

## Curriculum Vitae April 2008

**Calvin J. Ribbens**

### Personal:

Birth date and place    December 23, 1959, Cadillac, MI  
Marital status            Married, three children  
Citizenship                U.S.

### Education:

B.S.     Mathematics, Calvin College, 1981.  
M.S.     Computer Science, Purdue University, 1984.  
Ph.D.    Computer Science, Purdue University, 1986, "Domain Mappings: A Tool for the Development of Vector Algorithms for Numerical Solutions of Partial Differential Equations," Dr. John R. Rice, advisor.

### Professional Experience:

2003–            Associate Department Head, Department of Computer Science, Virginia Tech.  
1993–            Associate Professor of Computer Science, Virginia Tech.  
1999–2000      Visiting Computational Scientist, Lawrence Livermore National Laboratory.  
1987–1993      Assistant Professor of Computer Science, Virginia Tech.  
1986–1987      Visiting Assistant Professor of Computer Sciences, Purdue University.

### Research Interests:

Parallel computing  
Scientific computing, computational science & engineering  
High-end computing systems  
Numerical methods for linear algebra and partial differential equations  
Mathematical software

### Membership in Professional Organizations:

Association for Computing Machinery (ACM)  
Sigma Xi  
Society for Industrial and Applied Mathematics (SIAM)  
SIAM Activity Group on Supercomputing  
SIAM Activity Group on Computational Science & Engineering  
Upsilon Pi Epsilon

### Honors and Awards:

Department of Computer Science Award for Teaching Excellence, 1991.  
Certificate of Teaching Excellence, College of Arts & Sciences, 1994, 1997.

## Publications:

- L. S. Heath, C. J. Ribbens, and S. V. Pemmaraju, "Processor-Efficient Sparse Matrix-Vector Multiplication," *Computers and Mathematics with Applications*, 48(2004), pp 589–608.
- C. J. Ribbens, "High performance computing," *Virginia Tech Scholarly Review*, 2003, pp 11–15.
- G. Mateescu, C. J. Ribbens, and L. T. Watson, "A domain decomposition preconditioner for hermite collocation problems," *Num. Meth. PDEs*, 19(2003), pp 135–151.
- N. Ramakrishnan, L. T. Watson, D. G. Kafura, C. J. Ribbens, and C. A. Shaffer, "Programming environments for multidisciplinary grid communities," *Concurrency and Computation: Practice and Experience*, 14(2002), pp 1241–1273.
- N. Ramakrishnan and C. J. Ribbens, "Mining and visualizing recommendation spaces for PDE solvers: the continuous attributes case," in *Computational Science, Mathematics and Software*, Ronald F. Boisvert and Elias Houstis (eds.), Purdue University Press, West Lafayette, IN, 2002, pp 171–196.
- D. Farkas, M. Duranduru, W. A. Curtin, and C. Ribbens, "Multiple-dislocation emission from the crack tip in the ductile fracture of Al," *Philosophical Magazine A*, 81(2001), pp 1241–1255.
- N. Ramakrishnan and C. J. Ribbens, "Mining and visualizing recommendation spaces for elliptic PDEs with continuous attributes," *ACM Trans. Math. Softw.*, 26 (2000), pp 254–273.
- A. Goel, C. Phanouriou, F. A. Kamke, C. J. Ribbens, C. A. Shaffer, and L. T. Watson, "WBC-Sim: A prototype PSE for wood-based composites simulations," in *Enabling Technologies for Computational Science: Frameworks, Middleware and Environments*, E. Houstis, J. Rice, E. Gallopoulos and R. Bramley (eds.), Kluwer Academic Publishers, Norwell, MA, 2000, pp 187–196.
- A. Goel, C. Phanouriou, F. A. Kamke, C. J. Ribbens, C. A. Shaffer, and L. T. Watson, "WBCSim: A prototype problem solving environment for wood-based composites simulations," *Engrg. Computers*, 15 (1999), pp 198–210.
- G. Mateescu, C. J. Ribbens, L. T. Watson, and C.-Y. Wang, "Effect of a sawtooth boundary on Couette flow," *Computers & Fluids*, 28 (1999), pp 801–813.
- D. F. Pilkey, C. J. Ribbens, and D. J. Inman, "High performance computing issues for model reduction/expansion," *Advances in Engineering Software*, 29 (1998), pp 389–393.
- C. J. Ribbens, L. T. Watson, and C.-Y. Wang, "Steady viscous flow in a triangular cavity," *J. Comput. Phys.*, 112 (1994), pp 173–181.
- W. D. McQuain, C. J. Ribbens, L. T. Watson, and R. C. Melville, "Preconditioned iterative methods for sparse linear algebra problems arising in circuit simulation," *Computers Math. Applic.*, 27 (1994), pp 25–45.
- W. D. McQuain, C. J. Ribbens, C.-Y. Wang, and L. T. Watson, "Steady viscous flow in a trapezoidal cavity," *Comput. & Fluids*, 23 (1994), pp 613–626.

