Thomas H. Cormen

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Current Position

Emeritus Professor of Computer Science.

Research Interests

Algorithm engineering, parallel computing, speeding up computations with high latency, Gray codes.

Education

Massachusetts Institute of Technology, Cambridge, Massachusetts
Ph.D. in Electrical Engineering and Computer Science, February 1993.
Thesis: "Virtual Memory for Data-Parallel Computing."
Advisor: Charles E. Leiserson.
Minor: Engineering management and entrepreneurship.

S.M. in Electrical Engineering and Computer Science, May 1986.
Thesis: "Concentrator Switches for Routing Messages in Parallel Computers."
Advisor: Charles E. Leiserson.

Princeton University, Princeton, New Jersey
B.S.E. *summa cum laude* in Electrical Engineering and Computer Science, June 1978.

Honors and Awards

ACM Distinguished Educator, 2009.

McLane Family Fellow, Dartmouth College, 2004–2005.

Jacobus Family Fellow, Dartmouth College, 1998–1999.

Dartmouth College Class of 1962 Faculty Fellowship, 1995–1996.

Adopted Member, Dartmouth College Class of 1962, 2015.

Professional and Scholarly Publishing Award in Computer Science and Data Processing, Association of American Publishers, 1990.

Distinguished Presentation Award, 1987 International Conference on Parallel Processing, St. Charles, Illinois.

Best Presentation Award, 1986 International Conference on Parallel Processing, St. Charles, Illinois.

National Science Foundation Fellowship.

Elected to Phi Beta Kappa, Tau Beta Pi, Eta Kappa Nu.

Prepared on January 8, 2023.

Professional Experience

Dartmouth College, Hanover, New Hampshire

- Emeritus Professor, Department of Computer Science, January 2022–present.
- Chair, Department of Computer Science, July 2009–July 2015.
- Professor, Department of Computer Science, July 2004–December 2021.
- Director of the Dartmouth Institute for Writing and Rhetoric, July 2007–June 2008.
- Chair of the Writing Program (renamed to Writing and Rhetoric Program), July 2005–June 2008.
- Director of the Writing Program, July 2004–June 2005.
- Associate Professor, Department of Computer Science, July 1998–June 2004.
- Assistant Professor, Department of Computer Science, July 1992–June 1998.
- Mathematics and Social Science committee, 2000–2014.

Courses taught:
Courses numbered below 100 are undergraduate courses, and courses numbered above 100 are graduate courses.

COSC 1	Introduction to Programming and Computation: Winter 2012, Winter 2013, Fall 2013, Winter 2015, Winter 2016, Spring 2017, Fall 2018, Fall 2019.
COSC 5	Introduction to Computer Science: Fall 1993, Spring 1995, Fall 1995, Fall 1996, Spring 1998, Fall 1998, Fall 1999, Fall 2000, Fall 2001, Fall 2002, Fall 2003, Spring 2005, Spring 2006, Fall 2006, Fall 2007, Fall 2009, Spring 2011.
COSC 10	Problem Solving Via Object-Oriented Programming: Spring 2014.
COSC 18	Structure and Interpretation of Computer Programs: Winter 2001.
COSC 23	Software Design and Implementation: Winter 1993, Spring 1994, Winter 1997, Winter 1998, Winter 1999, Spring 2000, Winter 2002.
COSC 25/31	Algorithms: Summer 1994, Spring 2001, Spring 2002, Spring 2003, Spring 2016, Fall 2016, Winter 2019.
COSC 48	Implementation of Programming Languages: Spring 1999, Fall 2010.
COSC 49.05/149	Parallel Computing: Winter 2017.
COSC 57	Compilers, Spring 2013.
COSC 91/110/191	Writing, Presenting, and Evaluating Technical Papers in Computer Science: Fall 2005, Winter 2010, Fall 2012, Fall 2014, Spring 2019.
COSC 98	Engineering Projects in Community Service: Fall 2011, Winter 2012, Spring 2012.
COSC 105	Algorithms: Winter 2004.
COSC 108	Programming and Computer Systems I (Operating Systems): Winter 1995.
COSC 118	Programming and Computer Systems II (Programming Languages and Compilers): Spring 1993.
COSC 187	Computer Architecture and Hardware Seminar: Fall 1992.
COSC 88/188	Topics in Computer Systems/Computer Systems Seminar: • Design and Implementation of CVL on the MasPar MP-2: Winter 1994. • Computing on the Memory Hierarchy: Fall 1997. • Parallel Computing: Winter 2000, Winter 2003. • How to Write, Evaluate, and Present Technical Papers in Computer Science: Fall 2003.
COSC 80/82/94	Reading Courses: • Learning C++ and Tcl: Winter 1997. • Multiprocessor Out-of-Core FFTs: Spring 1997. • Graphics-based Game Development: Summer 1997. • Designing a Business Plan for a Software Product: Fall 1997. • Parallel Computing: Winter 2011, Fall 2012.
English 5	Expository Writing: Winter 2005.

Institute for Mathematics and Its Applications, University of Minnesota, Minneapolis, Minnesota
Visitor, September 1996.

Carnegie Mellon University, Pittsburgh, Pennsylvania
Visiting Scientist, January–June 1996. Worked with Garth Gibson in the Parallel Data Laboratory.

Massachusetts Institute of Technology, Cambridge, Massachusetts
Graduate student, September 1984–September 1992. Major projects and teaching:

- Designed a full-duplex hyperconcentrator switch, Spring 1985.
- Teaching Assistant for a junior/senior-level algorithms course, Fall 1986.
- Coauthored Introduction to Algorithms, 1987–1990.
- Designed and implemented VM-DP, a Unix-based simulator for data-parallel computing with explicitly managed virtual memory, January–August 1992.

Thinking Machines Corporation, Cambridge, Massachusetts
Summer 1990. Specified and implemented a C* runtime library of functions that operate on segmented vectors.

