

ROBERT J. VANDERBEI

Operations Research and
Financial Engineering
Princeton University



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EDUCATION

<i>Cornell University</i>	1976-1981
Ph.D. in Applied Mathematics	1981
<i>Dissertation Title: "Toward a Stochastic Calculus for Several Markov Processes"</i>	
<i>Advisor: E.B. Dynkin Thesis Committee: F. Spitzer, H.M. Taylor</i>	
M.S. in Applied Mathematics	1979
<i>Rensselaer Polytechnic Institute</i>	1973-1976
M.S. in Operations Research and Statistics	1978
B.S. in Chemistry <i>Award: Rensselaer Medal</i>	1976

HONORS

SEAS Excellence in Mentoring Princeton University	2023
Member Institute for Advanced Study	2019–2020
Khachiyan Prize INFORMS Optimization Society	2017
Fellow American Mathematical Society (AMS)	2014
Fellow Society for Industrial and Applied Mathematics (SIAM)	2012
Fellow Institute for Ops. Res. and Mgmt. Sciences (INFORMS)	2006

RESEARCH INTERESTS

Interior-point methods for linear and nonlinear optimization, semi-definite programming, robust optimization, probabilistic potential theory, optimization models for high contrast imaging, the search for exosolar planets, stable periodic solutions to the n -body problem, and the stability of Saturn-like ring systems.

EMPLOYMENT/POSITIONS

*Princeton University***Department Chair**

Operations Research and Financial Engineering 2005 – 2012

Professor

Emeritus 2024 –

Operations Research and Financial Engineering 1999 –

Civil Engineering and Operations Research 1996 – 1999

Affiliated Member

Mechanical and Aerospace Engineering 2011 –

Astrophysics 2006 –

Mathematics 2003 –

Computer Science 2000 –

Applied and Computational Mathematics 1994 –

Associate Professor

Civil Engineering and Operations Research 1991 – 1996

Visiting Lecturer

Civil Engineering and Operations Research 1990 – 1991

*AT&T Bell Laboratories***Member of Technical Staff**

Mathematics Research Center 1987 – 1991

Advanced Decision Support Systems 1985 – 1987

Performance Analysis Department 1984 – 1985

*University of Illinois at Urbana-Champaign***Postdoc**

Mathematics 1982 – 1984

*Courant Institute of Mathematical Sciences at NYU***NSF Postdoctoral Research Fellow**

Mathematics 1981 – 1982

*Summer Jobs/Experiences***Cornell,** Calculus Instructor 1979**Citibank,** Summer Intern 1976, 1977, 1978**Stauffer Chemical Company,** Gas Chromatography of Vinyl Chloride 1975**Amway,** Statistical Analysis of Tergotometer Data 1974**Grand Rapids Junior College,** Organic Chemistry Lab Assistant 1972, 1973**Northern Illinois University,** NSF Summer Program in Chemistry 1971**Olivet College,** NSF Summer Program in Chemistry 1970

PLENARY TALKS

Flat Maps via Stress Minimization, **INFORMS, Philadelphia Chapter**, via Zoom February 2022.

The Parametric Self-Dual Simplex Method – A Modern Perspective, **Distinguished Lecture, Omega Rho**, Seattle WA, October 2019.

Sparsity Matters, **Khachiyan Prize Talk, INFORMS**, Houston TX, October 2017.

Numerical Optimization Applied to Space-Related Problems, **Distinguished Alumni Colloquium**, Cornell University, November 2016.

Fast Fourier Optimization, **Optimization Days**, GERAD, Montreal CA, May 2013.

Linear Optimization, **Machine-Learning Summer School**, LaPalma Canary Islands, April 2012.

Optimization in Engineering Design, **Computational Engineering and Science**, Lehigh University, October 2009.

Extreme Optics and the Search for Earth-Like Planets, **ISMP**, Rio de Janeiro, August 2006.

Nonlinear Programming and Engineering Applications (tutorial), **INFORMS**, Denver, October 2004.

Engineering Applications of Nonlinear Optimization, **AIRO**, Venice Italy, September 2003.

New Directions in Linear Programming, **INFORMS**, Miami Beach, FL, October 2001.

Interior-Point Methods for Second-Order Cone Programming, **5th International Conference on High Performance Optimization Techniques**, Rotterdam, NETHERLANDS, June 2000.

Interior-Point Methods for Semidefinite Programming, **5th International Conference on High Performance Optimization Techniques**, Rotterdam, NETHERLANDS, June 2000.

Interior-point methods for nonlinear programming and Interior-point methods for second-order cone programming and semidefinite programming, **Twenty-fifth Conference on the Mathematics of Operations Research**, Lunteren, NETHERLANDS, January 2000.

Nonlinear Optimization: Algorithms and Models, **Large-Scale Nonlinear Optimization**, Erice, SICILY, July 2001.

Switching among Several Brownian Motions, **Twentieth Conference on Stochastic Processes and their Applications**, Nahariya, ISRAEL, June 1991.

Interior Methods for Linear Programming, **Operations Research Society of Israel**, Tel-Aviv University, ISRAEL, May 1987.

Constructing Strong Markov Processes, **12th Midwest Probability Symposium**, Northwestern University, October 1984.

