Restoration Using Autoregressive Models Driven by Heavy-Tailed Noise, *Advances in Image Processing and Understanding, Workshop in Honor of Professor R. L. Kashyap On the Occasion of His 61st Birthday*, Purdue University, West Lafayette, Indiana, August 15–16, 1999. No proceedings.
56. Yibin Zheng and Peter C. Doerschuk, "3D Virus Structures from Model-Based Inverse Problems," *Advances in System Theory: A Symposium in Honor of Sanjoy K. Mitter*, Cambridge, Massachusetts, October 15–16, 1999. No proceedings.
57. Peter C. Doerschuk and John E. Johnson, "3D image reconstruction algorithms for cryo electron microscopy images of virus particles," *SPIE's 45th Annual Meeting The International Symposium on Optical Science and Technology*, San Diego, CA, July 30–August 4, 2000; *Image Reconstruction from Incomplete Data*, Michael A. Fiddy and Rick p. Millane (editors), Proc. SPIE, vol. 4123, pp. 231–242 (2000).
58. Peter C. Doerschuk, "Orientation using statistical models of virus structure and image formation," *Workshop on Single Particle Reconstruction*, National Center for Macromolecular Imaging, Baylor College of Medicine, Houston, TX, April 28–30, 2000. No proceedings, see "Workshops and Symposia" under URL <http://ncmi.bcm.tmc.edu>.
59. Peter C. Doerschuk, "Simultaneous statistical classification, orientation, and reconstruction for specimens with multiple classes of virus particles," *Workshop on Single Particle Reconstruction*, National Center for Macromolecular Imaging, Baylor College of Medicine, Houston, TX, April 28–30, 2000. No proceedings, see "Workshops and Symposia" under URL <http://ncmi.bcm.tmc.edu>.
60. Peter C. Doerschuk, Karen M. Haberstroh, Thomas J. Webster, and George R. Wodicka, "A Highly Independent Biomedical Engineering Undergraduate Curriculum: Considerations, Challenges, and Opportunities," Whitaker Foundation's Biomedical Engineering Educational Summit, Lansdowne, VA, USA, December 7–10, 2000. No proceedings, see URL <http://summit.whitaker.org/>.
61. Zhye Yin, Yili Zheng, and Peter C. Doerschuk, "3-D reconstructions from cryoelectron microscopy images," Optical Society of America, *Signal Recovery and Synthesis*, Albuquerque, NM, November 4–8, 2001, in *OSA Trends in Optics and Photonics (TOPS)*, vol. 67, Signal Recovery and Synthesis, OSA Technical Digest, Meeting Edition, (Optical Society of America, Washington DC, 2001), pp. 77–79.
62. Zhye Yin, Yili Zheng, and Peter C. Doerschuk, "Robustness of 3-D maximum likelihood reconstructions of viruses from cryo electron microscope images," *Proceedings of the IEEE 2002 International Conference on Acoustics, Speech, and Signal Processing*, vol. IV, pp. 3249–3252, Orlando, Florida, May 13–17, 2002.
63. Zhye Yin, Yili Zheng, and Peter C. Doerschuk, "A statistical model for cryo electron microscope images and 3-D reconstruction and experimental design," *Proceedings of the IEEE International Symposium on Biomedical Imaging*, pp. 673–676, Washington, DC, July 8–10, 2002.
64. Yili Zheng, Zhye Yin, and Peter C. Doerschuk, "3-D maximum likelihood reconstructions of viruses from cryo electron microscope images and parallel computation," *Proceedings of the IEEE 2002 International Conference on Image Processing*, Rochester, New York, September 22–25, 2002, vol. II, pp. 617–620.

