Vita
October 9, 2023

Name: Peter C. Doerschuk

Education

Degree	*Date*	*School*
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

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.
13. Cornell University Merrill Presidential Scholar faculty mentor named by Ms. Yiqi Jiang, Spring 2022.

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–June 2006	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.
July 2006–present	Professor, Meinig School of Biomedical Engineering and School of Electrical and Computer Engineering, Cornell University, Ithaca, NY.

Ph.D. Thesis Supervision Completed

1. Chi-hsin Wu, Ph.D., Deterministic Parallelizable Solutions for Bayesian Markov Random Field Estimation Problems, Purdue University, School of Electrical and Computer Engineering, May 1994.
2. Shan Lu, Ph.D., Nonlinear Speech Modeling with Applications to Speech Processing, Purdue University, School of Electrical and Computer Engineering, December 1995.
3. Yibin Zheng, Ph.D., Symmetry Constrained Signal Reconstruction from Spherically Averaged Fourier Transform Intensities, Purdue University, School of Electrical and Computer Engineering, May 1996.
4. Wan-Chieh Pai, Ph.D., A Modified Extended Kalman Filter Approach to Demodulation of AM-FM Signals and its Applications on Speech Signals, Purdue University, School of Electrical and Computer Engineering, December 1998.
5. Yuh-Chin Chang, Ph.D., Statistical Models for Image Restoration and Segmentation, Purdue University, School of Electrical and Computer Engineering, August 2000.
6. Zhye Yin, Ph.D., Maximum Likelihood 3-D Virus Reconstruction From Projections of Unknown Orientation and Cryo Electron Microscopy Application, Purdue University, School of Electrical and Computer Engineering, August 2003.

7. Martin H. Plawecki, Ph.D., A Physiologically-Based Pharmacokinetic (PBPK) Model for Ethanol: Mathematical Foundations, Parameter Identification, and Other Applications, Purdue University, Weldon School of Biomedical Engineering, May 2005.
8. Jae-Joon Han, Ph.D., Statistical Signal Processing and Pattern Recognition for an Implanted Ethanol Biosensor, Purdue University, School of Electrical and Computer Engineering, August 2006 (jointly advised with Professor S. B. Gelfand).
9. Cory J. Prust, Ph.D., Model-Based Inference Problems Concerning Non-Linear 3-D Tomography with Applications to the Structural Biology of Asymmetric Virus Particles, Purdue University, School of Electrical and Computer Engineering, August 2006.
10. Junghoon Lee, Ph.D., A Fast Algorithm for Maximum Likelihood 3-D Signal Reconstruction From 2-D Projections of Unknown Orientation and Applications to the Electron Microscopy of Viruses, Purdue University, School of Electrical and Computer Engineering, December 2006.
11. Youngha Hwang, Ph.D., Reconstruction from Spherically-Averaged Fourier Transform Magnitude Information and Solution X-ray Scattering, Purdue University, School of Electrical and Computer Engineering, August 2008.
12. Yili Zheng, Ph.D., Novel statistical models and a high-performance computing toolkit for the solution of cryo electron microscopy inverse problems in viral structural biology, Purdue University, School of Electrical and Computer Engineering, August 2008.
13. Seunghee Lee, Ph.D., Maximum likelihood reconstruction of 3-D objects with helical symmetry from 2-D projections of unknown orientation and application to electron microscope images of viruses, Purdue University, School of Electrical and Computer Engineering, August 2009.
14. Kang Wang, Ph.D., Model-Based Statistical Estimation Algorithm for Functional Structural Virology, Cornell University, Graduate Field of Biomedical Engineering, December 2011.
15. Qiu Wang, Ph.D., From Homogeneous to Heterogeneous: Statistical 3-D Signal Reconstruction of Macromolecular Complexes, Cornell University, Graduate Field of Electrical and Computer Engineering, May 2013.
16. Nathan R. Cornelius, Ph.D., Mathematical Modeling and Statistical Analysis of the Cortical Microvasculature and Hemodynamic Response, Cornell University, Graduate Field of Biomedical Engineering, December 2013.
17. Ipek Ozil, Ph.D., System Identification of Dynamical Models for Signals Related to the Human Use of Ethanol, Cornell University, Graduate Field of Electrical and Computer Engineering, August 2014.
18. Nan Xu, Ph.D., Statistical modeling and inference in biological data: From brain networks to virus heterogeneity, Cornell University, Graduate Field of Electrical and Computer Engineering, May 2017.
19. Yunye Gong, Ph.D., Computational image understanding incorporating physics-based modeling and empirical learning for real-world applications, Cornell University, Graduate Field of Electrical and Computer Engineering, August 2019.