GRANTS

Office of Naval Research (2016–2019) *Efficient Optimization via Sparsification with Applications to Fast Fourier Optimization, Compressive Sensing, and other Machine-Learning Problems*, principal investigator

Office of Naval Research (2013–2015) *Fast Fourier Optimization with Application to Antenna Array Control and High-Contrast Imaging*, principal investigator

Jet Propulsion Laboratory (2004–2005, 2010–2012) *Concept Study of Pupil Mapping for High-Contrast Imaging*, principal investigator

Ball Aerospace (2005–2005) *Truss-topology optimization for the High-Contrast Imaging Testbed*, principal investigator

Jet Propulsion Laboratory (2001–2006) *Optimizing the Design of High-Contrast Coronagraph for the Terrestrial Planet Finder*, principal investigator

Office of Naval Research. (1997–2008) *Interior-Point Methods for Nonlinear Optimization and Complementarity*, principal investigator

National Science Foundation. (1995–2004) *Interior Point Methods for Large Scale Nonlinear Programming*, principal investigator

Air Force Office of Scientific Research (1991–1998) *Robust Optimization of Large-Scale Systems: An Emerging Technology*, principal investigator

Co-investigator on several other grants

UNIVERSITY SERVICE

Department Chair	2005–2012
Director of Undergraduate Studies (DUS), ORFE	2022–2023
Committee Member, Optimization and Quantitative Decision Science	2019–2023
Task Force Member, SEAS Strategic Planning	2014–2016
Executive Committee Member, Planets and Life Program	2008–2024
Committee Member, Discipline	2014–2016
Committee Member, Grading	2008–2012
Committee Member, Appointments and Advancements (C/3)	2007–2008
Committee Chair, Classrooms and Schedules	2005–2007
Committee Member, Course of Study	2001–2005
Director of Graduate Studies (DGS), ORFE	2003–2005
Program Director, Engineering and Management Systems	1994–2003
Committee Member, Engineering and Management Systems	1991–1994

PROFESSIONAL ACTIVITIES

Beale-Orchard Hayes Award Committee, Chair	1995–1997
Beale-Orchard Hayes Award Committee, Member	1993–1994
INFORMS Khachiyani Prize Award Committee, Chair	2019
INFORMS Subdivisions Council, Member	2010–2012
INFORMS Sections and Societies Committee, Member	2010–2012
INFORMS Computing Society, Chair	2010–2011
INFORMS Computing Society, Chair-Elect	2008–2009
INFORMS Computing Society Prize Committee, Member	1999–2000
INFORMS Expository Writing Award Committee, Chair	2003
INFORMS Expository Writing Award Committee, Member	2001–2002
INFORMS Nicholson Prize Committee, Member	1995
INFORMS Optimization Section, Chair	1999–2001
INFORMS Optimization Section Prize Committee, Chair	1999–2000
Princeton Public Library, Scientist in Residence	2019
SIAG-OPT Optimization Prize Committee, Chair	2005, 2008
SIAG-OPT, Vice-Chair	2004–2008
Univ. of Michigan, Ind. and Ops. Engr. Dept., Member Advisory Board	1995–2000

EDITORIAL POSITIONS

Associate Editor, <i>Operations Research</i>	2015–2018
Editorial Board, <i>Optimization Methods and Software</i>	2014–
Subject Editor, <i>Optimization and Engineering</i>	2001–2005, 2014–
Editorial Board, <i>Foundations and Trends in Optimization</i>	2012–
Editorial Advisory Board, <i>Mathematical Programming Computation</i>	2008–
Associate Editor, <i>Mathematical Programming</i>	2003–2005
Associate Editor, <i>INFORMS Journal on Computing</i>	1991–2001

MEMBERSHIPS IN PROFESSIONAL SOCIETIES

American Astrophysical Society (AAS)	2002–
American Mathematical Society (AMS)	1977–
American Society of Engineering Education (ASEE), Member	2005–2017

Bernoulli Society	1983–2001
International Society for Optical Engineering (SPIE), Senior Member	2002–2022
Institute for Mathematical Statistics (IMS)	1980–2001
Institute for Operations Res. and Mgmt. Sci. (INFORMS), Senior Member	1994–
Mathematical Association of America (MAA)	1987–2023
Mathematical Programming Society (MPS)	1985–2010
Mathematical Optimization Society (MOS)	2010–2024
Operations Research Society of America (ORSA)	1985–1994
Sigma Xi	2005–2024
Society for Industrial and Applied Mathematics (SIAM)	1990–2025

BOOKS

1. E.Çınlar and R.J. Vanderbei. *Real and Convex Analysis*. Springer, 2013.
2. J.R. Gott and R.J. Vanderbei. *Sizing Up The Universe: The Cosmos In Perspective*. National Geographic, 2010.
3. R.J. Vanderbei. *Linear Programming: Foundations and Extensions*. Springer (formerly Kluwer), (1st edition) 1997, (paperback) 1998, (2nd edition) 2001, (3rd edition) 2007, (4th edition) 2013, (5th edition) 2020.
4. N.D. Tyson, J.R. Gott, M.A. Strauss, and R.J. Vanderbei. *Welcome to the Universe in 3D*. Princeton University Press, 2022.