- C. J. Ribbens, G. G. Pitts, and L. T. Watson, "Parallel ELLPACK for shared memory multiprocessors," *Comput. Systems Engrg.*, 4 (1993), pp 531–540.
- A. Chakraborty, D. C. S. Allison, C. J. Ribbens, and L. T. Watson, "The parallel complexity of embedding algorithms for the solution of systems of nonlinear equations," *IEEE Trans. Parallel Distrib. Sys.*, 4 (1993), pp 458–465.
- J. Shankar, C. J. Ribbens, R. T. Haftka, and L. T. Watson, "Computational study of a nonhierarchical decomposition algorithm," *Comput. Optim. Appl.*, 2 (1993), pp 273–293.
- C. J. Ribbens, L. T. Watson, and C. deSa, "Toward parallel mathematical software for elliptic partial differential equations," *ACM Trans. Math. Softw.*, 19 (1993), pp 457–473.
- C. deSa, K. M. Irani, C. J. Ribbens, L. T. Watson, and H. F. Walker, "Preconditioned iterative methods for homotopy curve tracking," *SIAM J. Sci. Stat. Comput.*, 13 (1992), pp 30–46.
- K. M. Irani, M. P. Kamat, C. J. Ribbens, H. F. Walker, and L. T. Watson, "Experiments with conjugate gradient algorithms for homotopy curve tracking," *SIAM J. Optim.*, 1 (1991), pp 222–251.
- C. J. Ribbens, C.-Y. Wang, L. T. Watson, and K. A. Alexander, "Vorticity induced by a moving elliptic belt," *Comput. & Fluids*, 20 (1991), pp 111–119.
- A. Chakraborty, D. C. S. Allison, C. J. Ribbens, and L. T. Watson, "Note on unit tangent vector computation for homotopy curve tracking on a hypercube," *Parallel Comput.*, 17 (1991), pp 1385–1395.
- D. C. S. Allison, K. M. Irani, C. J. Ribbens, and L. T. Watson, "High dimensional homotopy curve tracking on a shared memory multiprocessor," *J. Supercomputing*, 5 (1991), pp 347–366.
- C. J. Ribbens, "A fast adaptive grid scheme for elliptic partial differential equations," *ACM Trans. Math. Softw.*, 15 (1989), pp 179–197.
- W. R. Dyksen, C. J. Ribbens, and J. R. Rice, "The performance of numerical methods for elliptic problems with mixed boundary conditions," *Num. Meth. PDEs*, 4 (1988), pp 347–361.
- W. R. Dyksen and C. J. Ribbens, "Interactive ELLPACK: an interactive problem-solving environment for elliptic partial differential equations," *ACM Trans. Math. Softw.*, 13 (1987), pp 113–132.
- J. R. Rice, C. J. Ribbens, and W. A. Ward, "A simple macro processor," *ACM Trans. Math. Softw.*, 10 (1984), pp 410–416.

#### **Papers in Conference Proceedings:**

- I. Akhtar, A. H. Nayfeh and C. J. Ribbens, "A galerkin model of the pressure field in incompressible flows," 46th AIAA Aerospace Sciences Meeting and Exhibit, Reno, NV, Jan. 7-10, 2008, AIAA2008-611.