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, Purdue University, School of Electrical and Computer Engineering, December 1992.
2. Wen Gao, M.S.E.E., 3D Reconstruction Of Virus Structure From Electron Micrographs, Purdue University, School of Electrical and Computer Engineering, July 1998.
3. Cory J. Hoelting, M.S.E.E., Multi-Attribute Analysis of Seismic Data, Purdue University, School of Electrical and Computer Engineering, May 2000.
4. Yili Zheng, M.S.E.E., Parallel implementations of 3-D reconstruction algorithms for cryo electron microscopy: A comparative study, Purdue University, School of Electrical and Computer Engineering, August 2002.

5. Qiaoyun (Charlene) Chen, M.S.E.E., Nonlinear stochastic tomography reconstruction algorithms for objects with helical symmetry and applications to virus structures, Cornell University, Graduate Field of Electrical and Computer Engineering, December 2008.

M.Eng. Project Supervision Completed

1. Nathan Raj Cornelius, Image processing for scanning laser images of moving blood cells, Cornell University, Graduate Field of Electrical and Computer Engineering, May 2007 (jointly supervised with Professor Christopher B. Schaffer).
2. John Sunwoo, Computation of neural microvasculature flows from partial information derived from two-photon laser scanning microscopy, Cornell University, Graduate Field of Biomedical Engineering, August 2011.
3. Tejapratap Bollu, Inverse problems for cortical microvascular flow based on two-photon laser scanning microscopy and models for cortical perfusion, Cornell University, Graduate Field of Biomedical Engineering, May 2012.
4. Hsin-I Lin, Image processing for the detection of functional connections in brain function MRI, Cornell University, Graduate Field of Biomedical Engineering, May 2012.
5. Parallel implementation in `python` using MPI of a software system for the computation of heterogeneous 3-D reconstructions of nanometer scale objects from electron micrographs, Cornell University. The team, with various graduation dates, consisted of
   (a) Yunhan Wang; Graduate Field of Biomedical Engineering, December 2013; Graduate Field of Computer Science, August 2014.
   (b) Xiao Ma, Graduate Field of Electrical and Computer Engineering Engineering, May 2014.
   (c) Zhengyu Cai, Graduate Field of Electrical and Computer Engineering Engineering, May 2014.
   (d) Shenghan Gao, Graduate Field of Electrical and Computer Engineering Engineering, December 2014.
   (e) Yayi Li, Graduate Field of Electrical and Computer Engineering Engineering, December 2014.
   (f) Yu Tang, Graduate Field of Computer Science, May 2014.
6. Image segmentation for real-time vocal-tract MRI, Cornell University. The team, with various graduation dates, consisted of
   (a) Yaolin Wang, Graduate Field of Electrical and Computer Engineering, May 2014.
   (b) Yunbin Sang, Graduate Field of Electrical and Computer Engineering, December 2014.
7. A *python* implementation of algorithms for reconstructing the 3-D statistics of objects visualized in electron microscopy images, Cornell University. The team consisted of
   (a) Xiaofei Chang, Graduate Field of Electrical and Computer Engineering, May 2015.
   (b) Kainan Qi, Graduate Field of Electrical and Computer Engineering, May 2015.
   (c) Weidan Yan, Graduate Field of Electrical and Computer Engineering, May 2015.
   (d) Pei Heng Zeng, Graduate Field of Electrical and Computer Engineering, May 2015.
   (e) Wen Zhu, Graduate Field of Electrical and Computer Engineering, May 2015.
   (f) Yiming Jia, Graduate Field of Electrical and Computer Engineering, May 2015.
   (g) Guantian Zheng, Graduate Field of Electrical and Computer Engineering, May 2015.
   (h) Dan Zhang, Graduate Field of Electrical and Computer Engineering, May 2015.
   (i) Eva Sharma, Graduate Field of Computer Science, May 2015.
   (j) Nan Kang, Graduate Field of Electrical and Computer Engineering, May 2015.
8. Vocal tract geometry from segmentation of real-time MRI, Cornell University. The team consisted of
   (a) Tao Lu, Graduate Field of Electrical and Computer Engineering, May 2015.
   (b) Yifan Liu Graduate Field of Electrical and Computer Engineering, May 2015
9. A software simulator for resting-state functional MRI, Cornell University. The team consisted of