MOST CITED PUBLICATIONS

(AS OF DECEMBER 2024)

1. R.J. Vanderbei. *Linear Programming: Foundations and Extensions*. Springer, 4th edition, 2013.
2. J.M. Mulvey, R.J. Vanderbei, and S.A. Zenios. Robust optimization of large scale systems. *Operations Research*, 43(2):264–281, 1995.
3. C. Helmberg, F. Rendl, R.J. Vanderbei, and H. Wolkowicz. An interior point method for semidefinite programming. *SIAM Journal on Optimization*, 6:342–361, 1996.
4. R.J. Vanderbei and D.F. Shanno. An interior-point algorithm for nonconvex nonlinear programming. *Computational Optimization and Applications*, 13:231–252, 1999.
5. R.J. Vanderbei. LOQO: An interior point code for quadratic programming. *Optimization Methods and Software*, 12:451–484, 1999.
6. R.J. Vanderbei, M.S. Meketon, and B.F. Freedman. A modification of Karmarkar's linear programming algorithm. *Algorithmica*, 1:395–407, 1986.
7. R.J. Vanderbei. Symmetric quasi-definite matrices. *SIAM Journal on Optimization*, 5(1):100–113, 1995.
8. N.J. Kasdin, R.J. Vanderbei, D.N. Spergel, and M.G. Littman. Extrasolar planet finding via optimal apodized and shaped pupil coronagraphs. *Astrophysical Journal*, 582:1147–1161, 2003.

9. R.J. Vanderbei. LOQO user's manual—version 3.10. *Optimization Methods and Software*, 12:485–514, 1999.
10. R. Soummer, L. Pueyo, A. Sivaramakrishnan, and R.J. Vanderbei. Fast computation of lyot-style coronagraph propagation. *Optics Express*, 15(24):15935–15951, 2007.
11. R.J. Vanderbei and T.J. Carpenter. Symmetric indefinite systems for interior-point methods. *Mathematical Programming*, 58:1–32, 1993.
12. H.Y. Benson, D.F. Shanno, and R.J. Vanderbei. Interior-Point Methods for Nonconvex Nonlinear Programming: Filter Methods and Merit Functions. *Computational Optimization and Applications*, 23:257–272, 2002.
13. D.F. Shanno and R.J. Vanderbei. Interior-Point Methods for Nonconvex Nonlinear Programming: Orderings and Higher-Order Methods. *Math. Prog.*, 87(2):303–316, 2000.
14. L.A. Shepp and R.J. Vanderbei. The complex zeros of random polynomials. *Transactions of the AMS*, 347(11):4365–4384, 1995.
15. R.J. Vanderbei and J.C. Lagarias. I.I. Dikin's convergence result for the affine-scaling algorithm. In *Contemporary Math*. AMS, 1990.
16. R.J. Vanderbei, E. Cady, and N.J. Kasdin. Optimal occulter design for finding extrasolar planets. *Astrophysical Journal*, 665(1):794–798, 2007.
17. R.J. Vanderbei, D.N. Spergel, and N.J. Kasdin. Circularly Symmetric Apodization via Starshaped Masks. *Astrophysical Journal*, 599:686–694, 2003.
18. R.J. Vanderbei, D.N. Spergel, and N.J. Kasdin. Spiderweb Masks for High Contrast Imaging. *Astrophysical Journal*, 590:593–603, 2003.
19. A. Ruszczyński and R.J. Vanderbei. Frontiers of Stochastically Nondominated Portfolios. *Econometrica*, 71(4):1287–1297, 2003.
20. A. Carlotti, R. J. Vanderbei, and N. J. Kasdin. Optimal pupil apodizations for arbitrary apertures. *Optics Express*, 19(27):26796–26809, 2011.

REFEREED JOURNAL PUBLICATIONS

Number of singly-authored: 35, doubly-authored: 24, triply-authored: 26

1. R.J. Vanderbei. The Search for Earth-Like Exoplanets. *Curiosita Magazine*, 2026.
2. R.J. Vanderbei. The Postdoc Variant of the Secretary Problem. *Mathematica Applicanda*, 49:3–13, 2021.
3. N.J. Kasdin, R.J. Vanderbei, and N.T. Zimmerman. Chapter 19: Pupil-Plane Amplitude Coronagraphy. In *The WSPC Handbook of Astronomical Instrumentation*, World Scientific Series in Astrophysics, pages 365–376, 2021.
4. R.J. Vanderbei. Comments on: Distance Geometry and Data Science. *TOP Spanish Society of Statistics and Operations Research*, 28(2):1 – 3, 2020.
5. H. Sun, N.J. Kasdin, and R.J. Vanderbei. Efficient wavefront sensing for space-based adaptive optics. *Journal of Astronomical Telescopes, Instruments, and Systems*, 6(1):1 – 13, 2020.
6. E. Naghib, P. Yoachim, R.J. Vanderbei, A.J. Connolly, and R.L. Jones. A Framework for Telescope Schedulers: With Applications to the Large Synoptic Survey Telescope. *The Astronomical Journal*, 157(4):151, Apr 2019.
7. R.J. Vanderbei. Blink and you'll see it. *Sky and Telescope*, 137(6):84, 2019.
8. R.J. Vanderbei. Sparsity matters. *INFORMS OS Today*, 8(1):10–16, 2018.