Avera Corporation, Scotts Valley, California
July 1979–October 1983 and March 1984–June 1984. Senior Staff Engineer. Developed software for a line of microprocessor-based turnkey computer-aided engineering graphics systems. Designed, implemented, and integrated the graphic database manager and graphic editing commands. Wrote applications utilities and improved system performance. Lead designer for the Schematic Designer product, a graphic editor for electrical schematic drawings which dynamically maintained the netlist and informed the user upon significant changes and errors. Helped convert the Avera software from Pascal to C to run under Unix; redesigned the cell-library software during this conversion. Taught an in-house course on Pascal for beginning programmers.

Caere Corporation, Los Gatos, California
October 1983–February 1984. Senior Software Engineer. Developed optical character recognition algorithms for typewritten and handwritten characters.

Amdahl Corporation, Sunnyvale, California
July 1978–July 1979. Systems Design Engineer. Developed part of an advanced design automation system for large mainframe design. Designed and implemented an improved user interface and a design-file comparator. Handled user liaison. Taught an in-house course on OS/VS JCL.

Princeton University, Princeton, New Jersey

- Foreman, APL Clinic, March 1976–June 1978.
- Teaching Assistant for a sophomore-level software course, Fall 1977.
- Computer programmer, Transportation Program, Summer 1975–1977. Wrote software to graphically display the expected operation of the then-proposed ConRail system for a study commissioned by the U. S. House of Representatives. Modeled U. S. railroad performance for the Federal Railroad Administration.

Publications

Books and Book Chapters

Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. *Introduction to Algorithms*, Fourth edition. The MIT Press, 2022.

Thomas H. Cormen. What Is Computer Science? Chapter in *What Are the Arts and Sciences?*, Daniel Rockmore, editor, University Press of New England, 2017.

Thomas H. Cormen. Parallel Computing in a Python-Based Computer Science Course. Chapter 9 in Sushil K. Prasad, Anshul Gupta, Arnold L. Rosenberg, Alan Sussman, and Charles C. Weems, editors, *Topics in Parallel and Distributed Computing: Introducing Concurrency in Undergraduate Courses*, Morgan Kaufmann, 2015.

Thomas H. Cormen. *Algorithms Unlocked*. The MIT Press, 2013. Translations: French (Dunod Editeur, 2013), Japanese (Nikkei Business Publications, 2016), Polish (Helion S.A., 2016), Chinese simplified character (China Machine Press/Beijing Huazhang Graphics & Information Co., 2016), Korean (Acorn Publishing Company, 2016), Ukra-

nian (K. I. S. Ltd., 2021), Portuguese (Elsevier Editora Ltda. of Rio de Janeiro, in progress), Russian (Williams Publishers, in progress), Mongolian (Mongolian University of Science and Technology Press, in progress).

Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. *Introduction to Algorithms*, Third edition. The MIT Press, 2009. Translations: French (Dunod, 2010), Italian (McGraw-Hill/Italy, 2010), German (Oldenbourg Wissenschaftsverlag, 2010), Polish (Wydawnictwo Naukowe PWN, 2012), Japanese (Kindai Kagaku Sha, 2012), Greek (Crete University Press, 2016), Korean (Hanbit Academy, Inc., 2014), Ukranian (K.I.S. Ltd., 2019), Mongolian (Mongolian University of Science and Technology Press, 2021).

Thomas H. Cormen. *Instructor's Manual to Accompany Introduction to Algorithms, Third edition*. The MIT Press, 2009. Available as a password-protected PDF file from the MIT Press.

Thomas H. Cormen and Elena Riccio Davidson. Using FG to Reduce the Effect of Latency in Parallel Programs Running on Clusters. Chapter 34 in Sanguthevar Rajasekaran and John Reif, editors, *Handbook of Parallel Computing: Models, Algorithms and Applications*, Chapman & Hall/CRC, 2007.

Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. *Introduction to Algorithms*, Second edition. The MIT Press and McGraw-Hill, 2001. Translations: Portuguese (Editora Campus, 2002), French (Dunod, 2002), Hungarian (Scolar Informatika, 2003), Polish (Wydawnictwa Naukowo-Techniczne, 2004), Korean (Hanbit Media, 2005), German (Oldenbourg Wissenschaftsverlag, 2005), Russian (Williams Publishing, 2005), Greek (Crete University Press, 2007), Chinese simplified character (China Machine Press, 2006), Hebrew (Open University of Israel, 2008), Chinese complex character (Unalis Corporation, Taipei, in progress), Italian (McGraw-Hill Publishing Group Italia, in progress), Japanese (Kindai Kagaku Sha, in progress).

Thomas H. Cormen, Clara Lee, and Erica Lin. *Instructor's Manual to Accompany Introduction to Algorithms, Second edition*. The MIT Press and McGraw-Hill, 2002. Available as a password-protected PDF file from http://www.cs.dartmouth.edu/~thc/manual/ (password-protected site).

Thomas H. Cormen, Charles E. Leiserson, and Ronald L. Rivest. *Introduction to Algorithms*. The MIT Press and McGraw-Hill, 1990. Winner of 1990 Professional and Scholarly Publishing Award in Computer Science and Data Processing, Association of American Publishers. Translations: French (Dunod, 1994), Italian (Jackson Libri, 1994), Hebrew (Open University of Israel, 1995), Japanese (Kindai Kagaku Sha, 1996), Hungarian (Műszaki Könyvkiadó, 1997), Polish (Wydawnictwa Naukowo-Techniczne, 1997), Russian (Moscow Center for Continuing Mathematics Education, 1999), Romanian (Computer Libris Agora, 2000).

Thomas H. Cormen. Determining an Out-of-Core FFT Decomposition Strategy for Parallel Disks by Dynamic Programming. In Michael T. Heath, Abhiram Ranade, and Robert S. Schreiber, editors, *Algorithms for Parallel Processing*, Volume 105 of IMA Volumes in Mathematics and its Applications, pp. 307–320, Springer-Verlag, 1999. Also available as Dartmouth College Computer Science Technical Report PCS-TR97-322, July 1997.