(a) Siyu Dong, Graduate Field of Electrical and Computer Engineering, May 2015.
(b) Seung Hoon Choe Graduate Field of Biomedical Engineering, May 2015.
(c) Chudi Huang, Graduate Field of Electrical and Computer Engineering, May 2015.
(d) Jingyi Chen, Graduate Field of Electrical and Computer Engineering, May 2015.
(e) Nan Wang, Graduate Field of Electrical and Computer Engineering, May 2015.
(f) Zheng Chen, Graduate Field of Electrical and Computer Engineering, May 2015.
(g) Tianyi Ding, Graduate Field of Electrical and Computer Engineering, May 2015.
(h) Xijia Wang, Graduate Field of Electrical and Computer Engineering, May 2015.

10. A *python* implementation of algorithms for reconstructing the 3-D statistics of objects visualized in electron microscopy images, Cornell University. The team consists of
    (a) Anqi Yu, Graduate Field of Electrical and Computer Engineering, May 2016.
    (b) Mengyuan Yang, Graduate Field of Electrical and Computer Engineering, May 2016.
11. Use of general-purpose GPUs for statistical image computations. Cornell University. The team consists of
    (a) Minmin Gong, Graduate Field of Electrical and Computer Engineering, May 2016.
    (b) Yiwen Wang, Graduate Field of Electrical and Computer Engineering, May 2016.
12. Use of MPI in `Python` for distributed-memory parallel statistical image computations. Cornell University.
    (a) Xiaokai Zhao, Graduate Field of Electrical and Computer Engineering, May 2016.
13. Mathematical models for transdermal ethanol sensors
    (a) Weiyou Dai, Graduate Field of Electrical and Computer Engineering, December 2018.
14. Deep learning for classifying particle images in cryo electron microscopy
    (a) Shuheng Lin, Graduate Field of Electrical and Computer Engineering, May 2018.
    (b) Yiqi Yu, Graduate Field of Electrical and Computer Engineering, May 2018.
15. Applications of deep learning in microscopy
    (a) Darshan Kumar S. Yaradoni, Graduate Field of Electrical and Computer Engineering, May 2019.
    (b) Anirudh Raghavendra, Graduate Field of Electrical and Computer Engineering, May 2019.
    (c) Mengfei Xiong, Graduate Field of Electrical and Computer Engineering, Started Fall 2018, degree anticipated May 2019.
    (d) Han Shi, Graduate Field of Electrical and Computer Engineering, Started Fall 2018, degree anticipated May 2019.
16. Shortening development time and increasing yield in the cleanroom via machine learning
    (a) Yixuan Wang, Graduate Field of Electrical and Computer Engineering, May 2020.
    (b) Gengqiao Xie, Graduate Field of Electrical and Computer Engineering, May 2020.
    (c) Yifei Xu, Graduate Field of Electrical and Computer Engineering, May 2020.
    (d) Xinru Zhang, Graduate Field of Electrical and Computer Engineering, May 2020.
17. Deep learning tools for use in the cleanroom
    (a) Peter A. Cook, Graduate Field of Electrical and Computer Engineering, May 2021.
18. Software to assist human-labeling of scanning electron micrographs
    (a) Jingyi Zhu, Graduate Field of Biomedical Engineering, May 2021.
19. Parallel computing in `Python` for statistical inference
    (a) Bochong Chen, Graduate Field of Electrical and Computer Engineering, December 2021.
20. Shortening development time and increasing yield in the cleanroom via machine learning
    (a) Jiaxian Chen, Graduate Field of Electrical and Computer Engineering, December 2021.