- R. Sudarsan and C. J. Ribbens, “ReSHAPE: A framework for dynamic resizing and scheduling of homogeneous applications in a parallel environment,” *Proceedings of the International Conference on Parallel Processing (ICPP-2007)*, IEEE Computer Society, Washington, DC, 2007, pp 44.
- R. Sudarsan and C. J. Ribbens, “Efficient multidimensional data redistribution for resizable parallel computations,” *Proceedings, Fifth International Symposium on Parallel and Distributed Processing and Applications (ISPA-07)*, I. Stojmenovic, R. K. Thulasiram, L. T. Yang, W. Jia, M. Guo and R. F. de Mello (eds.), Springer-Verlag, Berlin, 2007, pp 182–194.
- M. Belgin, C. J. Ribbens and G. Back, “An operation stacking framework for large ensemble computations,” in *Proceedings of the 21st ACM International Conference on Supercomputing (ICS07)*, B. Smith (ed.), 2007, ACM, New York, pp 83–92.
- M. Belgin and C. J. Ribbens, “Improving the performance of HPC applications by using operation stacking,” *Proceedings of ICCSE2005, The International Conference on Computational Science and Engineering*, H. Dag and Y. Deng (eds.), Istanbul Technical University, 2005, pp 183–190.
- C. J. Ribbens, S. Varadarjan, M. Chinnusamy and G. Swaminathan, “Balancing computational science and computer science research on a terascale computing facility,” in *Proceedings of ICCS 2005, the 5th International Conference on Computational Science*, V. Sunderam, G. van Albada, P. Sloot, J. Dongarra (eds.), Springer-Verlag, Berlin, 2005, Part II, pp 60–67.
- S. Tadepalli, C. J. Ribbens and S. Varadarajan, “GEMS: A job management system for fault tolerant grid computing,” in *Proceedings High Performance Computing Symposium 2004*, J. Meyer (ed.), Soc. for Modeling and Simulation Internat., San Diego, CA, 2004, pp 59–66.
- P. Bora, C. J. Ribbens, S. Prabhakar, G. Swaminathan, M. Chinnusamy, A. Jeyakumar, B. Diaz-Acosta, “Issues in runtime algorithm selection for grid environments,” in *Proceedings of the International Workshop on Challenges of Large Applications in Distributed Environments*, I. Banicescu (ed.), IEEE Press, Los Alamitos, CA, 2003, pp 80–87.
- C. J. Ribbens, P. Bora, M. Di Ventra, J. Hauck, S. Prabhakar and C. Taylor, “From cluster to Grid: a case study in scaling-up a molecular electronics simulation code,” in *Proceedings of the High Performance Computing Symposium 2003*, I. Banicescu (ed.), Society for Modeling and Simulation International, San Diego, pp 54–62.
- S. Prabhakar, C. Ribbens and P. Bora, “Multifaceted web services: an approach to secure and scalable grid scheduling,” in *The Web and the GRID: from e-science to e-business*, Proceedings of Euroweb 2002, B. Matthews, B. Hopgood, M. Wilson (eds.) British Computer Society, Swindon, UK, pp 116–125.
- S. Kohn, G. Kumfert, J. Painter and C. J. Ribbens, “Divorcing language dependencies from a scientific software library,” in *Proceedings of the Tenth SIAM Conference on Parallel Processing for Scientific Computing*, C. Koelbel and J. Meza (eds.), SIAM, Philadelphia, PA, 2001.
- G. Mateescu and C. J. Ribbens, “An Iterative Substructuring Preconditioner for Collocation with Hermite Bicubics,” in *Proceedings of the Eleventh International Conference on Domain Decomposition Methods*, C-H Lai, P. E. Bjorstad, M. Cross, and O. Widlund, (eds.), DDM.org, Bergen, 1999, pp 73–81.