Thomas H. Cormen. Algorithmic Complexity. Section 16.4 in Kenneth H. Rosen, editor, *CRC Handbook of Discrete and Combinatorial Mathematics*, CRC Press, 2000.

Articles in Refereed Journals

Geeta Chaudhry and Thomas H. Cormen. Slabpose Columnsort: A New Oblivious Algorithm for Out-of-Core Sorting on Distributed-Memory Clusters. *Algorithmica*, 45:3, July 2006, pp. 483–508.

Thomas H. Cormen and James C. Clippinger. Performing BMMC Permutations Efficiently on Distributed-Memory Multiprocessors with MPI. *Algorithmica*, 24:3/4, July/August 1999, pp. 349–370.

Thomas H. Cormen and David M. Nicol. Performing Out-of-Core FFTs on Parallel Disk Systems. *Parallel Computing*, 24:1, January 1998, pp. 5–20. Also available as Dartmouth College Computer Science Technical Report PCS-TR96-294, August 1996, revised September 1996, and ICASE Report 96-70, December 1996.

Thomas H. Cormen, Thomas Sundquist, and Leonard F. Wisniewski. Asymptotically Tight Bounds for Performing BMMC Permutations on Parallel Disk Systems. *SIAM Journal on Computing*, 28:1, pp. 105–136.

Thomas H. Cormen and Kristin Bruhl. Don't Be Too Clever: Routing BMMC Permutations on the MasPar MP-2. *Theory of Computing Systems*, 31, pp. 251–278.

Thomas H. Cormen and Melissa Hirschl. Early Experiences in Evaluating the Parallel Disk Model with the ViC* Implementation. *Parallel Computing*, 23(4–5), June 1997, pp. 571–600.

Thomas H. Cormen. Fast Permuting on Disk Arrays. *Journal of Parallel and Distributed Computing*, 17(1–2), January and February 1993, pp. 41–57.

Thomas H. Cormen and Charles E. Leiserson. A Hyperconcentrator Switch for Routing Bit-Serial Messages. *Journal of Parallel and Distributed Computing*, 10:3, November 1990, pp. 193–204.

Invited Journal Articles

Thomas H. Cormen and David M. Nicol. Out-of-Core FFTs with Parallel Disks. ACM SIGMETRICS *Performance Evaluation Review*, 25:3, December 1997, pp. 3–12.

Thomas H. Cormen and Michael T. Goodrich. A Bridging Model for Parallel Computation, Communication, and I/O. *ACM Computing Surveys*, 28A(4), December 1996, http://www.acm.org/pubs/citations/journals/surveys/1996-28-4es/a208-cormen/.

Articles in Refereed Conferences and Workshops

Jessica C. Fan and Thomas H. Cormen. Dense Gray Codes in Mixed Radices. *2017 IEEE International Symposium on Information Theory (ISIT)*, June 2017.

Thomas H. Cormen and Jessica C. Fan. Dense Gray Codes, or Easy Ways to Generate Cyclic and Non-Cyclic Gray Codes For the First n Whole Numbers. *54th Annual Allerton Conference on Communication, Control, and Computing*, October 2016.

Peter C. Johnson and Thomas H. Cormen. Networks Beat Pipelines: The Design of FG 2.0. *2012 International Workshop on Programming Models and Applications for Multicores and Manycores (PMAM 2012)*, February 2012.

Priya Natarajan, Thomas H. Cormen, and Elena Riccio Strange. Out-of-Core Distribution Sort in the FG Programming Environment. *Workshop on Multithreaded Architectures and Applications (MTAAP 2010)*, April 2010.

Geeta Chaudhry and Thomas H. Cormen. Oblivious vs. Distribution-based Sorting: An Experimental Evaluation. *13th Annual European Symposium on Algorithms (ESA 2005)*, October 2005. LNCS 3669, pp. 317–328, Springer, 2005.

Elena Riccio Davidson and Thomas H. Cormen. Building on a Framework: Using FG for More Flexibility and Improved Performance in Parallel Programs. *19th IEEE International Parallel and Distributed Processing Symposium (IPDPS 2005)*, April 2005.

Elena Riccio Davidson and Thomas H. Cormen. The FG Programming Environment: Reducing Source Code Size for Parallel Programs Running on Clusters. *Second Workshop on Productivity and Performance in High-End Computing (P-PHEC 2005)*, February 2005, pp. 27–34.

Thomas H. Cormen and Elena Riccio Davidson. FG: A Framework Generator for Hiding Latency in Parallel Programs Running on Clusters. *17th International Conference on Parallel and Distributed Computing Systems (PDCS-2004)*, September 2004. pp. 137–144.

Thomas H. Cormen, Elena Riccio Davidson, and Siddhartha Chatterjee. Asynchronous Buffered Computation Design and Engineering Framework Generator (ABCDEFG). White paper at *High-End Computing Revitalization Task Force Workshop*, June 2003.

Geeta Chaudhry and Thomas H. Cormen. Getting More From Out-of-Core Columnsort. *4th Workshop on Algorithm Engineering and Experiments (ALENEX 02)*, January 2002. LNCS 2409, pp. 143–154, Springer-Verlag, 2002.

Geeta Chaudhry, Thomas H. Cormen, and Leonard F. Wisniewski. Columnsort Lives! An Efficient Out-of-Core Sorting Program. *Thirteenth Annual ACM Symposium on Parallel Algorithms and Architectures*, July 2001, pp. 169–178.

Lauren M. Baptist and Thomas H. Cormen. Multidimensional, Multiprocessor, Out-of-Core FFTs with Distributed Memory and Parallel Disks. *Eleventh Annual ACM Symposium on Parallel Algorithms and Architectures*, June 1999, pp. 242–250.

Alex Colvin and Thomas H. Cormen. ViC*: A Compiler for Virtual-Memory C*. Extended abstract in *Third International Workshop on High-Level Parallel Programming Models and Supportive Environments (HIPS '98)*, March 1998, pp. 23–33. Full paper available as Dartmouth College Computer Science Technical Report PCS-TR97-323, November 1997.