21. Parallel computing in `Python` for statistical inference. 2022 ECE M.Eng. Poster Session Winner in the "Signal and Information Processing" category.
    (a) Yue Wang, Graduate Field of Electrical and Computer Engineering, May 2022.
22. Machine learning to guide printed electronics fabrication. 2022 ECE M.Eng. Poster Session Winner in the "AI / Pattern Recognition (Computer Vision, Machine Learning, Robotics)" category.
    (a) Shuhan Ding Graduate Field of Electrical and Computer Engineering, May 2022.
    (b) Yiling Peng Graduate Field of Electrical and Computer Engineering, May 2022.
23. Shortening development time and increasing yield in the cleanroom via machine learning
    (a) Ziwang Luo, Graduate Field of Electrical and Computer Engineering, May 2022.
24. Machine learning for controlling processes in the cleanroom
    (a) Ruicheng Gong, Graduate Field of Electrical and Computer Engineering, May 2022.
    (b) Jingkun Yu, Graduate Field of Electrical and Computer Engineering, May 2022.
    (c) Yuchen Lu, Graduate Field of Electrical and Computer Engineering, May 2022.
25. Improvements to `Image Label Voter` (ILV)
    (a) Yaqun Niu, Graduate Field of Electrical and Computer Engineering, May 2022.
26. Using Lam Research Coventor software in the Microsoft Azure cloud for predicting cleanroom outcomes
    (a) Yutong Xie, Graduate Field of Electrical and Computer Engineering, May 2022.

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

1. M.Eng. Project Supervision:
   (a) Artificial intelligence and machine learning for digital twins of cleanroom tools and sequences of cleanroom tools
      i. Aditya Arcot, Graduate Field of Electrical and Computer Engineering, expected May 2024.
      ii. Miriya Pinkerman, Graduate Field of Electrical and Computer Engineering, expected May 2024.
      iii. Alexander James Scotte, Graduate Field of Electrical and Computer Engineering, expected May 2024.
      iv. Demian Yutin, Graduate Field of Electrical and Computer Engineering, expected May 2024.
   (b) Investigation of the role of AI/ML in the characterization of Lipid Nano Particles by biophysical methods for pharmaceutical applications
      i. Yiduo (Neo) Wang, Graduate Field of Electrical and Computer Engineering, expected May 2024.
      ii. Qingyuan Xie, Graduate Field of Electrical and Computer Engineering, expected May 2024.
   (c) Investigation of AI/ML tools for improving the fabrication by printing of flexible and hybrid electronics with special focus on the incorporation of ink properties
      i. Hardik Gajanan Hedaoo, Graduate Field of Electrical and Computer Engineering, expected May 2024.
      ii. Haochen Luo, Graduate Field of Electrical and Computer Engineering, expected May 2024.
      iii. Aditi Rao, Graduate Field of Electrical and Computer Engineering, expected May 2024.
      iv. Syed Askari Raza, Graduate Field of Electrical and Computer Engineering, expected May 2024.
2. M.S. thesis students

   (a) Zehui Lin, thesis in the area of AI/ML for improving the outcomes in flexible printed electonics, Graduate Field of Materials Science and Engineering, started Fall 2023.

3. Ph.D. thesis students

   (a) Christina L. Lau, Understanding the dynamics of biological nano-scale particles via single-particle cryo electron microscopy: statistical and mechanistic approaches, Graduate Field of Electrical and Computer Engineering, started Fall 2021.