9. He Sun, N.J. Kasdin, and R.J. Vanderbei. Identification and adaptive control of a high-contrast focal plane wavefront correction system. *J. Astron. Telesc. Instrum. Syst.*, 4(4):049006, 2018.
10. Haotian Pang, Han Liu, R.J. Vanderbei, and Tuo Zhao. Parametric Simplex Method for Sparse Learning. In I. Guyon et al., editor, *Advances in Neural Information Processing Systems 30*, pages 188–197. Curran Associates, Inc., 2017.
11. R.J. Vanderbei. The falling slinky. *American Mathematical Monthly*, 124(1):24–36, 2017.
12. B. Rudloff, F. Ulus, and R.J. Vanderbei. A parametric simplex algorithm for linear vector optimization problems. *Mathematical Programming, Series A*, 163(1):213–242, 2017.
13. D. Sirbu, Y. Kim, N.J. Kasdin, and R.J. Vanderbei. Diffraction-based sensitivity analysis for an external occulter laboratory demonstration. *Applied Optics*, 55(22):6083–6094, 2016.
14. N.T. Zimmerman, A.J. Riggs, N.J. Kasdin, A. Carlotti, and R.J. Vanderbei. Shaped Pupil Lyot Coronagraphs: High-Contrast Solutions for Restricted Focal Planes. *J. Astronomical Telescopes, Instruments, and Systems*, 2(1):1–21, 2016.
15. R.J. Vanderbei, K. Lin, H. Liu, and L. Wang. Revisiting Compressed Sensing: Exploiting the Efficiency of Simplex and Sparsification Methods. *Math. Prog. C*, 8:253–269, 2016.
16. R.J. Vanderbei. Alternative hypotheses for making the moon. *Physics Today*, 68(4):8–8, 2015.
17. C.L. Mallows and R.J. Vanderbei. Which Young Tableaux can represent an outer sum? *Journal of Integer Sequences*, 18, 2015.
18. F. Georget, J.H. Prévost, and R.J. Vanderbei. A Speciation Solver for Cement Paste Modeling and the Semismooth Newton Method. *Cement and Concrete Research*, 68:139–147, 2015.
19. Haotian Pang, Han Liu, and R.J. Vanderbei. The fastclime Package for Linear Programming and Large-Scale Precision Matrix Estimation in R. *JMLR*, 15(1):489–493, 2014.
20. R.J. Vanderbei, G. Scharf, and D. Marlow. A Regression Approach to Fairer Grading. *SIAM Review*, 56(2):337–352, 2014.
21. D. Sirbu, N.J. Kasdin, and R.J. Vanderbei. Monochromatic verification of high-contrast imaging with an occulter. *Optics Express*, 21(26):32234–32253, Dec 2013.
22. R.J. Vanderbei, M.Ç. Pinar, and E.F. Bozkaya. Discrete-Time Pricing and Optimal Exercise of American Perpetual Warrants in the Geometric Random Walk Model. *Applied Mathematics and Optimization*, 67:97–122, 2013.
23. R. J. Vanderbei. Fast Fourier optimization. *Math. Prog. Comp.*, 4(1):53–69, 2012.
24. R.J. Vanderbei. Local Warming. *SIAM Review*, 54(3):597–606, 2012.
25. A. Carlotti, R. J. Vanderbei, and N. J. Kasdin. Optimal pupil apodizations for arbitrary apertures. *Optics Express*, 19(27):26796–26809, 2011.
26. L. Pueyo, N.J. Kasdin, A. Carlotti, and R. J. Vanderbei. Design of phase induced amplitude apodization coronagraphs over square apertures. *The Astrophysical Journal*, 195(2):25, 2011.
27. R.J. Vanderbei. Sequencing the stars. *Sky and Telescope*, 116(11):30–34, 2010.
28. N.J. Kasdin, D.N. Spergel, R.J. Vanderbei, E. Cady, D. Savransky, D. Lisman, S. Shaklan, R. Lee, R. Egerman, G. Matthews, and D. Tenerelli. A medium size mission for finding and characterizing terrestrial exoplanets with an external occulter and a conventional telescope. *Bull. AAS*, 42:287, 2010.