Thomas H. Cormen, Jake Wegmann, and David M. Nicol. Multiprocessor Out-of-Core FFTs with Distributed Memory and Parallel Disks. *Fifth Workshop on I/O in Parallel and Distributed Systems (IOPADS '97)*, November 1997, pp. 68–78.

Leonard F. Wisniewski, Thomas H. Cormen, and Thomas Sundquist. Performing BMMC Permutations in Two Passes Through the Expanded Delta Network and MasPar MP-2. *6th Symposium on the Frontiers of Massively Parallel Computation*, October 1996, pp. 282–289.

Thomas H. Cormen and Kristin Bruhl. Don't Be Too Clever: Routing BMMC Permutations on the MasPar MP-2. *7th Annual ACM Symposium on Parallel Algorithms and Architectures*, July 1995, pp. 288–297.

Thomas H. Cormen and Leonard F. Wisniewski. Asymptotically Tight Bounds for Performing BMMC Permutations on Parallel Disk Systems. *5th Annual ACM Symposium on Parallel Algorithms and Architectures*, June 1993, pp. 130–139.

Thomas H. Cormen and David Kotz. Integrating Theory and Practice in Parallel File Systems. *DAGS '93 Symposium*, June 1993, pp. 64–74.

Lars E. Bader and Thomas H. Cormen. Virtual Memory for Data-Parallel Computing. *1992 MIT Student Workshop on VLSI and Parallel Systems*, July 1992, pp. 3-1–3-2.

Thomas H. Cormen. Fast Permuting on Disk Arrays. *1992 Brown/MIT VLSI Conference*, March 1992, pp. 58–76.

Thomas H. Cormen. Efficient Multichip Partial Concentrator Switches. *1987 International Conference on Parallel Processing*, August 1987, pp. 525–532.

Thomas H. Cormen and Charles E. Leiserson. A Hyperconcentrator Switch for Routing Bit-Serial Messages. *1986 International Conference on Parallel Processing*, August 1986, pp. 721–728.

Unrefereed Articles

Thomas H. Cormen, Priya Natarajan, and Elena Riccio Davidson. When One Pipeline Is Not Enough. Dartmouth College Computer Science Technical Report TR2007-596, June 2007.

Thomas H. Cormen and Elena Riccio Davidson. Asynchronous Buffered Computation Design and Engineering Framework Generator (ABCDEFG) Tutorial and Reference, Version 1.4. Available from http://www.cs.dartmouth.edu/FG/.

Geeta Chaudhry and Thomas H. Cormen. Stupid Columnsort Tricks. Dartmouth College Computer Science Technical Report TR2003-444, April 2003.

Geeta Chaudhry, Elizabeth A. Hamon, and Thomas H. Cormen. Relaxing the Problem-Size Bound for Out-of-Core Columnsort. *SPAA 2003 Revue*, June 2003. Also Dartmouth College Computer Science Technical Report TR2003-445, April 2003.

Thomas H. Cormen, Sumit Chawla, Preston Crow, Melissa Hirschl, Roberto Hoyle, Keith D. Kotay, Rolf H. Nelson, Nils Nieuwejaar, Scott M. Silver, Michael B. Taylor, and Rajiv Wickremesinghe. DartCVL: The Dartmouth C Vector Library. Dartmouth College Computer Science Technical Report PCS-TR95-250, January 1995.

Thomas H. Cormen and Alex Colvin. ViC*: A Preprocessor for Virtual-Memory C*. Dartmouth College Computer Science Technical Report PCS-TR94-243, November 1994.

Thomas H. Cormen. Vector Layout in Virtual-Memory Systems for Data Parallel Computing. Dartmouth College Computer Science Technical Report PCS-TR93-194, August 1993.

Thomas H. Cormen. *Virtual Memory for Data-Parallel Computing*. Ph.D. thesis available as MIT Technical Report MIT/LCS/TR-559, January 1993.

Software

Algorithms from *Introduction to Algorithms*, Fourth edition, in Python. With Linda Xiao. Available from https://mitp-content-server.mit.edu/books/content/sectbyfn/books_pres_0/11599/clrsPython.zip.

FG. Available from http://www.cs.dartmouth.edu/FG/.

Algorithms from *Introduction to Algorithms*, Second edition, in Java. Available from http://www.cs.dartmouth.edu/~thc/clrsjava/ (password-protected site).

clrscode.sty and clrscode3e.sty: Packages for LaTeX2e that allows users to typeset pseudocode as in *Introduction to Algorithms*, second edition (clrscode.sty) and third edition (clrscode3e.sty). Available from http://www.cs.dartmouth.edu/~thc/clrscode/. clrscode.sty also available from http://www.ctan.org/.

libbmmc_mpi.a: A library to perform fast BMMC permutations for any multiprocessor system that supports MPI. Available from Netlib at http://www.netlib.org/mpi/contrib/bmmc.tar.gz.

Posters

Thomas H. Cormen, Jake Wegmann, and David M. Nicol. Multiprocessor Out-of-Core FFTs with Distributed Memory and Parallel Disks.
- Gordon Research Conference on High-Performance Computing and Information Infrastructure, Plymouth, New Hampshire, July 1997.
- SPAA Revue, Newport, Rhode Island, June 1997.

Talks

Dense and Cyclic Gray Codes for Binary, Fixed, and Mixed Radices
- Boston University, Boston, Massachusetts, March 2022.
- Bowdoin College, Brunswick, Maine, April 2019.
- Studencki Festiwal Informatyczny, Krakow, Poland, March 2017. Keynote presentation.

Dense Gray Codes, or Easy Ways to Generate Cyclic and Non-Cyclic Gray Codes for the First n Whole Numbers
- Dartmouth Computer Science Research Symposium, Hanover, New Hampshire, May 2016.

Edge Coloring For Regular Bipartite Multigraphs
- Dartmouth Computer Science Research Symposium, Hanover, New Hampshire, September 2013.

We Must Be Doing Something Right . . . Or Is It the Facebook Movie?
- Consortium for Computing Sciences in Colleges—Northeastern Region, Siena College, Loudonville, New York, April 2013. Keynote presentation.