- G. Mateescu and C. J. Ribbens, "Parallel algorithm for the solution of high order discretization of elliptic PDEs," in *Proceedings of the ASME Fluids Engineering Division—1998*, ASME, New York, 1998, pp 105–112.
- M. Embree and C. J. Ribbens, "On the scalability of parallel Krylov subspace methods," in *Proceedings of the Eighth SIAM Conference on Parallel Processing for Scientific Computing*, SIAM, Philadelphia, 1997.
- C. J. Waldhart, Z. Gurdal, and C. J. Ribbens, "Analysis of tow placed, parallel fiber, variable stiffness laminates," in *Proceedings of the AIAA/ASME/ASCE/AHS/ASC 37th SDM Conference*, Salt Lake City, UT, 1996, pp 2210–2220.
- G. G. Pitts, C. J. Ribbens, and L. T. Watson, "Domain decomposition and high order finite differences for elliptic PDEs," in *Parallel Processing for Scientific Computing*, R. F. Sincovec, et al., (eds.), SIAM, Philadelphia, 1993, pp 727-731.
- C. J. Ribbens, "A moving mesh scheme for adaptive domain decomposition," in *Unstructured Scientific Computation on Scalable Multiprocessors*, P. Mehrotra, J. Saltz, and R. Voigt (eds.), MIT Press, Cambridge, MA, 1992, pp 205–219.
- L. S. Auvil, C. J. Ribbens, and L. T. Watson, "Problem specific environments for parallel computing," in *Proc. Scalable High Performance Computing Conference*, R. Voigt (ed.), IEEE Computer Soc. Press, Los Alamitos, CA, 1992, pp 149–152.
- C. J. Ribbens, "On adaptive domain decomposition with moving subdomains," in *Fifth International Symposium on Domain Decomposition Methods for Partial Differential Equations*, D. Keyes, et al. (eds.), SIAM, Philadelphia, 1992, pp 322–329.
- C. Beattie and C. J. Ribbens, "Parallel solution of a generalized symmetric eigenvalue problem," in *Parallel Processing for Scientific Computing*, J. Dongarra, et al. (eds.), SIAM, Philadelphia, 1992, pp 16-21.
- K. M. Irani, C. J. Ribbens, and L. T. Watson, "Parallel HOMPACT: a case study in parallel mathematical software," in *Parallel Processing for Scientific Computing*, J. Dongarra, et al. (eds.), SIAM, Philadelphia, 1992, pp 643-648.
- C. J. Ribbens and G. G. Pitts, "Strategies for parallelizing PDE software," in *Advances in Computer Methods for Partial Differential Equations VII*, R. Vichnevetsky, D. Knight, and G. Richter (eds.), IMACS, New Brunswick, N.J., 1992, pp 615–621.
- D. C. S. Allison, K. M. Irani, C. J. Ribbens, and L. T. Watson, "Shared memory parallel algorithms for homotopy curve tracking," in *Proceedings 1991 International Conference on Parallel Processing*, Vol. III, K. So (ed.), CRC Press, Boca Raton, FL, 1991, pp 17–20.
- A. Chakraborty, D. C. S. Allison, C. J. Ribbens, and L. T. Watson, "Parallel unit tangent vector computation for homotopy curve tracking on a hypercube," in *Proceedings 1990 ACM Eighteenth Annual Computer Science Conference*, Washington, DC, 1990, pp 103–108.
- A. Chakraborty, D. C. S. Allison, C. J. Ribbens, and L. T. Watson, "Low dimensional homotopy curve tracking on a hypercube," in *Proceedings 1990 International Conference on Parallel Processing*, Vol. III, P.-C. Yew (ed.), Penn State University Press, University Park, PA, 1990, pp 44–51.

- A. Chakraborty, D. C. S. Allison, C. J. Ribbens, and L. T. Watson, “Parallel homotopy curve tracking on a hypercube,” in *Parallel Processing for Scientific Computing*, J. Dongarra, et al. (eds.), SIAM, Philadelphia, 1990, pp 149–153.
- A. Chakraborty, D. C. S. Allison, C. J. Ribbens, and L. T. Watson, “Parallel orthogonal decompositions of rectangular matrices for curve tracking on a hypercube,” in *Proceedings Fourth Conference on Hypercubes, Concurrent Computers, and Applications*, J. L. Gustafson (ed.), ACM, Monterey, CA, 1989, pp 651–654.
- C. J. Ribbens, “Parallelization of adaptive grid domain mappings,” in *Parallel Processing for Scientific Computing*, G. Rodrigue (ed.), SIAM, Philadelphia, 1989, pp 196–200.
- C. J. Ribbens, “A priori grid adaption strategies for elliptic PDEs,” in *Advances in Computer Methods for Partial Differential Equations VI*, R. Vichnevetsky and R.S. Stepleman (eds.), IMACS, New Brunswick, N.J., 1987, pp 102–107.