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 *Global Optimization: Scientific and Engineering Case Studies*, János D. Pintér (ed), in the series "Nonconvex Optimization and Its Applications," Springer, New York, 2006, Chapter 13, pp. 301–329 (ISBN: 0-387-30408-8).
3. Fred Sigworth, Peter C. Doerschuk, Jose-Maria Carazo, Sjors H. W. Scheres, "Maximum-likelihood methods in cryo-EM. Part I: theoretical basis and overview of existing approaches", *Methods in Enzymology*, 482:263–294, 2010, Elsevier.
4. Qiu Wang, Peter C. Doerschuk, "Statistical Methods for Materials Science: The Data Science of Microstructure Characterization", Jeffrey P. Simmons, Lawrence F. Drummy, Charles A. Bouman, Marc De Graef, editors, CRC Press, Boca Raton, FL, 2019, Chapter 7, pp. 111–126 (ISBN-13: 978-1498738200).

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. https://doi.org/10.1109/TBME.1983.325162.
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. https://doi.org/10.1080/00207729008910361.
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. https://doi.org/10.1080/00207729008910362.
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. https://doi.org/10.1364/JOSAA.8.001207.
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. https://doi.org/10.1364/JOSAA.8.001222.
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. https://doi.org/10.1109/83.298397.
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. https://doi.org/10.1007/BF02510502.
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. https://doi.org/10.1109/34.368192.

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. https://doi.org/10.1109/34.385979.
10. Samir Patel, Shan Lu, Peter C. Doerschuk, George R. Wodicka, "Sonic Phase Delay from Trachae to Chest Wall: Spatial and Inhaled Gas Dependence," *Medical & Biological Engineering & Computing*, vol. 33, no. 4, pp. 571–574, July 1995. https://doi.org/10.1007/BF02522516.
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. https://doi.org/10.1063/1.168544.
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). https://doi.org/10.1007/BF01250284.
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. https://doi.org/10.1109/9.402242.
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. https://doi.org/10.1016/S0006-3495(95)79939-8.
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. https://doi.org/10.1109/78.492530.
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. https://doi.org/10.1107/S0108767395012888.
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. https://doi.org/10.1117/1.600747.
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. https://doi.org/10.1364/JOSAA.13.001483.
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. https://doi.org/10.1109/7.570795.
20. Yibin Zheng, Peter C. Doerschuk, "3-D Image Reconstruction from Averaged Fourier Transform Magnitude by Parameter Estimation," *IEEE Transactions on Image Processing*, vol. 7, no. 11, pp. 1561–1570, November 1998. https://doi.org/10.1109/83.725363.
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. https://doi.org/10.1006/jtbi.1998.0751.
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. https://doi.org/10.1109/78.815491.
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. https://doi.org/10.1109/78.852011.
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. https://doi.org/10.1137/S0036141098341770.

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. https://doi.org/10.1109/18.857786.

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. https://doi.org/10.1109/97.905941.

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. https://doi.org/10.1006/jsbi.2001.4356.

28. Po-Han Chen, Yuh-Chin Chang, Luh-Maan Chang, Peter C. Doerschuk "Application of Multiresolution Pattern Classification to Steel Bridge Coating Assessment," *J. Computing in Civil Engineering*, vol. 16, no. 4, pp. 244–251, October 2002. https://doi.org/10.1061/(ASCE)0887-3801(2002)16:4(244).

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. https://doi.org/10.1016/j.jsb.2003.09.023.

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. https://doi.org/10.4310/CIS.2004.v4.n1.a4. 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, Part 6, pp. 737–743, 2005. https://doi.org/10.1107/S0907444905000053.

32. Junghoon Lee, Peter C. Doerschuk, and John E. Johnson, "Exact Reduced-Complexity Maximum Likelihood Reconstruction of Multiple 3-D Objects from Unlabeled Unoriented 2-D Projections and Electron Microscopy of Viruses", *IEEE Transactions on Image Processing*, 16(12):2865–2878, 2007. https://doi.org/10.1109/TIP.2007.908298.

33. Jae-Joon Han, Peter C. Doerschuk, Saul B. Gelfand, and Sean J. O'Connor, "Models and signal processing for an implanted ethanol bio-sensor", *IEEE Transactions on Biomedical Engineering*, 55(2):603–613, 2008. https://doi.org/10.1109/TBME.2007.912652.