Latency? Not a Problem When You Use FG
- SIAM Conference on Computational Science and Engineering, Reno, Nevada, February 2011. Invited presentation.

FG: The Good, the Bad, and the Ugly
- Duke University, Durham, North Carolina, December 2010.

When One Pipeline Is Not Enough *or* Putting a Square Buffer Into a Round Pipeline
- Dartmouth Computer Science Research Symposium, Hanover, New Hampshire, January 2010.

Mitigate Latency and Keep Cores Busy with FG
- OSD Invitational Workshop on Software Issues in Advanced Computing, George Mason University, Fairfax, Virginia, September 2009. Invited presentation.

Mitigate Latency with FG
- University of New Hampshire, Durham, New Hampshire, April 2009.

Oblivious vs. Distribution-based Sorting: An Experimental Evaluation
- 13th Annual European Symposium on Algorithms (ESA 2005), Palma de Mallorca, Spain, October 2005.

Asynchronous Buffered Computation Design and Engineering Framework Generator (ABCDEFG)
- IBM via videoconference, November 2004.
- Harvard University, Cambridge, Massachusetts, December 2004.

Edna St. Vincent Millay Was Right
- Reflections | Projections Student Computing Conferece at UIUC, Urbana, Illinois, October 2004. Invited presentation.
- Workshop on Scalable File Systems and Storage Technologies at 17th International Conference on Parallel and Distributed Computing Systems, San Francisco, California, September 2004. Invited presentation.

Parallel Out-of-core Sorting: The Third Way
- University of Alabama, Tuscaloosa, Alabama, March 2003.

Getting More From Out-of-Core Columnsort
- 4th Workshop on Algorithm Engineering and Experiments (ALENEX 02), San Francisco, California, January 2002.

Columnsort Lives! An Efficient Out-of-Core Sorting Program
- Sandia National Laboratories, Albuquerque, New Mexico, December 2001.
- Middlebury College, Middlebury, Vermont, November 2001.
- Thirteenth Annual ACM Symposium on Parallel Algorithms and Architectures, Crete Island, Greece, July 2001.

Everything You Always Wanted to Know About Out-of-Core FFTs (But Were Afraid to Ask)
- State University of New York, Albany, New York, October 2000.

FFT In Four Styles: Teaching Paradigms of Parallel Programming
- SPAA Revue, Bar Harbor, Maine, July 2000. Invited presentation.

Multidimensional, Multiprocessor, Out-of-Core FFTs with Distributed Memory and Parallel Disks
- Eleventh Annual ACM Symposium on Parallel Algorithms and Architectures, St.-Malo, France, June 1999.

Multiprocessor Out-of-Core FFTs with Distributed Memory and Parallel Disks
- University of Texas, Austin, Texas, October 1998.
- Carleton University, Ottawa, Ontario, Canada, September 1998.
- California Institute of Technology, Pasadena, California, February 1998.
- Fifth Workshop on I/O in Parallel and Distributed Systems (IOPADS '97), San Jose, California, November 1997.
- SPAA Revue, Newport, Rhode Island, June 1997.

Thanks for the Memory Hierarchy
- SPAA Revue, Puerto Vallarta, Mexico, July 1998. Invited presentation.

Performing Out-of-Core FFTs on Parallel Disk Systems
- University of California, Berkeley, California, November 1997.
- Massachusetts Institute of Technology, Cambridge, Massachusetts, October 1997.
- Northwestern University, Evanston, Illinois, May 1997.
- University of Massachusetts, Amherst, Massachusetts, May 1997.
- University of New Hampshire, Durham, New Hampshire, April 1997.
- University of Connecticut, Storrs, Connecticut, April 1997.
- University of Minnesota, Minneapolis, Minnesota, September 1996.

The spin on parallel disk systems: They may be a RAID to you, but they're Just a Bunch of Disks to me
- Gordon Research Conference on High-Performance Computing and Information Infrastructure, Plymouth, New Hampshire, July 1997. Invited presentation.

Keeping the Fun in Functions: Personal Experiences in Teaching and Learning Parallel Computing
- Forum on Parallel Computing Curricula, Newport, Rhode Island, June 1997. Invited presentation.

ViC*: A Compiler for Virtual-Memory C*
- University of Maryland, College Park, Maryland, May 1996.
- University of North Carolina, Chapel Hill, North Carolina, May 1996.
- Duke University, Durham, North Carolina, April 1996.
- ICASE, Hampton, Virginia, April 1996.
- Brown University, Providence, Rhode Island, April 1996.
- Princeton University, Princeton, New Jersey, March 1996.
- Carleton University, Ottawa, Ontario, Canada, March 1996.
- University of Central Florida, Orlando, Florida, March 1996.
- University of Michigan, Ann Arbor, Michigan, January 1996.
- Workshop on Modeling and Specification of I/O, IEEE Symposium on Parallel and Distributed Processing, October 1995. Invited presentation.
- Carnegie Mellon University, Pittsburgh, Pennsylvania, May 1995.
- University of California at Irvine, Irvine, California, April 1995.
- University of New Hampshire, Durham, New Hampshire, November 1994.

How an Introduction to Algorithms Became a Long-Term Commitment
- Carnegie Mellon University, Pittsburgh, Pennsylvania, May 1996.

Don't Be Too Clever: Routing BMMC Permutations on the MasPar MP-2
- 7th Annual ACM Symposium on Parallel Algorithms and Architectures, Santa Barbara, California, July 1995.
- Johns Hopkins University, Baltimore, Maryland, November 1994.

An Asymptotically Optimal Algorithm for Performing BMMC Permutations on Parallel Disk Systems
- DIMACS Workshop on Organizing and Moving Data in Parallel Machines, Princeton, New Jersey, January 1994. Invited presentation.

Asymptotically Tight Bounds for Performing BMMC Permutations on Parallel Disk Systems
- 5th Annual ACM Symposium on Parallel Algorithms and Architectures, Velen, Germany, June 1993.