### Grants:

- “CSR-AES: The Adaptive Code Kitchen: Flexible Tools for Dynamic Application Composition,” National Science Foundation, Grant CNS-0615181, N. Ramakrishnan, C. Ribbens, D. Tafti, S. Varadarajan, \$642,736, 2006–2009.
- “ITR/NGS: Deja Vu: Transparent Checkpointing and Migration of Parallel Codes Over Grid Infrastructures,” National Science Foundation, Grant CNS-0325534, S. Varadarajan, C. Ribbens, D. Kafura, \$715,000, 2004–2007.
- “Acquisition of a large scale cluster for research in computational sciences and engineering,” National Science Foundation Major Research Instrumentation Program, Grant EIA-0321066, S. Varadarajan, C. Ribbens, N. Ramakrishnan, and L. T. Watson, \$400,000, 2003–06.
- “Scalable solvers and applications,” Lawrence Livermore National Laboratory, C. Ribbens, 1999–2002, \$105,305.
- “Towards leadership in problem solving environments for science, engineering, and manufacturing,” Virginia Tech ASPIRES program, (co-principal investigator with F. A. Kamke, M. Abrams, D. C. S. Allison, D. Kafura, M. B. Rosson, C. Shaffer, and L. T. Watson), 1997, \$36,000.
- “Breaking barriers in education and research with distributed visual computing,” SUN Microsystems (co-principal investigator with C. Beattie and R. Kriz), 1996, \$95,475.
- “PDE solving kernels and systems for scalable mimd multiprocessors,” Purdue University (sub-contract on ARPA grant), 1994–1997, \$133,340.
- “An Undergraduate Course in High-Performance Scientific Computing,” Virginia Tech Center for Excellence in Undergraduate Teaching Teaching-Learning Grant (co-principal investigator with C. Beattie), 1994–95, \$4,895.
- “Design of tow-placed variable stiffness laminates,” Boeing Defense & Space Group (co-principal investigator with Z. Gurdal), 1994–95, \$24,365.

“Tools and algorithms for parallel domain decomposition” U. S. Department of Energy Grant DE-FG05-93ER25189, 1993–96, \$146,929.

“Parallel algorithms and mathematical software,” U.S. Department of Energy Grant DE-FG05-88ER25068/A002 (co-principal investigator with L. T. Watson), 1991–93, \$138,000.

“Optimization by nonhierarchical asynchronous decomposition,” NASA Grant NAG-1-1079 (co-principal investigator with R. T. Haftka and L. T. Watson), 1990–91, \$30,125.

“Optimization by nonhierarchical asynchronous decomposition,” NASA Contract NAS1-18471-24 (co-principal investigator with R. T. Haftka and L. T. Watson), 1989–90, \$10,430.

“Parallel mathematical software,” U. S. Department of Energy Grant DE-FG05-88ER25068 (co-principal investigator with L. T. Watson), 1988–91, \$290,387.

**Teaching** (New courses developed are indicated by an \*):

Programming II

Assembly and Assemblers

Grid Computing\* (graduate)

High Performance Scientific Computing\* (honors; co-taught with C. Beattie)

Introduction to Computer Science

Introduction to Computer Organization\*

Introduction to Object-Oriented Development

Numerical Analysis and Software I,II (graduate)

Numerical Methods

Parallel and Distributed Computation

Parallel Computation

Parallel Processing for Scientific Computing\* (graduate)

Programming Massively Parallel Hardware (graduate; co-taught with D. Nikolopoulos)

Research Methods in Computer Science (graduate)

Software for High Performance Scientific Computing\* (graduate)

Theory of Computation