29. C. Harper and R.J. Vanderbei. Two professors retake the sat: Is it a good test? *Chronicle of Higher Education*, 55:A30–31, 2009.
30. R.J. Vanderbei and M.Ç. Pinar. Pricing American Perpetual Warrants by Linear Programming. *SIAM Review*, 51:767–782, 2009.
31. J. N. Winn, A. W. Howard, J. A. Johnson, G. W. Marcy, J. Z. Gazak, D. Starkey, E. B. Ford, K. D. Colón, F. Reyes, L. Nortmann, S. Dreizler, S. Odewahn, W. F. Welsh, S. Kadakia, R. J. Vanderbei, E. R. Adams, M. Lockhart, I. J. Crossfield, J. A. Valenti, R. Dantowitz, and J. A. Carter. The Transit Ingress and the Tilted Orbit of the Extraordinarily Eccentric Exoplanet HD 80606b. *The Astrophysical Journal*, 703:2091–2100, October 2009.
32. R.J. Vanderbei. Eliminating poisson’s spot with linear programming. In J.W. Chinneck, B. Kristjansson, and M. Saltzman, editors, *Operations Research and Cyber-Infrastructure*. Springer, 2009.
33. K. Yetilmezsoy, S. Demirel, and R.J. Vanderbei. Response surface modeling of Pb(II) removal from aqueous solution by Pistacia vera l.: Box-Behnken experimental design. *J. of Hazardous Materials*, 171:551–562, 2009.
34. J.C. Lagarias, E. Rains, and R.J. Vanderbei. The Kruskal Count. In S. Brams et al., editor, *The Mathematics of Preference, Choice, and Order: Essays in Honor of Peter C. Fishburn*. Springer-Verlag, 2009.
35. R.J. Vanderbei. The Earth Is Not Flat: An Analysis of a Sunset Photo. *Optics and Photonics News*, November:34–39, 2008.
36. R.J. Vanderbei. Linear Stability of Ring Systems Around Oblate Central Masses. *Advances in Space Research*, 42:1370–1377, 2008.
37. R.J. Vanderbei. Extreme Optics and the Search for Earth-Like Planets. *Mathematical Programming Series B*, 112(1):255–272, 2008.
38. I. Griva, D.F. Shanno, R.J. Vanderbei, and H.Y. Benson. Global convergence of a primal-dual interior-point method for nonlinear programming. *Algorithmic Operations Research*, 3(1):12–19, 2008.
39. N. J. Kasdin, R. J. Vanderbei, and R. Belikov. Shaped pupil coronagraphy. *Comptes Rendus Physique*, 8:312–322, April 2007.
40. R.J. Vanderbei, E. Cady, and N.J. Kasdin. Optimal occulter design for finding extra-solar planets. *Astrophysical Journal*, 665(1):794–798, 2007.
41. N.J. Kasdin, R.J. Vanderbei, and R. Belikov. Shaped pupil coronagraphy. *C.R. Physique*, 8:312–322, 2007.
42. R.J. Vanderbei and R. Belikov. Measuring the astronomical unit from your backyard. *Sky and Telescope*, 113(1):91–94, 2007.
43. R.J. Vanderbei. A Simple Approximate Analysis of the Linear Stability of Ring Systems. In *New Trends in Astrodynamics and Applications III*, volume 886, pages 169–174. American Institute of Physics, 2007.
44. R.J. Vanderbei and E. Kolemen. Linear Stability of Ring Systems. *Astronomical Journal*, 133(2):656–664, 2007.
45. R. Soummer, L. Pueyo, A. Sivaramakrishnan, and R.J. Vanderbei. Fast computation of lyot-style coronagraph propagation. *Optics Express*, 15(24):15935–15951, 2007.
46. H.Y. Benson, A. Sen, D.F. Shanno, and R.J. Vanderbei. Interior-point algorithms, penalty methods and equilibrium problems. *Comp. Opt. and Appl.*, 34:155–182, 2006.
47. R. Belikov, N.J. Kasdin, and R.J. Vanderbei. Diffraction-Based Sensitivity Analysis of Apodized Pupil Mapping Systems. *Astrophysical Journal*, 652:833, 2006.
48. Give’on A., Kasdin N. J., Vanderbei R. J., and Avitzour Y. On representing and correcting wavefront errors in high-contrast imaging systems. *Journal of the Optical*

- Society of America A*, 23, May 2006.
49. R.J. Vanderbei. Diffraction Analysis of 2-D Pupil Mapping for High-Contrast Imaging. *Astrophysical Journal*, 636:528, 2006.
 50. R.J. Vanderbei. Horsing Around on Saturn. In *New Trends in Astrodynamics and Applications*, volume 1065, pages 336–345. NY Academy of Sciences, 2005.
 51. I. Griva and R.J. Vanderbei. Case Studies in Trajectory Optimization: Catenary Problem. *Optimization and Engineering*, 6:463–482, 2005.
 52. R.J. Vanderbei and W.A. Traub. Pupil Mapping in 2-D for High-Contrast Imaging. *Astrophysical Journal*, 626:1079–1090, 2005.
 53. N.J. Kasdin, R.J. Vanderbei, M.G. Littman, and D.N. Spergel. Optimal one-dimensional apodizations and shaped pupils for planet finding coronagraphy. *Applied Optics*, 44(7):1117–1128, 2005.
 54. N. J. Kasdin, R. J. Vanderbei, M. G. Littman, D. Ren, M. Carr, and D. N. Spergel. Optimal Designs, Mask Manufacture, and Experimental Results for Shaped Pupil Coronagraphs. *Bulletin of the American Astronomical Society*, 205:514–+, December 2004.
 55. A. Giveón, N. J. Kasdin, M. G. Littman, L. A. Pueyo, and R. J. Vanderbei. Adaptive Optics for High-Contrast Imaging. *Bulletin of the American Astronomical Society*, 205:515–+, December 2004.
 56. N.J. Kasdin, R.A. Brown, C.J. Burrows, S. Kilston, M. Kuchner, M.G. Littman, M.C. Noecker, S. Seager, R. J. Vanderbei, and R.A. Woodruff. An optical/UV space coronagraph concept for the terrestrial planet finder. *Advances in Space Research*, 34(3):625–630, 2004.
 57. R. J. Vanderbei, N. J. Kasdin, and D. N. Spergel. Checkerboard-Mask Coronagraphs for High-Contrast Imaging. *Astrophysical Journal*, 615(1):555, 2004.
 58. H.Y. Benson, D.F. Shanno, and R.J. Vanderbei. Interior-Point Methods for Nonconvex Nonlinear Programming: Jamming and Numerical Testing. *Mathematical Programming*, 99(1):35–48, 2004.
 59. W.A. Traub and R.J. Vanderbei. Two-Mirror Apodization for High-Contrast Imaging. *Astrophysical Journal*, 599:695–701, 2003.
 60. R.J. Vanderbei, D.N. Spergel, and N.J. Kasdin. Circularly Symmetric Apodization via Starshaped Masks. *Astrophysical Journal*, 599:686–694, 2003.
 61. W. Simmons, N.J. Kasdin, R.J. Vanderbei, and W. Cash. System concept design for the new worlds observer. *Bulletin of the American Astronomical Society*, 35:1205, 2003.
 62. R.J. Vanderbei, D.N. Spergel, and N.J. Kasdin. Spiderweb Masks for High Contrast Imaging. *Astrophysical Journal*, 590:593–603, 2003.
 63. A. Ruszczyński and R.J. Vanderbei. Frontiers of Stochastically Nondominated Portfolios. *Econometrica*, 71(4):1287–1297, 2003.
 64. R.J. Vanderbei and H.Y. Benson. Solving Problems with Semidefinite and Related Constraints Using Interior-Point Methods for Nonlinear Programming. *Mathematical Programming*, 95:279–302, 2003.
 65. N.J. Kasdin, R.J. Vanderbei, D.N. Spergel, and M.G. Littman. Extrasolar Planet Finding via Optimal Apodized and Shaped Pupil Coronagraphs. *Astrophysical Journal*, 582:1147–1161, 2003.
 66. H.Y. Benson, D.F. Shanno, and R.J. Vanderbei. Interior-Point Methods for Nonconvex Nonlinear Programming: Filter Methods and Merit Functions. *Computational Optimization and Applications*, 23:257–272, 2002.
 67. R.J. Vanderbei. A Case Study in Trajectory Optimization: Putting on an Uneven Green. *SIAG/OPT Views-and-News*, 12(1):6–14, 2001.