34. Martin H. Plawecki, Jae-Joon Han, Peter C. Doerschuk, Vijay Ramchandani, and Sean J. O'Connor, "Physiologically-based pharmacokinetic (PBPK) models for ethanol", *IEEE Transactions on Biomedical Engineering*, 55(12):2691–2700, 2008. https://doi.org/10.1109/TBME.2008.919132.

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pp. 262–265, September 27–30, 2015, Québec City, Canada. https://doi.org/10.1109/ICIP.2015.7350800.

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148. Yutong Xie, Benyamin Davaji, Ivan Chakarov, Sandy Wen, Michael Hargrove, David Fried, Peter C. Doerschuk, Amit Lal, "BinDev: a Metric of Geometric Accuracy for Plasma-etch 3D Modeling Using Computer Vision", SEMI Advanced Semiconductor Manufacturing Conference (ASMC) 5/1/2023–5/4/2023, The Saratoga Hilton, Saratoga Springs NY, United States. (4 pages).
149. Shuhan Ding, Yiling Peng, Benyamin Davaji, Jeremy Clark, Garry Bordonaro, Vincent Genova, Christopher K. Ober, Steve Ayres, Marco Heuser, Peter C. Doerschuk, Amit Lal, "Double U-Net based Virtual Metrology on Plasma-Etch CD-SEM Images", SEMI Advanced Semiconductor Manufacturing Conference (ASMC) 5/1/2023–5/4/2023, The Saratoga Hilton, Saratoga Springs NY, United States. (4 pages).
150. Landon Ivy, Yutong Xie, Theo Lobo, Ved Gund, Benyamin Davaji, Meera Garud, Peter C. Doerschuk, Amit Lal, "Feature Based Machine Learning for Predicting Resistances in Printed Electronics", 2023 IEEE International Conference on Flexible and Printable Sensors and Systems (FLEPS) (4 pages).

Major Teaching Assignments at Purdue University

Year	Fall			Spring		
	Course	Enrollment	Evaluations	Course	Enrollment	Evaluations
2005–06	ECE440	25	3.04/3.03	ECE440	26	4.63/4.01
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 reported School-wide averages on its evaluation forms, which are the denominators in the previous table, and used a 4 point scale from Fall 1994–95 through Fall 2005–06 and a 5 point scale starting in Spring 2005–06. 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., Kirchhoff'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.

Major Teaching Assignments at Cornell University

Year	Fall		Spring	
	Course	Enrollment	Course	Enrollment
2023-24	Math 1910	116/517	BME 4020	
2022-23	BME 2000/ENGRD 2202	82	ECE 4670/ECE 5670	11
2021-22	BME 2000/ENGRD 2202	65	ECE 4670/ECE 5670	14
	ENGRG 1050	20		
2020-21	BME 2000/ENGRD 2202	45	ECE 4670	10
2019-20	BME 2000/ENGRD 2202	38	ECE 4670	6
2018-19	BME 2000/ENGRD 2202	64	ECE 2200/ENGRD 2220	84
	ENGRG 1050	21		
2017-18	BME 2000/ENGRD 2202	65	BME 4020	31
			ECE 2200/ENGRD 2220	95
			BME 5010	88
2016-17	ECE 3950	22	BME 4020	28
	ENGRG 1050	22	ECE 2200/ENGRD 2220	88
			BME 5010	71
2015-16	No assignment in anticipation of Spring double assigment		BME 4020	5
			ECE 2200/ENGRD 2220	52
			BME 5010/BEE 5010	54
2014-15	ECE 2200	41	BME 4020	29
	BME 5010	100	BME 5010	72
	ENGRG 1050	19		
2013-14	Sabbatical leave		BME 4020	37
			BME 5010	69
2012-13	BME 7310	32	BME 7130	15
2011-12	BME 7310	37	ECE 2200	52
	ENGRG 1050	20		
2010–11	BME 7310	31	ECE 2200	96
2009–10	BME 7310	24	BME 5010	
	ENGRG 1050	20		
2008–09	BME 731	28	BME 501	
2007–08	BME 731	25	ECE 320	69
	ENGRI 150	20		
2006–07	BME 731	13	NA	

Multiple rows associated with one academic year in the previous table means that I was responsible for multiple courses during one semester (e.g., Fall 2007) or multiple sections of one course during one semester. I had no class assignment during Spring 2007 as a part of moving to Cornell.