65. Zhye Yin, Yili Zheng, and Peter C. Doerschuk, “Computational 3-D Reconstructions by Optimization for Cryo-Electron Microscopy,” *Proceedings of the Electronic Imaging 2003 Symposium*, January 20–24, 2003, Santa Clara, CA, SPIE vol. 5016, p. 71–79, 2003.
66. Zhye Yin, Yili Zheng, Peter C. Doerschuk, and John E. Johnson, “Statistical classification and 3-D reconstruction of multiple virion types from mixtures of boxed cryo electron microscopy images,” *Mont Diego Workshop*, The Scripps Research Institute, La Jolla, CA, March 28–29, 2003. No proceedings.
67. Youngha Hwang, Cory J. Prust, Peter C. Doerschuk, and John E. Johnson, “The potential for computing 3-D structure from x-ray solution scattering using strong scattering labels or orientable labels,” *Mont Diego Workshop*, The Scripps Research Institute, La Jolla, CA, March 28–29, 2003. No proceedings.
68. Zhye Yin, Peter C. Doerschuk, and Saul B. Gelfand, “Cryo Electron Microscopy of Mixed Ensembles: Simultaneous Pattern Recognition and 3-D Reconstruction,” *2003 IEEE Workshop on Statistical Signal Processing*, St. Louis, MO, September 28–October 1, 2003. Abstract only.
69. Zhye Yin, Yili Zheng, and Peter C. Doerschuk, “Inverse problems in computational biology,” *Proceedings of the Electronic Imaging 2004 Symposium*, January 18–22, 2004, San Jose, CA.
70. Martin H. Plawecki, Peter C. Doerschuk, Sean O’Connor, “Achieving both good resolution and numerous accepted trials in spectral analysis of EEG”, *27th Annual Scientific Meeting of the Research Society on Alcoholism*, Abstract 74-W-795, June 26–30, 2004, Vancouver, BC Canada. RSA Student Merit/Junior Investigator Award.
71. Junghoon Lee, Zhye Yin, Peter C. Doerschuk, and John E. Johnson, “Processing electron micrographs of spherical viruses: Joint *ab initio* 3-D reconstructions and classification,” *1st Annual Viruses and Protein Cages as Materials Conference*, August 1–3, 2004, Montana State University, Bozeman, MT.
72. Junghoon Lee, Yili Zheng, Peter C. Doerschuk, Jinghua Tang, John E. Johnson, “Maximum likelihood 3-D reconstruction of multiple viruses from mixtures of cryo electron microscope images”, in *Computational Imaging III*, edited by Charles A. Boumand and Eric L. Miller, Proceedings of SPIE-IS&T Electronic Imaging, *SPIE* vol. 5674, pp. 336–343, 2005; *IS&T/SPIE Symposium on Electronic Imaging 2005*, January 16–20, 2005, San Jose, CA.
73. Junghoon Lee, Peter C. Doerschuk, Jinghua Tang, John E. Johnson, “Computing the 3-D structure of viruses from electron microscope images”, *2005 IEEE International Conference on Acoustics, Speech, and Signal Processing, Proceedings of the IEEE 2005 International Conference on Acoustics, Speech, and Signal Processing*, vol. V, pp. 845–848, March 18–23, 2005, Philadelphia, PA, (Invited).
74. Keyuan Xu, George C. Verghese, Peter C. Doerschuk, “Evaluating Estimates of Markov Models of Sequence Evolution through Simulation”, *27th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBS)*, September 1–4, 2005, Shanghai International Convention Center, Shanghai, China. To appear in the proceedings.

Invited Lectures

1. IEEE Control Systems Society—Boston Chapter, Bedford, MA, “X-ray Crystallography as a Statistical Estimation Problem,” January 17, 1990.
2. The Purdue Electrical Engineering Industrial Institute Spring Workshop, West Lafayette, IN, “X-ray Crystallography as a Signal Processing Problem,” April 15, 1991.
3. Hillenbrand Biomedical Engineering Center, Purdue University, West Lafayette, IN, “X-ray Crystallography as a Statistical Signal Processing Problem,” June 7, 1993.
4. *Eta Kappa Nu*, Purdue University, West Lafayette, IN, “Biological X-ray Crystallography as an Electrical Engineering Problem,” September 20, 1993.
5. The Purdue Electrical Engineering Industrial Institute Workshop, West Lafayette, IN, “Classification of Spatial Patterns with Application to Remote Sensing,” April 7, 1994.

