

ROBERT J. VANDERBEI

Operations Research and
Financial Engineering
Princeton University



rvdb@princeton.edu
<https://vanderbei.princeton.edu>

EDUCATION

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| <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</i> | <i>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

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|---|-----------|
| 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– |
| Associate Editor, <i>Optimization in 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 |

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|---|-----------|
| Bernoulli Society | 1983–2001 |
| International Society for Optical Engineering (SPIE), Senior Member | 2002–2022 |
| Institute for Mathematical Statistics (IMS) | 1980–2001 |
| Institute for Operations Research and Mgmt. Sciences (INFORMS) | 1994– |
| Mathematical Association of America (MAA) | 1987–2023 |
| Mathematical Programming Society (MPS) | 1985–2010 |
| Mathematical Optimization Society (MOS) | 2010– |
| Operations Research Society of America (ORSA) | 1985–1994 |
| Sigma Xi | 2005– |
| 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 2023)

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.J. Vanderbei and T.J. Carpenter. Symmetric indefinite systems for interior-point methods. *Mathematical Programming*, 58:1–32, 1993.
11. R. Soummer, L. Pueyo, A. Sivaramakrishnan, and R.J. Vanderbei. Fast computation of lyot-style coronagraph propagation. *Optics Express*, 15(24):15935–15951, 2007.
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. Vanderbei. The Postdoc Variant of the Secretary Problem. *Mathematica Applicanda*, 49:3–13, 2021.
2. 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.
3. R.J. Vanderbei. Comments on: Distance Geometry and Data Science. *TOP Spanish Society of Statistics and Operations Research*, 28(2):1 – 3, 2020.
4. 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.
5. 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.
6. R.J. Vanderbei. Blink and you'll see it. *Sky and Telescope*, 137(6):84, 2019.
7. R.J. Vanderbei. Sparsity matters. *INFORMS OS Today*, 8(1):10–16, 2018.

8. 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.
9. 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.
10. R.J. Vanderbei. The falling slinky. *American Mathematical Monthly*, 124(1):24–36, 2017.
11. 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.
12. 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.
13. 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.
14. 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.
15. R.J. Vanderbei. Alternative hypotheses for making the moon. *Physics Today*, 68(4):8–8, 2015.
16. C.L. Mallows and R.J. Vanderbei. Which Young Tableaux can represent an outer sum? *Journal of Integer Sequences*, 18, 2015.
17. 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.
18. 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.
19. R.J. Vanderbei, G. Scharf, and D. Marlow. A Regression Approach to Fairer Grading. *SIAM Review*, 56(2):337–352, 2014.
20. 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.
21. 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.
22. R. J. Vanderbei. Fast Fourier optimization. *Math. Prog. Comp.*, 4(1):53–69, 2012.
23. R.J. Vanderbei. Local Warming. *SIAM Review*, 54(3):597–606, 2012.
24. A. Carlotti, R. J. Vanderbei, and N. J. Kasdin. Optimal pupil apodizations for arbitrary apertures. *Optics Express*, 19(27):26796–26809, 2011.
25. 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.
26. R.J. Vanderbei. Sequencing the stars. *Sky and Telescope*, 116(11):30–34, 2010.
27. 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.

