

Charles F. Van Loan

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Education

1969 B.S., University of Michigan - Applied Mathematics
1970 M.A., University of Michigan - Mathematics
1973 Ph.D., University of Michigan - Mathematics

Academic Positions

1970-1973 Teaching Assistant, University of Michigan
1974-1975 Research Fellow, University of Manchester, England
1975-1980 Assistant Professor, Cornell University
1980-1987 Associate Professor, Cornell University
1987- present Professor, Cornell University
1998-present Joseph C. Ford Professor of Engineering, Cornell University

Administrative Positions

1982-1987 Director, Computer Science PhD Program (about 80 students)
1994-2003 Director, Computer Science Undergraduate Program (about 350 students)
1999-2006 Chair, Department of Computer Science (about 35 faculty)
2013-Present Director, Computer Science Master Of Engineering Program (about 100 students)

Honors and Awards

1997 Robert A. and Donna B. Paul Award for Excellence in Advising, College of Arts and Sciences
1998 Merrill Scholar Faculty Impact Award
2003 James M. Mc Cormack Excellence in Advising, College of Engineering
2009 James and Mary Tien Teaching Award, College of Engineering
2009 Merrill Scholar Faculty Impact Award

Books

- Matrix Computations, First Edition*, 476pp., Johns Hopkins University Press, Baltimore, Md., 1983. (With G.H. Golub)
- Matrix Computations, Second Edition*, 642pp., Johns Hopkins University Press, Baltimore, Md., 1989. (With G.H. Golub)
- Matrix Computations, Third Edition*, 694pp., Johns Hopkins University Press, Baltimore, Md., 1996. (With G.H. Golub)
- Matrix Computations, Fourth Edition*, 756pp., Johns Hopkins University Press, Baltimore, Md., 2013. (With G.H. Golub)
- Handbook for Matrix Computations*, 264pp., SIAM Publications, Philadelphia, PA, 1988. (With T. Coleman)
- Computational Frameworks for the Fast Fourier Transform*, 273pp., SIAM Publications, Philadelphia, PA., 1992.
- Introduction to Computational Science and Mathematics*, 558pp., Jones and Bartlett, Sudbury, MA, 1996.
- Introduction to Scientific Computation: A Matrix-Vector Approach Using Matlab*, 365pp., Prentice Hall, Upper Saddle River, NJ, 1999.
- Insight Through Computing--A Matlab Introduction to Computational Science and Engineering*, 464pp., SIAM Publications, Philadelphia, PA, 2009. (With D. Fan)

Teaching/Advising Publications

- Computer Science and the Liberal Arts Student, *Educational Forum*, XLV, 1980, 29-42 .
- Building Freshman Intuition for Computational Science and Mathematics, *SIAM News*, October 1995.
- Benjamin Franklin: The Doctor Would Want a Masters, *SIAM News*, May 2013.

Research Publications

- A General Matrix Eigenvalue Algorithm, *SIAM J. Numer. Anal.* 12, 1975, 819-834.
- Generalizing the Singular Value Decomposition, *SIAM J. Numer. Anal.* 13, 1976, 76-83.
- A Study of the Matrix Exponential, Numerical Analysis Report No. 10, Department of Mathematics, University of Manchester, 1975.
- The Sensitivity of the Matrix Exponential, *SIAM J. Numer. Anal.* 14, 1977, 971-981.

The Limitations of Pade Approximation for Computing the Matrix Exponential . In *Pade Approximation*, E.B. Saff and R.S. Varga (eds), New York, Academic Press, 1977.

Computing Integrals Involving the Matrix Exponential, *IEEE Transactions on Automatic Control* AC-23, 1978, 395-404.

Nineteen Dubious Methods for Computing the Matrix Exponential, *SIAM Review* 20, 1978, 801-836. (With C.B. Moler.)

A Generalized Horner Algorithm for the Computation of Integrals Involving the Matrix Exponential. In *Proceedings of the 1978 IEEE Conference on Decision and Control*, 74-79.

A Note on the Evaluation of Matrix Polynomials, *IEEE Transactions on Automatic Control* AC-24, 1979, 320-321.

Unsymmetric Positive Definite Linear Systems, *Linear Algebra and Its Applications* 28, 1979, 85-97. (With G.H. Golub.)

A Hessenberg-Schur Algorithm for $AX + XB = C$, *IEEE Transactions on Automatic Control* AC-24, 1979, 909-913. (With G.H. Golub and S. Nash.)