Integrating Theory and Practice in Parallel File Systems
- DAGS '93 Symposium, Hanover, New Hampshire, June 1993.

Virtual Memory for Data-Parallel Computing
- DAGS '94 School, Hanover, New Hampshire, July 1994.
- Thinking Machines Corporation, Cambridge, Massachusetts, April 1994.
- Bellcore, Morristown, New Jersey, January 1994.
- University of Massachusetts, Amherst, Massachusetts, December 1993.
- Dartmouth College, Hanover, New Hampshire, June 1992.

Fast Permuting on Disk Arrays
- University of Virginia, Charlottesville, Virginia, April 1992.
- York University, North York, Ontario, Canada, March 1992.
- 1992 Brown/MIT VLSI Conference, Providence, Rhode Island, March 1992.
- Thinking Machines Corporation, Cambridge, Massachusetts, March 1992.
- Pennsylvania State University, State College, Pennsylvania, February 1992.
- University of Minnesota, Minneapolis, Minnesota, February 1992.
- Wellesley College, Wellesley, Massachusetts, February 1992.
- Sandia National Laboratories, Albuquerque, New Mexico, February 1992.
- DARPA Microsystems Contractors' Meeting, Pasadena, California, November 1991.

Concentrator Switches for Routing Messages on Parallel Computers
- GTE Laboratories, Waltham, Massachusetts, December 1987.

Efficient Multichip Partial Concentrator Switches
- 1987 International Conference on Parallel Processing, St. Charles, Illinois, August 1987. Received Distinguished Presentation Award.
- MIT VLSI Research Review, Cambridge, Massachusetts, May 1987.

A Hyperconcentrator Switch for Routing Bit-Serial Messages
- 1986 International Conference on Parallel Processing, St. Charles, Illinois, August 1986. Received Best Presentation Award.
- DARPA VLSI Contractors' Meeting, Seattle, Washington, October 1985.
- MIT VLSI Research Review, Cambridge, Massachusetts, May 1985.

Tutorials

Algorithms tutorials on Khan Academy. https://www.khanacademy.org/computing/computer-science/algorithms. With Devin Balkcom.

Parallel I/O Issues in High-Performance Distributed Computing, *Fourth International Symposium on High Performance Distributed Computing*, August 1995. With David Kotz.

Panels

Unconventional Wisdom in Multicore Computing, *2010 IEEE International Parallel and Distributed Processing Symposium*, plenary panel, April 2010.

Funding

Co-Principal Investigator, National Science Foundation, "GridIron," $474,888, awarded June 2012 for five years.

Subcontractor to DARPA-funded IBM PERCS project, "Asynchronous Buffered Computation Design and Engineering Framework Generator," $212,880, awarded September 2003 for three years.

Co-Principal Investigator, National Science Foundation ITR (Medium), Award 0326155, "Information Extraction from Massive Data Sets," with Sanguthevar Rajasekaran (PI) and Sartaj Sahni (Co-PI), $235,000 (my portion) plus $4000 REU, awarded September 2003 for four years.

Principal Investigator, Dartmouth College Women in Science Program, "Encouraging Women in Computer Science Through the Use of Undergraduate Section Leaders," WISP mini-grant, $1600 awarded September 2000.

Principal Investigator, Sun Microsystems donation, "Out-of-Core Sorting on a Network of Sun Systems," $50,000 donated December 1998, $11,345 in equipment donated March 1999.

Co-Principal Investigator, workshop on "New Approaches to Pharmacokinetic Pharmacodynamic (PK-PD) Relationships in Phase-I Drug Development," $5000 from Dartmouth College, awarded May 1998.

Principal Investigator, National Science Foundation Grant CCR-9625894, "ViC*: A Compiler and Runtime System for Out-of-Core C*," $109,185 awarded August 1996 for two years.

Co-Principal Investigator, "Large-Address-Space Operating Systems, Parallel I/O, and Algorithms on a Digital 2100 Server," Digital Equipment Corporation equipment allowance of $52,037, awarded August 1994.

Principal Investigator, National Science Foundation Research Initiation Award CCR-9308667, "Virtual Memory for Data-Parallel Computing," $98,218 awarded September 1993 for three years.

Burke Research Initiation Award, $15,000 from Dartmouth College, awarded June 1993 for two years.

Patents

Message merging device. With Charles E. Leiserson. U. S. Patent Number 4,922,246.

Professional Activities

- *Parallel Computing*, Subject Area Editor, 2010–2014.
- WADS 2007 (Workshop on Algorithms and Data Structures), Program Committee.
- HiPC 2007 (International Conference on High Performance Computing), Program Committee.
- PDCS-2005 (International Conference on Parallel and Distributed Computing Systems), Program Committee.
- SPAA 2004, Program Committee.
- WADS 2003 (Workshop on Algorithms and Data Structures), Program Committee.
- Workshop on Parallel I/O in Cluster Computing and Computational Grids at 3rd IEEE/ACM International Symposium on Cluster Computing and the Grid (CCGrid 2003), Program Committee.
- ALENEX 03 (Workshop on Algorithm Engineering and Experiments), Program Committee.
- ESA 2001 (European Symposium on Algorithms), Program Committee.
- SPAA Steering Committee, 2000–2007.
- SPAA 2000, Local Arrangements Chair.
- IPDPS 2000 (International Parallel and Distributed Processing Symposium), Program Committee.
- FCRC '99, Organizing Committee.
- IOPADS '99, General Chair, Finance Chair, and Proceedings Chair.
- IOPADS Steering Committee, 1997–1999.
- SPAA '99, Secretary and Proceedings Editor.
- SPAA '98, Program Committee, Secretary, and Proceedings Editor.
- Co-editor, special issue of *Theory of Computing Systems*, selected papers from SPAA '98.
- Third Workshop on Algorithm Engineering (WAE'99), Program Committee.
- Fifth International Conference on High Performance Computing (HiPC'99), Program Committee.
- 11th International Conference on Parallel and Distributed Computing Systems (1998), Program Committee.
- IOPADS '97, General Chair, Finance Chair, and Proceedings Chair.
- IOPADS '96, General Chair, Program Committee, Finance Chair, and Proceedings Chair.
- Strategic Directions in Computing Research (1996), Workshop Participant (participation by invitation only), member of Working Group on Storage I/O Issues in Large-Scale Computing.
- IPPS '95 Workshop on I/O in Parallel and Distributed Systems, Program Committee.
- IPPS '94 Workshop on I/O in Parallel Computer Systems, Program Committee.
- DAGS '94, School Co-Chair.
- DAGS '93, Organizing and Program Committees.