68. S. Kruk, M. Muramatsu, R. Rendl, R.J. Vanderbei, and H. Wolkowicz. The Gauss-Newton Direction in Semidefinite Programming. *Optimization Methods and Software*, 15(1):1–27, 2001.
69. R.J. Vanderbei. Case Studies in Trajectory Optimization: Trains, Planes, and Other Pastimes. *Optimization and Engineering*, 2:215–243, 2001.
70. D.F. Shanno and R.J. Vanderbei. Interior-Point Methods for Nonconvex Nonlinear Programming: Orderings and Higher-Order Methods. *Math. Prog.*, 87(2):303–316, 2000.
71. R.J. Vanderbei. LOQO: An interior point code for quadratic programming. *Optimization Methods and Software*, 12:451–484, 1999.
72. R.J. Vanderbei. LOQO User’s Manual—Version 3.10. *Optimization Methods and Software*, 12:485–514, 1999.
73. R.J. Vanderbei and D.F. Shanno. An Interior-Point Algorithm for Nonconvex Nonlinear Programming. *Computational Optimization and Applications*, 13:231–252, 1999.
74. R.J. Vanderbei. Extension of Piyavskii’s Algorithm to Continuous Global Optimization. *J. Global Opt.*, 14:205–216, 1999.
75. M. Muramatsu and R.J. Vanderbei. Primal-Dual Affine-Scaling Algorithms Fail for Semidefinite Programming. *Mathematics of Operations Research*, 24(1):149–175, 1999.
76. A. Kagan, C. Mallows, L.A. Shepp, R.J. Vanderbei, and Y. Vardi. Symmetrization of Binary Random Variables. *Bernoulli*, 5(6):1013–1020, 1999.
77. P. Fishburn, P. Schwander, L.A. Shepp, and R.J. Vanderbei. The discrete Radon transform and its approximate inversion via linear programming. *Disc. Appl. Math.*, 75:39–61, 1997.
78. A.J. Berger, J.M. Mulvey, E. Rothberg, and R.J. Vanderbei. Solving multistage stochastic programs using tree dissection. *SIAM Journal on Optimization*, 1996. To appear.
79. C. Helmberg, F. Rendl, R.J. Vanderbei, and H. Wolkowicz. An interior point method for semidefinite programming. *SIAM Journal on Optimization*, 6:342–361, 1996.
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60. *Fabrication and Characteristics of Free Standing Shaped Pupil Masks for TPF-Coronagraph*, number 130 in 6265, May 2006.
61. *Hybrid Pupil Mapping/Masking Systems for High-Contrast Imaging*, number 48 in 6265, May 2006.
62. *Wavelength dependence of aberrations in the near field: influence and compensation of Fresnel effects in coronagraphs*, number 51 in 6265, May 2006.
63. *Primary Mirror interrogation and correction for high-contrast imaging*, number 162 in 6265, May 2006.
64. *Wavefront amplitude and phase correction using pupil-shape diversity*, number 46 in 6272, May 2006.
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118. A. Greenberg and R.J. Vanderbei. On successive approximation methods for stochastic problems: probabilistic interpretation, ordering heuristics, and parallel processing. In *Proceedings of the 26th Annual Allerton Conference*, 1988.