6. Biomedical Engineering Discussion Group, Purdue University, West Lafayette, IN, "Structure of Small Spherical Viruses," December 1, 1994.
7. Statistics 598A: Topics on Spatial Statistics and Image Processing, Purdue University, West Lafayette, IN, "Recent Work on Image Restoration and Spatial Pattern Classification Using Markov Random Field Models," March 23, 1995.
8. Biomedical Engineering Club, Purdue University, West Lafayette, IN, "Computing the 3D Structure of Viruses," November 29, 1995.
9. Stanford Synchrotron Radiation Laboratory, Palo Alto, CA, "The Mathematics of Icosahedral Virus Reconstruction," March 8, 1996.
10. The Scripps Research Institute, La Jolla, CA, "Reconstruction of Icosahedral Viruses from Solution X-ray Scattering Data," September 26, 1996.
11. Structural Biology Seminar, Department of Biological Sciences, Purdue University, West Lafayette, IN, "3D Low-Resolution Viral Structures from Solution X-ray Scattering Data," November 20, 1996.
12. Stochastic Systems Group, Department of Electrical Engineering and Computer Science, Massachusetts Institute of Technology, Cambridge, MA, "3D Reconstruction of Viruses from X-ray and Electron Microscopy Measurements," March 6, 1997.
13. Electrical Engineering Department, Ohio State University, Columbus, OH, "3D Signal Reconstruction Problems in Biophysics," November 4, 1997.
14. General Electrical Corporate Research and Development, Schenectady, NY, "Statistical Image Segmentation: Algorithms and Remote Sensing Applications," June 19, 1998.
15. The Purdue Electrical Engineering Industrial Institute Workshop, West Lafayette, IN, "High Performance Computation for Global Optimization," March 9, 2000.
16. Imaging Technology Group, Beckman Institute for Advanced Science and Technology, University of Illinois at Urbana-Champaign, "Cryo Electron Microscopy of Viruses and Methods for Computing 3D Reconstructions," June 29, 2000.
17. Electrical and Computer Engineering, Illinois Institute of Technology, "Tomography with unknown projection angles and the 3-D structure of viruses," April 19, 2002.
18. IEEE Computer Society, Purdue University, West Lafayette, IN, "Parallel Processing and Biomedical Imaging," September 12, 2002.
19. Department of Electrical Engineering, University of California at Los Angeles (UCLA), Los Angeles, CA, "Statistical inverse problems related to the structural biology of viruses," January 21, 2004.
20. Department of Statistics Bioinformatics Seminar Series, Purdue University, West Lafayette, IN, "3-D Reconstruction Problems for Viruses," March 2, 2004, (Professor Rebecca W. Doerge, <http://www.stat.purdue.edu/~doerge/BIOINFORM.D/SPRING04/sem.html>).
21. *Eta Kappa Nu*, Purdue University, West Lafayette, IN, "Using *ECE301* and *ECE302* tools to determine the 3-D structure of viruses," April 5, 2004.

Technical Reports

1. D. E. Gustafson, W. C. Kessel, J.-Y. Wang, P. C. Doerschuk, "Prototype VCG Interpretation Systems Operations Manual," The Charles Stark Draper Laboratory Inc., Cambridge, MA 02139, Report R-1043, Final Report to US Air Force School of Aerospace Medicine, Brooks AFB, Texas, USAF/AFSC Aeronautical Systems Division, Wright-Patterson AFB, Ohio, Contract F33615-76-C-0601, 109 pages, January 1977.
2. D. E. Gustafson, A. S. Willsky, S. K. Mitter, J.-Y. Wang, A. Akant, W. C. Kessel, P. C. Doerschuk, "Automated VCG Interpretation Studies Using Signal Analysis Techniques," The Charles Stark Draper Laboratory Inc., Cambridge, MA 02139, Report R-1044, Final Report to US Air Force School of Aerospace Medicine, Contract F41609-76-C-0009, 328 pages, January 1977.

3. D. E. Gustafson, J.-Y. Wang, W. C. Kessel, A. Akant, A. S. Willsky, S. K. Mitter, P. C. Doerschuk, S. Zisk, "Investigation of Signal Analysis Techniques for ECG/VCG Classification," Scientific Systems Inc., Cambridge, MA, Final Report to US Air Force School of Aerospace Medicine, Contract F33615-77-C-0606, 352 pages, January 1978.
4. D. E. Gustafson and P. C. Doerschuk, "Microprocessor-based Prosthesis Control: Phase I Final Report," Scientific Systems Inc., Cambridge, MA, Final Report to NSF, Contract NSF-C APR 77-19672, 95 pages, May 1978.
5. R. K. Mehra, P. C. Doerschuk, and E. F. Wood, "Sampling Analysis for the Experimental Estuary Water Treatment Plant (EEWTP)," Scientific Systems Inc., Cambridge, MA, submitted to Malcolm Pirnie, Inc., Silver Spring, MD, 344 pages, September 1978.
6. P. C. Doerschuk, "Direct Methods in Single Crystal X-ray Crystallography- Part 1: Markov Random Field Models," Laboratory for Information and Decision Systems LIDS-WP-1915, Massachusetts Institute of Technology, Cambridge, MA, 45 pages, October 1989, revised May 1990.
7. P. C. Doerschuk, "Direct Methods in Single Crystal X-ray Crystallography- Part 2: Generalizations of Mean-Field Theory," Laboratory for Information and Decision Systems LIDS-WP-1916, Massachusetts Institute of Technology, Cambridge, MA, 90 pages, October 1989.
8. P. C. Doerschuk, "Direct Methods in Single Crystal X-ray Crystallography- Part 3: The Spherical Approximation and Small-Noise Asymptotics," Laboratory for Information and Decision Systems LIDS-WP-1917, Massachusetts Institute of Technology, Cambridge, MA, 68 pages, October 1989, revised June 1990.
9. P. C. Doerschuk, "Bayesian Signal Reconstruction from Fourier Transform Magnitude in the Presence of Symmetries and X-ray Crystallography," TR-EE 92-16, School of Electrical Engineering, Purdue University, West Lafayette, IN, 102 pages, April 1992.
10. C.-h. Wu, P. C. Doerschuk, "Deterministic Parallelizable Solutions for Bayesian Markov Random Field Estimation Problems," TR-EE 94-17, School of Electrical Engineering, Purdue University, West Lafayette, IN, xii + 126 pages, May 1994.
11. P. C. Doerschuk, "Cramer-Rao Bounds for Discrete-Time Nonlinear Filtering Problems," TR-EE 94-20, School of Electrical Engineering, Purdue University, West Lafayette, IN, iii + 15 pages, May 1994.
12. Y. Zheng, P. C. Doerschuk, "Explicit Orthonormal Bases for Functions Exhibiting the Rotational Symmetries of a Platonic Solid," TR-EE 94-34, School of Electrical Engineering, Purdue University, West Lafayette, IN, iii + 49 pages, October 1994.
13. S. Lu, P. C. Doerschuk, "Nonlinear Modeling and Processing of Speech with Applications to Speech Coding," TR-ECE 95-23, School of Electrical and Computer Engineering, Purdue University, West Lafayette, IN, xii + 103 pages, October 1995.