Students Supervised

Ph.D. graduates supervised:

- Geeta Chaudhry, Ph.D. 2004. Dissertation title: *Parallel Out-Of-Core Sorting: The Third Way*.
- Alex Colvin, Ph.D. 1999. Dissertation title: *ViC*: Running Out-of-Core Instead of Running Out of Core*.
- Elena Riccio Davidson, Ph.D. 2006. Dissertation title: *FG: Improving Parallel Programs and Parallel Programming Since 2003.*
- Priya Natarajan, Ph.D. 2011. Dissertation title: *Tackling Latency Using FG*.
- Leonard F. Wisniewski, Ph.D. 1996. Dissertation title: *Efficient Design and Implementation of Permutation Algorithms on the Memory Hierarchy*.

M.S. graduates supervised:

- Melissa Hirschl, M.S. 1997.
- Mridul Khan.
- Lixing Lian, M.S. 2017.
- Michael Ringenburg, M.S. 2001. Thesis title: *Applying the Vector-Radix Method to Multidimensional, Multiprocessor, Out-of-Core Fast Fourier Transforms*.
- Georgi Vassilev, M.S. 1994.

Other graduate thesis committees:

- Feng Cao (M.S. 2003).
- Jonathan Denning (Ph.D. 2014).
- Zhiyu Liu (M.S. 2012).
- Scott McElfresh (Ph.D. 2002).
- Nils Nieuwejaar (Ph.D. 1996).
- Ron Oldfield (Ph.D. 2003).
- Srdjan Petrovic (Ph.D. 2005).
- Brian J. Premore (Ph.D. 2003).
- Elizabeth Shriver (Ph.D. 1997, New York University).
- Libo Song (Ph.D. 2008).
- Peter Su (Ph.D. 1994).
- Darren Erik Vengroff (Ph.D. 1997, Brown University).
- Gabriel Weaver (Ph.D. 2013).
- Berrin Yanikoglu (Ph.D. 1993).

Senior honors theses supervised:

- Lauren Baptist '99, Two Algorithms for Performing Multidimensional, Multiprocessor, Out-of-Core FFTs, Dartmouth College Computer Science Technical Report PCS-TR99-350.
- Kristin Bruhl '94, BMMC Permutations on a DECmpp 12000/Sx 2000, Dartmouth College Computer Science Technical Report PCS-TR94-224.
- Jessica Cheng '23, in progress.
- Benjamin Coleman '20, Push-relabel Algorithms for Computing Perfect Matchings of Regular Bipartite Multigraphs, Dartmouth College Computer Science Technical Report TR2020-887.
- Scott Cushman '95, A Multiple Discrete Pass Algorithm on a DEC Alpha 2100, Dartmouth College Computer Science Technical Report PCS-TR95-259.
- Trevor Davis '18, Thinking Inside the Box: Converting Encapsulated PostScript to Scalable Vector Graphics, Dartmouth College Computer Science Technical Report TR2018-856.
- Peter DeSantis '98, Avoiding Conflicts Dynamically in Direct Mapped Caches with Minimal Hardware Support, Dartmouth College Computer Science Technical Report PCS-TR98-339.
- Jessica C. Fan '17, Dense Gray Codes in Mixed Radices, Dartmouth College Computer Science Technical Report TR2017-818.
- Jeremy Fineman '01, Optimizing the Dimensional Method for Performing Multidimensional, Multiprocessor, Out-of-Core FFTs, Dartmouth College Computer Science Technical Report TR2001-402.

- Elizabeth Hamon '03, Enhancing Asynchronous Parallel Computing. Dartmouth College Computer Science Technical Report TR2003-460.
- Andrew Hannigan '13, A Heuristic Algorithm for Computing Edge Colorings on Regular Bipartite Multigraphs, Dartmouth College Computer Science Technical Report TR2015-769.
- Devina Kumar '18, Full and Dense Cyclic Gray Codes in Mixed Radices, Dartmouth College Computer Science Technical Report TR2018-851.
- Chris Leon '98, An Implementation of External-Memory Depth-First Search, Dartmouth College Computer Science Technical Report PCS-TR98-333.
- Cristina Maracine '04, Experimenting With Prefetch Instructions for Better Performance in Pipeline-Structured Computations.
- Collin McKinney '18, DartDraw: The Design and Implementation of Global State Management, User Interaction Management, and Text in a React-Redux Drawing Application, Dartmouth College Computer Science Technical Report TR2018-850.
- Christine McGavran '94, Human Creativity Through Computer Gaming, Dartmouth College Computer Science Technical Report PCS-TR94-225.
- Patricia Neckowicz '15, Two Algorithms for Finding Edge Colorings in Regular Bipartite Multigraphs, Dartmouth College Computer Science Technical Report TR2015-771.
- Stefanie L. Ostrowski '14, Chain Match: An Algorithm for Finding a Perfect Matching of a Regular Bipartite Multigraph, Dartmouth College Computer Science Technical Report TR2014-753.
- Matthew Pearson '99, Fast Out-of-Core Sorting on Parallel Disk Systems, Dartmouth College Computer Science Technical Report PCS-TR94-351.
- Elisabeth Pillsbury '18, Reflections on Building DartDraw: A React + Redux Vector-Based Graphics Editor, Dartmouth College Computer Science Technical Report TR2018-853.
- Nebojsa Sabovic '05, Performing Out-of-Core Mixed-Radix Permutations on Parallel Disk Systems.
- Brunn Roysden '04, Scheduling Pipelined, Multi-Threaded Programs in Linux, Dartmouth College Computer Science Technical Report TR2004-500.
- Jessica Webster '01, Bats and Stats: Covering All Bases from Interface to Database.
- Tiffany Wong '01, An Implementation of Object-Oriented Program Transformation for Thought-Guided Debugging, Dartmouth College Computer Science Technical Report TR2001-395; Implementing a Database Information System for an Electronic Baseball Scorecard, Dartmouth College Computer Science Technical Report TR2001-396.