TECHNICAL REPORTS

1. R. J. Vanderbei. Kepler's Laws for the 2-Body Problem. *ArXiv e-prints*, 2024.
2. R. J. Vanderbei. Flat Map of a Sphere via Stress Minimization, 2022.
3. J. R. Gott, III, D. M. Goldberg, and R. J. Vanderbei. Flat maps that improve on the Winkel Tripel, 2021.
4. R.J. Vanderbei. The complex zeros of random sums. Technical report, Princeton University, 2015.
5. Haotian Pang, Tuo Zhao, R.J. Vanderbei, and Han Liu. A Parametric Simplex Approach to Statistical Learning Problems. Technical report, Princeton University, 2015.
6. R.J. Vanderbei. Linear Stability of Lagrange Points: Complex Variable Notation. Technical report, Department of Operations Research and Financial Engineering, Princeton Univ., 2006.
7. R.J. Vanderbei. Lagrange Points for Eccentric Planar 3-Body Systems . Technical report, Department of Operations Research and Financial Engineering, Princeton University, 2006.
8. R.J. Vanderbei and H. Yurttan. Using LOQO to Solve Second-Order Cone Programming Problems. Technical Report SOR-98-09, Statistics and Operations Research, Princeton University, 1998. Submitted *Optimization and Engineering*.
9. R.J. Vanderbei and J. Iannone. An EM approach to OD matrix estimation. Technical Report SOR 94-04, Princeton University, 1994.
10. R.J. Vanderbei, A. Duarte, and B. Yang. An algorithmic and numerical comparison of several interior-point methods. Technical Report SOR 94-05, Princeton University, 1994.
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12. A. Duarte and R.J. Vanderbei. Interior point algorithms for LSAD and LMAD estimation. Technical Report SOR 94-07, Princeton University, 1994.
13. R.J. Vanderbei. Uniform continuity is almost Lipschitz continuity. Technical Report SOR-91-11, Statistics and Operations Research Series, Princeton University, 1991.
14. R.J. Vanderbei. Constructing strong markov processes. Technical report, University of Illinois, 1984.

BOOK REVIEWS & ENCYCLOPEDIA ENTRIES

1. R.J. Vanderbei. Linear programming. In *Encyclopedia of Applied and Computational Mathematics*, pages 742–745. Springer–Verlag, 2015.
2. R.J. Vanderbei. Review of Linear Programming, a Modern Integrated Analysis by R. Saigal. *Interfaces*, 27:120–122, 1997.

PATENTS

1. R.J. Vanderbei. Methods and apparatus for efficient resource allocation, May 1988. U.S. Patent Number 4,744,026. Extension of Karmarkar algorithm to handle linear programming problems with free variables.
2. R.J. Vanderbei. Methods and apparatus for efficient resource allocation, Dec 1989. U.S. Patent Number 4,885,686. Extension of Karmarkar algorithm to handle linear programming problems with dense columns.
3. B.A. Freedman, M.S. Meketon, and R.J. Vanderbei. Methods and apparatus for efficient resource allocation, May 1990. U.S. Patent Number 4,924,386. Extension of Karmarkar algorithm to handle linear programming problems with nonzero lower bounds and finite upper bounds.
4. P. Schwander, L.A. Shepp, and R.J. Vanderbei. Apparatus and method for tomography of microscopic samples, August 1997. U.S. Patent Number 5,659,175. Invention concerns microscopic tomography, wherein probabilities of occupancy of individual lattice sites within a crystal are estimated. Application to the examination of the internal structure of semiconductors.

ON-LINE EDUCATIONAL RESOURCES

Pivot tools for teaching linear programming:

<https://vanderbei.princeton.edu/JAVA/pivot/simple.html>

<https://vanderbei.princeton.edu/JAVA/network/nettool/netsimp.html>

A case study using sailing as a metaphor for the stochastic optimization.

<https://vanderbei.princeton.edu/JAVA/sail/sail.html>

WebGL applets illustrating interesting solutions to the n-body problem (several are obtained as the solution to an optimization problem):

https://vanderbei.princeton.edu/nBody_animations/index.html

https://vanderbei.princeton.edu/nBody_animations/New.html

A case study illustrating how optimization is used to design FIR filters:

<https://vanderbei.princeton.edu/floyd.html>

Applets illustrating linear programming algorithms in the context of solving the minimum weight structural design problem:

https://vanderbei.princeton.edu/JAVA/twophase_animate

https://vanderbei.princeton.edu/JAVA/pd_animate2

https://vanderbei.princeton.edu/JAVA/affine_animate2

WebGL 3D models of various minimal surfaces:

<https://vanderbei.princeton.edu/WebGL/minsurf.html>

GRADUATE STUDENTS ADVISED/CO-ADVISED

Antonio Marcos Duarte Júnior	Ph.D. 1993
Bing Yang	Ph.D. 1996
Jianhua Yuan	M.A. 1996
Hande Yurttan Benson	Ph.D. 2001
Arun Sen	Ph.D. 2005
Amir Give' on	Ph.D. 2006
Egemen Kolemen	Ph.D. 2008
Laurent Pueyo	Ph.D. 2008
Eric Cady	Ph.D. 2010
Dmitry Savransky	Ph.D. 2011
Tyler Groff	Ph.D. 2013
Dan Sirbu	Ph.D. 2014
Ethan Fang	Ph.D. 2016
Haotian Pang	Ph.D. 2017
Hari Subedi	Ph.D. 2018
Elahe Naghib	Ph.D. 2019
He Sun	Ph.D. 2019
Joane Joseph	Ph.D. 2020