BME731 BME7310 Advanced Biomedical Engineering Analysis of Biological Systems: A 3-credit entry graduate-level course which covers the fundamentals of quantitative analysis of biological systems especially with respect to to evolution over time and to uncertainty which is required of all BME Graduate Field Ph.D. students. It illustrates analytical methods applicable to a variety of biological systems, ranging from molecular to cellular to organ to application of whole-body systems.

BME7130 Core Concepts in Disease: A 3-credit Ph.D.-level course taught in collaboration with faculty at Weill Cornell Medical College and funded by the Howard Hughes Medical Institute (HHMI) which is required of all BME Graduate Field Ph.D. students. The goal is to describe disease mechanisms in preparation for the students' clinical exposure in BME 7160 *Immersion Experience in Medical Research and Clinical Practice* usually taking during the summer following the first year of graduate school. Most diseases emerge due to a relative small number of biological effects, including mechanisms like infection, inflammation, neoplasia, genetic mutation, protein misfolding, and metabolic disregulation. Students learn about disease-state biology by focusing on these broad disease pathways. The course consists of several modules, each focused on one broad

class of disease mechanism, and includes both a discussion of the underlying biology of the disease pathway as well as examples of specific diseases that involve those mechanisms. This course complements the training in fundamental normal-state biology students are already receiving by providing a mechanism-centered view of disease development.

BME501 BME50010 Bioengineering Seminar: A seminar focused on BME Masters of Engineering students with primarily speakers from industrial BME organizations.

ENGRI150 ENGRG1050 Engineering Seminar: A 1 credit course for entering freshmen engineers which is the mechanism by which the College of Engineering advises entering freshmen both with respect to career issues and with respect to the details of being a successful student at Cornell. The students are my advisees until they affiliate with a department sometime during their sophomore year.

BME4020 Electrical and Chemical Physiology: A 3-credit course listed at the 4000 level though it has no prerequisites and can be taken in any order with BME3010, BME3020, and BME4010. The course is required for BME undergraduate majors. Many undergraduate students taking the BME minor and many BME M.Eng. students take the course. For the offerings starting in Spring 2024, the course is primarily seniors in the BME major and is taught in an active learning mode with studios.

BME2000 Biomedical Transport Phenomena: A 3-credit sophomore-level course on transport phenomena, fluid mechanics and diffusion, which covers Chapters 1, 2, 3, 6, 7, and 10 of George A. Truskey, Fan Yuan, and David F. Katz, "Transport Phenomena in Biological Systems", Second Edition, Pearson Prentice Hall, 2009. In collaboration with Dr. Rajesh Bhaskaran (Swanson Director of Engineering Simulation), the students gain experience in using ANSYS/FLUENT which allows the solution of problems with more realistic geometry than can be achieved by pencil-and-paper calculations. The course is required for BME undergraduate majors.

ECE320 Signals, Systems, and Networks: A 3-credit junior-level course seeking to integrate and extend students understanding of the analytical and computational tools used in the design and representation of complex networks and systems. Topics include state-space techniques, finite state machines, graph-theoretic approaches to network design and analysis, complexity, phase transitions in complex systems, and scalability.

ECE 3950 Special Topic in ECE: This was a single-time offering of a 3-credit junior-level course on bio-ECE focused on the nervous system.

ECE2200 Signals and Systems: A 3-credit sophomore-level course in signals and linear systems.

ECE4670 Digital Communication System Design/ECE5670 Digital Communications A 3-credit senior-level course in physical layer digital communication systems focused on the design of software radios using Orthogonal Frequency Division Multiplexing (OFDM). ECE5670 is the co-meet course for M.Eng. students.

Math1910 Calculus for Engineers: A 3-credit freshman-level course that is essentially a second course in calculus. Topics include techniques of integration, finding areas and volumes by integration, exponential growth, partial fractions, infinite sequences and series, tests of convergence, and power series.