Total Least Squares. In *Smoothing Techniques for Curve Estimation*, Th. Gasser and M. Rosenblatt (eds), Lecture Notes in Mathematics No. 757, Springer Verlag, New York, 1979. (With G.H. Golub)

An Analysis of the Total Least Squares Problem, *SIAM Journal on Numerical Analysis* 17, 1980, 883-893. (With G.H. Golub.)

A Schur Decomposition for Hamiltonian Matrices, *Linear Algebra and Its Applications* 41, 1981, 11-32. (With C. Paige.)

Using the Hessenberg Decomposition in *Control Theory*. In *Algorithms and Theory in Filtering and Control*, D.C. Sorensen and R.J.-B. Wets (eds), Mathematical Programming Study No. 18, North-Holland, Amsterdam, 1982.

Generalizing the Linpack Condition Estimator. In *Numerical Analysis*, J.P. Hennart (ed), Lecture Notes in Mathematics No. 909, Springer-Verlag, New York, 1982. (with A.K. Cline and A.R. Conn).

A Generalized SVD Analysis of Some Weighting Methods for Equality Constrained Least Squares. In *Matrix Pencils Proceedings, Pite Havsbad, 1982*, B. Kagstrom and A. Ruhe (eds), Lecture Notes in Mathematics No. 973, Springer-Verlag, New York, 1983.

Computation of the Generalized Singular Value Decomposition Using Mesh Connected Processors, *Proceedings of the SPIE*, 1983. (With R. Brent and F. Luk).

A Symplectic Method for Computing all the Eigenvalues of a Hamiltonian Matrix, *J. Linear Algebra and Its Applications*, 61, 1984, 233-251.

Signal Processing Computations Using the Generalized Singular Value Decomposition, *Proceedings SPIE*, Vol. 495, *SPIE International Symposium*, San Diego, August, 1984. (with J. Speiser).

Computation of the Singular Value Decomposition Using Mesh-Connected Processors, *J. of VLSI and Computer Systems 1*, 1985, 242-270 (With R. Brent and F. Luk).

On the Method of Weighting for Equality Constrained Least Squares Problems, *SIAM J. Numer. Analysis*, 22, 1985, 851-864.

Computing the CS and the Generalized Singular Value Decompositions, *Numerische Mathematik*, 46, 1985, 479-491.

How Close is a Matrix to Being Unstable? In *Contemporary Mathematics Vol. 47, Linear Algebra and Systems Theory*, American Mathematical Society, (pp.465-478), 1985.

Computing the Minimum Eigenvalue of a Symmetric Positive Definite Toeplitz Matrix, *SIAM J. Scientific and Statistical Computing*, 1986, 123-131. (With G. Cybenko.)

Parallel Algorithms for Constrained and Unconstrained Least Squares problems, in *Numerical Analysis*, D.F.Griffiths and G.A.Watson (eds), Pitman Research Notes, Longman Scientific and Technical, Harlow, Essex, UK, pp. 112-124, 1986.

The Block Jacobi Method for Computing the Singular Value decomposition, in *Computational and combinatorial methods in systems theory*, C. Byrnes and A. Lindquist (eds), North-Holland, pp. 245-256, 1986.

Computing the Singular Value Decomposition on a Ring of Array Processors, in *Large scale eigenvalue problems*, J. Cullum and R. Willoughby (eds), Elsevier, pp.51-66, 1986, (with C. Bischof.)

Computation of the CS decomposition with Applications to Signal Processing . In *SPIE Proceedings*, Vol. 696, 1986. (with J. Speiser).

The WY Representation for Products of Householder Transformations, *SIAM J. Scientific and Statistical Computing*, 8, 1987, s2-s13. (With C. Bischof.)

On Estimating the Condition of Eigenvalues and Eigenvectors, *Linear Algebra and Its Applications*, 88, 1987, 715-732.

A Unitary Method for the ESPRIT Direction-of-Arrival Estimation Algorithm, *Proceedings of the SPIE*, 1987.

A Block QR Factorization Scheme for Loosely Coupled Systems of Array Processors, in *Algorithms for Modern Parallel Computer Architectures*, Springer-Verlag, Martin Schultz (ed), 1988, 217-228.

Matrix Computations and Signal Processing, *Proceedings of the McMaster Symposium on Signal Processing*, Prentice-Hall, 1988.

The Strong Stability of Algorithms for Solving Symmetric Linear Systems, *SIAM Journal on Matrix Analysis and Applications*, 10, 1989, 494-99 (with J . Bunch and J. Demmel).