NAMES OF COURSES TAUGHT

Princeton

Sizing Up the Universe	FRS 131, 175
Computer Methods for Problem Solving	CIV / ORF 201
Fundamentals of Statistics	ORF 245
Optimization	CIV / ORF 307
Stochastic Systems Analysis	CIV 308
Real Analysis for Engineers	CIV 506
Stochastic Processes	CIV 545
Linear and Convex Optimization	CIV 542, ORF 522
Nonlinear Programming	ORF 523
Convex Analysis	ORF 569

University of Illinois

Calculus II	MATH 130
Probability	MATH 361
Probability and Statistics	MATH 363
Applied Stochastic Processes	MATH 461

HISTORICAL RECORD OF COURSES TAUGHT...

Princeton

Year	Fall			Spring		
	Course	Enrollment	Evaluation	Course	Enrollment	Evaluation
2025 / 2026	FRS 131	14	4.4	<i>retired</i>		
2024 / 2025	FRS 131	13	4.6	<i>retired</i>		
2023 / 2024	FRS 131	14	4.0	<i>retired</i>		
2022 / 2023	FRS 131	12	4.3	<i>half-retired</i>		
2021 / 2022	FRS 131	12	4.9	<i>half-retired</i>		
2020 / 2021	FRS 131	12	4.6	<i>half-retired</i>		
2019 / 2020	<i>sabbatical</i>			<i>sabbatical</i>		
2018 / 2019	FRS 175	14	4.6	ORF 307	75	3.2
2017 / 2018	FRS 175	14	4.5	ORF 307	78	2.7
2016 / 2017	FRS 175	9	3.9	ORF 307	76	2.9
2015 / 2016	ORF 245	141	2.1	ORF 307	63	3.0
2014 / 2015	ORF 245	141	2.6	ORF 307	103	2.8
2013 / 2014	ORF 522	31	3.7	ORF 307	111	2.9
2012 / 2013	ORF 522	31	3.9	<i>sabbatical</i>		
2011 / 2012	<i>dept. chair</i>			ORF 307	77	3.0
2010 / 2011	ORF 522	19	3.9	<i>dept. chair</i>		
2009 / 2010	<i>sabbatical</i>			<i>sabbatical</i>		
2008 / 2009	<i>dept. chair</i>			ORF 307	91	3.0
2007 / 2008	ORF 522	26	4.4	<i>dept. chair</i>		
2006 / 2007	ORF 522	16	4.4	<i>dept. chair</i>		
2005 / 2006	ORF 522	18	4.2	<i>dept. chair</i>		
2004 / 2005	ORF 522	18	4.3	ORF 307	63	?
2003 / 2004	ORF 522	8	4.4	ORF 307	80	4.2
2002 / 2003	ORF 522	23	4.0	ORF 307	67	4.0
2001 / 2002	ORF 522	23	4.4	ORF 307	54	4.0
2000 / 2001	<i>sabbatical</i>			ORF 201	64	4.2
1999 / 2000	ORF 522	16	3.5	ORF 201	82	3.5
				ORF 523	13	4.3
1998 / 1999	CIV 542	14	4.0	CIV 307	62	3.3
				CIV 201	61	3.7
1997 / 1998	CIV 542	10	3.4	CIV 307	54	3.9
				CIV 201	43	3.6
1996 / 1997	CIV 542	12	4.6	CIV 545	6	5.0
1995 / 1996	CIV 542	9	4.7	CIV 307	70	4.0
1994 / 1995	CIV 542	11	4.8	CIV 201	107	3.7
1993 / 1994	CIV 308	45	3.9	CIV 506	5	4.1
1992 / 1993	CIV 308	50	3.1	CIV 545	12	4.5
	CIV 506	13	4.5			
1991 / 1992	CIV 201	76	3.5	CIV 506	9	4.5
1990 / 1991	CIV 308	29	4.0	CIV 201	76	3.5

University of Illinois

Year	Fall		Spring	
	Course	Enrollment	Course	Enrollment
1983 / 1984	Math 363	30	Math 363	30
	Math 461	8	Math 130	40
1982 / 1983	Math 363	30	Math 363	30
	Math 461	8	Math 361	30

DEVELOPMENT EXPERIENCE

KORBX: Lead architect and developer of AT&T's commercial implementation of the affine-scaling algorithm for linear programming.

LOQO: A software package for general nonlinear optimization.

OUTSIDE ACTIVITIES

Soaring

Private Pilot	1979–
Commercial Pilot	1983–
Certificated Flight Instructor (CFI)	1983–1999
Chief Flight Instructor, Central Jersey Soaring Club	1987–1996

Skiing

National Ski Patrol	1972–1974
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Tennis

Just to Run for Fun	1971–
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Ultimate Frisbee

RPI team created in 1972 by Columbia High School alum Joe Barbanel	1973
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Astronomy and Astrophotography

Amateur Astronomers Association of Princeton, Assistant Director	2024–
The Montgomery News, Astro Guy	Dec. 2023
Optics & Photonics News, Photo Contest, 2nd place	Dec. 2023
Astronomy Picture of the Day (APOD)	03/28/2019, 06/13/2019, 07/21/2021
Echo (Princeton Newspaper), Seeing Stars	Aug. 2019