Editorial Positions

1. Associate Editor, *IEEE Transactions on Signal Processing*, October 1995 - 1999.

Major Teaching Assignments at Purdue University

Year	Fall			Spring		
	Course	Enrollment	Evaluations	Course	Enrollment	Evaluations
2005–06	ECE440					
2004–05	Sabbatical leave at MIT					
2003–04	ECE440	35	3.28/3.11	ECE440	27	3.76/3.14
2002–03	ECE402	60	2.97/3.16	ECE301	80	3.40/3.16
2001–02	ECE440	50	3.53/2.98	ECE301	84	3.41/3.11
				ECE301	85	3.19/3.11
2000–01	ECE440	34	3.33/3.03	ECE440	35	3.34/3.03
1999–00	ECE695D	9	3.59/3.29	ECE440	23	3.62/3.06
1998–99	ECE440	44	3.42/2.99	ECE440	38	3.44/2.96
1997–98	ECE440	60	3.22/3.02	ECE440	41	3.35/2.94
1996–97	ECE201	126	2.89/3.05	ECE201	153	3.18/3.01
				ECE645	27	3.59/3.42
1995–96	ECE301	100	3.29/2.97	ECE440	42	3.51/3.07
	ECE301	99	3.35/2.97			
1994–95	ECE301		3.19/3.08	ECE440	34	3.27/3.05
1993–94	ECE440		3.6	ECE201		3.9
1992–93	ECE301		3.2	ECE440		3.8
1991–92	ECE201		3.3	ECE440		3.6
1990–91	ECE201		3.0	ECE643		3.2

Multiple rows associated with one academic year in the previous table means that I was responsible for multiple courses during one semester (e.g., Spring 1996–97) or multiple sections of one course during one semester (e.g., Spring 2001–02). Starting in Fall 1994–95 the School of Electrical and Computer Engineering reports School-wide averages on its evaluation forms, which are the denominators in the previous table, and uses a 4 point scale. Before Fall 1994–95 the School did not report School-wide averages on its evaluation forms and used a 5 point scale. Brief descriptions of the courses are:

ECE440 Transmission of Information: This is a senior-level course which covers both analog and digital communication systems at primarily the physical-layer level and which emphasizes the computation of SNRs in analog systems and bit error probabilities in digital systems. It makes extensive use of the prerequisites which are *ECE301 Signals and Systems* and *ECE302 Probabilistic Methods in Electrical and Computer Engineering*. I have written class notes and new laboratories are under development.

ECE301 Signals and Systems: This is a junior-level course on deterministic signals and, primarily, linear systems which emphasizes transform methods (continuous-time Fourier, discrete-time Fourier, bilateral Laplace, and Z transforms) and examines a variety of applications especially sampling and noise-free analog communication systems.