28. C. Harper and R.J. Vanderbei. Two professors retake the sat: Is it a good test? *Chronicle of Higher Education*, 55:A30–31, 2009.
29. R.J. Vanderbei and M.Ç. Pinar. Pricing American Perpetual Warrants by Linear Programming. *SIAM Review*, 51:767–782, 2009.
30. 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.
31. 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.
32. 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.
33. 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.
34. R.J. Vanderbei. The Earth Is Not Flat: An Analysis of a Sunset Photo. *Optics and Photonics News*, November:34–39, 2008.
35. R.J. Vanderbei. Linear Stability of Ring Systems Around Oblate Central Masses. *Advances in Space Research*, 42:1370–1377, 2008.
36. R.J. Vanderbei. Extreme Optics and the Search for Earth-Like Planets. *Mathematical Programming Series B*, 112(1):255–272, 2008.
37. 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.
38. N. J. Kasdin, R. J. Vanderbei, and R. Belikov. Shaped pupil coronagraphy. *Comptes Rendus Physique*, 8:312–322, April 2007.
39. R.J. Vanderbei, E. Cady, and N.J. Kasdin. Optimal occulter design for finding extra-solar planets. *Astrophysical Journal*, 665(1):794–798, 2007.
40. N.J. Kasdin, R.J. Vanderbei, and R. Belikov. Shaped pupil coronagraphy. *C.R. Physique*, 8:312–322, 2007.
41. R.J. Vanderbei and R. Belikov. Measuring the astronomical unit from your backyard. *Sky and Telescope*, 113(1):91–94, 2007.
42. 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.
43. R.J. Vanderbei and E. Kolemen. Linear Stability of Ring Systems. *Astronomical Journal*, 133(2):656–664, 2007.
44. R. Soummer, L. Pueyo, A. Sivaramakrishnan, and R.J. Vanderbei. Fast computation of lyot-style coronagraph propagation. *Optics Express*, 15(24):15935–15951, 2007.
45. 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.
46. R. Belikov, N.J. Kasdin, and R.J. Vanderbei. Diffraction-Based Sensitivity Analysis of Apodized Pupil Mapping Systems. *Astrophysical Journal*, 652:833, 2006.
47. 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.
48. R.J. Vanderbei. Diffraction Analysis of 2-D Pupil Mapping for High-Contrast Imaging. *Astrophysical Journal*, 636:528, 2006.
 49. R.J. Vanderbei. Horsing Around on Saturn. In *New Trends in Astrodynamics and Applications*, volume 1065, pages 336–345. NY Academy of Sciences, 2005.
 50. I. Griva and R.J. Vanderbei. Case Studies in Trajectory Optimization: Catenary Problem. *Optimization and Engineering*, 6:463–482, 2005.
 51. R.J. Vanderbei and W.A. Traub. Pupil Mapping in 2-D for High-Contrast Imaging. *Astrophysical Journal*, 626:1079–1090, 2005.
 52. 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.
 53. 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.
 54. 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.
 55. 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.
 56. R. J. Vanderbei, N. J. Kasdin, and D. N. Spergel. Checkerboard-Mask Coronagraphs for High-Contrast Imaging. *Astrophysical Journal*, 615(1):555, 2004.
 57. 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.
 58. W.A. Traub and R.J. Vanderbei. Two-Mirror Apodization for High-Contrast Imaging. *Astrophysical Journal*, 599:695–701, 2003.
 59. R.J. Vanderbei, D.N. Spergel, and N.J. Kasdin. Circularly Symmetric Apodization via Starshaped Masks. *Astrophysical Journal*, 599:686–694, 2003.
 60. 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.
 61. R.J. Vanderbei, D.N. Spergel, and N.J. Kasdin. Spiderweb Masks for High Contrast Imaging. *Astrophysical Journal*, 590:593–603, 2003.
 62. A. Ruszczyński and R.J. Vanderbei. Frontiers of Stochastically Nondominated Portfolios. *Econometrica*, 71(4):1287–1297, 2003.
 63. 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.
 64. 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.
 65. 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.
 66. R.J. Vanderbei. A Case Study in Trajectory Optimization: Putting on an Uneven Green. *SIAG/OPT Views-and-News*, 12(1):6–14, 2001.

67. 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.
68. R.J. Vanderbei. Case Studies in Trajectory Optimization: Trains, Planes, and Other Pastimes. *Optimization and Engineering*, 2:215–243, 2001.
69. 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.
70. R.J. Vanderbei. LOQO: An interior point code for quadratic programming. *Optimization Methods and Software*, 12:451–484, 1999.
71. R.J. Vanderbei. LOQO User’s Manual—Version 3.10. *Optimization Methods and Software*, 12:485–514, 1999.
72. R.J. Vanderbei and D.F. Shanno. An Interior-Point Algorithm for Nonconvex Nonlinear Programming. *Computational Optimization and Applications*, 13:231–252, 1999.
73. R.J. Vanderbei. Extension of Piyavskii’s Algorithm to Continuous Global Optimization. *J. Global Opt.*, 14:205–216, 1999.
74. M. Muramatsu and R.J. Vanderbei. Primal-Dual Affine-Scaling Algorithms Fail for Semidefinite Programming. *Mathematics of Operations Research*, 24(1):149–175, 1999.
75. A. Kagan, C. Mallows, L.A. Shepp, R.J. Vanderbei, and Y. Vardi. Symmetrization of Binary Random Variables. *Bernoulli*, 5(6):1013–1020, 1999.
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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.
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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.
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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>

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

<https://vanderbei.princeton.edu/JAVA/astro/galaxy/nBody.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/WebGL/ducati.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 |

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

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|------------------------------|----------|
| 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 |
| 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 |
|----------------------------|-----------|

Tennis

| | |
|----------------------------|-------|
| Just to Run for Fun | 1971– |
|----------------------------|-------|

Ultimate Frisbee

| | |
|---|------|
| RPI team created in 1972 by Columbia High School alum Joe Barbanel | 1973 |
|---|------|

Astrophotography

| | |
|--|------------------------------------|
| 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 |