Other undergraduate thesis committees:

- Julien Blanchet '15.
- Neha Narula '03.
- Rachel Ringel 04.
- Sam Slee '04.
- Nancy Zheng '11.

WISP Interns supervised: Yanlin Liu '02, Christiana Toomey '04, Annie Lape '13.

Other undergraduate students supervised: Kalpana Bagri '95, Nicolas Baum '07, Miranda Barrows '96, Dan Becker '00, Dax Burkhart '96, Devon Carew '96, Shuyang Fang '14, Glen Frank '98, David Gondek '98, Yichen (Annie) Ke '19, Mikhail Khankin '01, Malika Khurana '15, Rebecca Lau '13, Clara Lee '03, Elaine Levey '13, Erica Lin '03, Ka-Tak (Kitty) Lo '97, Jocelyn Miller '03, Emma Oberstein '18, Allison Pope '97, Denis Serenyi '96, Dan Siegal '00, Scott Silver '96, Bin Song '96, Senate Taka '08, Sofiya Taskova B.E. '13, Michael Taylor '96, Neerja Thakkar '19, Song Bac Toh '95, Luisa Vasquez Gutierrez '18, Jake Wegmann '97, Rajiv Wickremesinghe '95, Paton Wongviboonsin '03, Linda Xiao '20, Michelle Yu '19, Jean Zhou '18, David Zipkin '97.

Department and College Service

Department service:

- Chair, 2009–2015.
- Computer Science Undergraduate Program Director, 1998–2004, 2018–2020.
- M.S. Adviser, 2016–2017.
- M.S. Admissions Committee, 2016–2017.
- Ph.D. Adviser, Spring 2015.
- Grace Hopper Committee, 2015–present.
- Ph.D. Admissions Committee, 2012–2013, Chair 2010–2011.
- Computer Science Teaching Committee, 2009–2015.
- Computer Science Recruiting Committee for the Roth Chair in Digital Arts, 2011–2014.
- Dartmouth Women in Computer Science, Faculty Advisor, 2012–2018.
- CoderDojo, Faculty Advisor, 2012–present.
- Webmaster, 2011–2012.
- Computer Science Recruiting Committee for the Neukom Institute Director, 2006.
- Computer Science Visitors Committee, Chair 2002–2008, 2009–2015.
- Computer Science Vision Statement Committee, 2002–2003.
- Computer Science Brochure Committee, Chair 1999–2000.
- Graduate Program in Computer Science Admissions Committee, 1992–1995, 1996–1998, 1999–2000; Chair 1994–1995, 1996–1997.
- Computer Science Curriculum Committee, 1997–2002, 2004–2008, 2010–2012, 2015–2016; Chair 1998–1999, 2002–2004, 2006–2008, 2013–2014.
- Computer Science Colloquium Chair, 1993–1994, 1997–1998.
- Computer Science Master's Degree Committee, 1996–1997.
- Computer Science Equipment Committee, 1999–2000, Chair 1994–1995, 2000.
- Computer Science Faculty Recruiting Committee, 1993–1994, 1999–2000, 2001–2002, 2003–2004, 2013–2014.
- Computer Science Systems Administrator Recruiting Committee, 2000.
- Mathematics and Computer Science Teaching Evaluation Committee, 1993–1994.
- Kemeny Prize Committee, 1993, Chair 2002.
- Programming Club, Faculty Advisor, 1998–1999.

College service:

- Committee on Instruction, 2004–2008, Chair 2016–2017, 2018–2019.
- Faculty Coordinating Committee, 2016–2017, 2018–2019.
- Committee of Chairs, observer 2005–2008, member 2009–2015.
- Science Divisional Council, 2009–2015.
- Interim Dean of the College Search Committee, 2018.
- Dean of Libraries Search Committee, 2016.
- Community Citizenship Working Group for Moving Dartmouth Forward, Faculty Chair, 2015.
- Ad hoc Committee on Grading Practices, 2015.
- Committee on Priorities, 2009–2012.
- Experimental Dartmouth Working Group, Co-chair 2011–2012.
- BASIC at 50 Steering Committee, Faculty Chair, 2014.
- Scholarly Innovation and Advancement Selection Committee, 2012.
- Committee on *Sources*, Co-chair 2007–2008.
- Speech Hiring Committee, 2007–2008.
- Writing Program/Institute for Writing and Rhetoric Steering Committee, Chair 2005–2008.
- Council on Interdisciplinary Programs, 2005–2008.
- Speech Review Committee, 2005.
- Committee on Organization and Policy, 2004–2005.

- COI Subcommittee on Writing, 2004–2005.
- Humanities Divisional Council, 2004–2005.
- Committee on Student Life, 2001–2004, Chair 2001–2002, 2004
- Committee on Standards, 1999–2001, alternate member 2002–2004.
- Ad-hoc Committee on Academic Advising, 2001.
- Council on Student Organizations, 1997.
- Council on Computing, nonvoting member 1994–1995, voting member 1999.
- WDCR/WFRD Board of Overseers, 1994–1995.

Other Professional Activities

Distinguished Member of the Association for Computing Machinery.

Have refereed papers for several journals and conferences.

Have reviewed proposals for the National Science Foundation and Natural Sciences and Engineering Research Council of Canada.

Have served on an NSF panel.

Member, AIT-Budapest Advisory Council.

Quora Top Writer 2015, 2016, 2017, 2018

Personal

U. S. citizen. Widowed, no children.

New Hampshire State Representative, Grafton 15 (Lebanon Ward 3). Science, Technology, and Energy Committee. 2022–present.