ECE201 Linear Circuit Analysis I: This is a sophomore-level course on linear circuits including circuit elements such as resistors, capacitors, inductors, independent and dependent sources, and operational amplifiers; circuit laws, i.e., Kirchoff's current and voltage laws; organized ways to write equations describing circuits, i.e., nodal and mesh methods; and the behavior of standard circuits such as RC and serial and parallel RLC circuits.

ECE402 EE Design Projects: This is a senior-level one-semester course in which teams of students design a project, which varies each semester, and it focuses both on process and on end result.

ECE643 Stochastic Processes in Information Systems: This is a second-level graduate course which concerns basic stochastic process ideas and applications to Markov chains and processes, point processes, etc.

ECE645 Estimation Theory: This is a second-level graduate course which concerns fundamental detection and estimation theory with communication and signal processing applications.

ECE695D Advanced Biomedical System Identification: This is a second-level graduate special topics course that concerned the theory of dynamical system identification and its application to biomedical problems.

Special Projects, Short Courses, Etc.—Contribution

1. Purdue University Course EE 621 Engineering in Medicine: Cardiovascular System, guest lectures (3 hours), Fall 1992-93, Fall 1994-95, and Fall 1996-97.
2. Purdue University Course EE 522 Problems in the Measurement of Physiological Events, guest lectures (2 hours), Spring 1996-97, and Spring 1997-98.
3. Purdue University Course BME 602 Principles of Biomedical Engineering II, guest lectures (9 hours), Spring 1997-98.
4. Purdue University Course EE 695B Principles of Biomedical Engineering I, guest lectures (9 hours), Fall 1998-99, Fall 1999-2000.

Short Courses Attended

1. 1988 Summer Program on Signal Processing, June 26–July 22, 1988, Institute for Mathematics and Its Applications, University of Minnesota, Minneapolis, Minnesota.

Other Activities

1. Program Committee, SPIE 37th Annual International Symposium on Optical Applied Science and Engineering, San Diego, CA, July 19-24, 1992, *Neural and Stochastic Methods in Image and Signal Processing*.
2. Program Committee, SPIE's 1993 Annual Meeting: International Symposium on Optical Instrumentation and Applied Science, San Diego, CA, July 11-16, 1993, *Neural and Stochastic Methods in Image and Signal Processing II*.
3. Program Committee, SPIE's 1994 Annual Meeting: International Symposium on Optics, Imaging, and Instrumentation, San Diego, CA, July 24-29, 1994, *Neural and Stochastic Methods in Image and Signal Processing III*.
4. Technical Program Committee, *First IEEE International Conference on Image Processing*, Austin, TX, November 13-16, 1994.
5. Session Chair, "Speech Analysis," *The 1995 International Conference on Acoustics, Speech, and Signal Processing*, IEEE, May 9-12, 1995.
6. Program Committee, SPIE's 1995 Annual Meeting: International Symposium on Optical Science, Engineering, and Instrumentation, San Diego, CA, July 9-14, 1995, *Neural, Morphological, and Stochastic Methods in Image and Signal Processing*.
7. Co-chair, SPIE's 1996 International Symposium on Optical Science, Engineering, and Instrumentation, Denver, CO, August 4-9, 1996, *Digital Image Recovery and Synthesis III*,
8. Session Chair, SPIE's 1996 International Symposium on Optical Science, Engineering, and Instrumentation, Denver, CO, August 4-9, 1996, *Digital Image Recovery and Synthesis III*, Session "Tomography and 3D Reconstruction."
9. Invited speaker, NSF Workshop on Research Opportunities in Biology and Control, Washington DC, November 13-14, 1995, "Drug Design".
10. Session Chair, "Computed Imaging II," *The 1998 IEEE International Conference on Image Processing*, IEEE, October 4-7, 1998.
11. Program Committee, *Advances in System Theory: A Symposium in Honor of Sanjoy K. Mitter*, Cambridge, Massachusetts, October 15-16, 1999.
12. Session introduction and moderator, "Orientation determination / 2D image comparison," *Workshop on Single Particle Reconstruction*, National Center for Macromolecular Imaging, Baylor College of Medicine, Houston, TX, April 28-30, 2000.

13. Session Chair, *Signal Recovery and Synthesis*, Optical Society of America, Albuquerque, NM, November 4-8, 2001, Session “Signal Modeling and Information.”
14. Session Chair, *IEEE 2002 International Conference on Acoustics, Speech, and Signal Processing*, Orlando, Florida, May 13-17, 2002.
15. Co-chair, Optical Society of America, *Topical Meeting on Signal Recovery and Synthesis*, 2005.
16. Chair, Optical Society of America, *Topical Meeting on Signal Recovery and Synthesis*, 2007.