A Storage Efficient WY Representation for Products of Householder Transfor mations, *SIAM Journal on Scientific and Statistical Computing*, 10, 1989, 53-57 (wit h R. Schreiber).

High Performance GEMM-Based Level-3 BLAS: Sample Routines for Double Precision Real Data, in *High Performance Computing II*, M. Durand and F. Dabaghi (eds), North Holland, 1991 (with B. Kagstrom and P. Ling).

Parallel Block Algorithms on the Shared Memory Multiprocessor IBM 3090 VF/600J, *International Journal on Supercomputing Applications*, 1992, 6, 69-97 (with B. Kagstrom, E. Elmroth, and K. Dackland).

A Survey of Matrix Computations, in *Handbooks in Operations Research and Management Science, Volume 3: Computing*, E.G. Coffman, J.K. Lenstra, and A.H.G. Rinnooy Kan (Eds), 1992, North Holland, 247-322.

Approximation with Kronecker Products, in *Linear Algebra for Large Scale and Real-Time Applications*, M.S. Moonen and G.H. Golub (eds), Kluwer Publications, 1993, 293-314 (with N. Pitsianis).

Optimizing Closed-Loop Adaptive-Optics Performance with Use of Multiple Control Bandwidths, *Journal of the Optical Society of America A*, 1994, 2871-2886 (with B.L. Ellerbroek, N.P. Pitsianis, and R.J. Plemmons).

GEMM-Based Level 3 BLAS: Algorithms for the Model Implementations, *ACM Transactions on Mathematical Software* 24 (1999), 268-302. (with P. Ling and B. Kagstrom).

Algorithm 784. GEMM-Based Level 3 BLAS: Portability and Optimization Issues, *ACM Transactions on Mathematical Software* 24 (1999), 303-316. (with P. Ling and B. Kagstrom).

Rational Matrix Functions and Rank-One Updates, *SIAM J. Matrix Analysis and Applications*, 22(2000), 145-154. (with D.S. Bernstein).

The Ubiquitous Kronecker Product, *Journal of Computational and Applied Mathematics*, 123(2000), 85-100.

Product Triangular Systems with Shift, *SIAM J. Matrix Analysis and Applications*, 24(2002), 292-301. (with Carla Dee Martin).

Nineteen Dubious Ways to Compute the Exponential of a Matrix, Twenty-Five Years Later, *SIAM Review* 45(2003), 3--49. (with Cleve Moler).

Solving Real Linear Systems with the Complex Schur Decomposition, *SIAM J. Matrix Analysis and Applications*, 29(2007), 177-183. (with Carla D. Martin).

Shifted Kronecker Product Systems, *SIAM J. Matrix Analysis and Applications*, 29(2007), 184-98. (with Carla Dee Martin).

A Jacobi-Type Method for Computing Orthogonal Tensor Decompositions, *SIAM J. Matrix Analysis and Applications*, 30 (2008), 1219-1232. (with Carla D. Martin).

From Random Polygon to Ellipse, *SIAM Review*, 52 (2010), 151-170. (with Adam Elmachtoub).

A Higher Order Generalized Singular Value Decomposition for Comparison of Global mRNA Expression from Multiple Organisms, *PLoS One*, 6 (2011) Issue 12. (With Sri Priya Ponnappalli, M.A. Saunders, and Orly Alter).

Block Tensor Unfoldings, *SIAM J. Matrix Analysis and Applications*, 33(2012), 149–169. (with Stefan Ragnarsson).

Block Tensors and Symmetric Embeddings, *Linear Algebra and its Applications*. 438 (2012), 853-874. (with Stefan Ragnarsson)

PhD Students

Ralph Byers (1983). *Hamiltonian and Symplectic Algorithms for the Algebraic Riccati Equation*.

Clare Chu (1988). *The Fast Fourier Transform on Hypercube Parallel Computers*.

Chris Bischof (1988). *QR Factorization Algorithms for Course-Grained Distributed Systems*.

Greg Henry (1994). *Improving Data Reuse in Eigenvalue Related Computations*.

Nikos Pitsianis (1997). *The Kronecker Product in Approximation and Fast Transform Generation*.

Adam Florence (2001). *Computational Multilinear Algebra*

Carla Martin (2005) . *Higher-Order Kronecker Products and Tensor Decompositions*.

Stefan Ragnarsson (2011). *Structured Tensor Computations: Blocking, Symmetries, and Kronecker Factorizations*

Mike McCourt (2012). *Building Infrastructure for Multiphysics Simulations*