

Curriculum Vitae

Sathish S. Vadhiyar

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Research Interests

- Application optimization: Building application-oriented middleware frameworks and optimization techniques for challenging high performance computing systems including GPUs, state-of-art supercomputers, and grids, .
- Adaptivity and Fault-tolerance: To sustain long-duration executions in the presence of failures, improve performance, and in general provide adaptivity to executions.
- Middleware for Production Supercomputers: The objective is to abstract the complexities of the job submissions in supercomputing systems, and to provide quick turnaround times for the user jobs.
- Performance Modeling, Scheduling and Load Balancing: For estimation of application performance, and using the performance models for efficient processor allocation, and load balancing.

Education

- **Ph.D:** May 2003, Department of Computer Science, University of Tennessee, U.S.A.
Dissertation: *A Preemption-Based Meta-Scheduling System for Distributed Computing*
Advisor: Dr. Jack Dongarra
- **M.S.:** May 1999, Department of Computer Science, Clemson University, South Carolina, U.S.A.
Project: *Static Assignment of Multithreaded Systems*
Advisor: Dr. Harold Grossman
- **B.E.:** May 1997, Computer Science and Engineering, Thiagarajar College of Engineering, Madurai, India
Project: *Anti-missile simulation software based on neural networks*

Experience

- **November 2009 - present:** Associate Professor, Supercomputer Education and Research Centre, Indian Institute of Science, Bangalore, India.

- **July - August 2010:** Visitor, Parallel Programming Lab (Lab of Prof. Laxmikant Kale), Computer Science Department, University of Illinois, Urbana-Champaign, USA
- **November 2003 - present:** Assistant Professor, Supercomputer Education and Research Centre, Indian Institute of Science, Bangalore, India.
- **May 2003 - August 2003:** Senior Research Associate, Innovative Computing Laboratory, Department of Computer Science, Knoxville, Tennessee, U.S.A.
- **May 1999 - May 2003:** Graduate Research Assistant, Innovative Computing Laboratory, Department of Computer Science, Knoxville, Tennessee, U.S.A.

Publications

Papers in Refereed Journals

1. Sivagama Sundari M., Sathish Vadhiyar, Ravi Nanjundiah. Adaptive Executions of Multi-Physics Coupled Applications on Grids. *Journal of Grid Computing*, Vol 9/4, pp 455-478, 2011.
2. H.A. Sanjay and Sathish Vadhiyar. Strategies for Rescheduling Tightly-Coupled Parallel Applications in Multi-Cluster Grids. *Journal of Grid Computing*, Vol 9/3, pp 379-403, 2011.
3. Sivagama Sundari M., Sathish Vadhiyar, Ravi Nanjundiah. Grids with Multiple Batch Systems for Performance Enhancement of Multi-Component and Parameter Sweep Parallel Applications. *Future Generation Computer Systems*, Vol 26/2, pp 217-227, 2010.
4. H.A. Sanjay and Sathish Vadhiyar. A Strategy for Scheduling Tightly-Coupled Parallel Applications on Clusters. *Concurrency and Computation: Practice & Experience*, Vol 21/18, pp 2491-2517, 2009.
5. Sivagama Sundari M., Sathish Vadhiyar, Ravi Nanjundiah. Dynamic Component Extension: a Strategy for Performance Improvement in Multicomponent Applications. *International Journal of High Performance Computing Applications*, Vol 23/1 pp 84-98, 2009.
6. Yadnyesh Joshi and Sathish Vadhiyar. Analysis of DNA Sequence Transformations on Grids. *Journal of Parallel and Distributed Computing*, Vol 69/1, pp 80-90, 2009.
7. H.A. Sanjay and Sathish Vadhiyar. Performance Modeling of Parallel Applications for Grid Scheduling. *Journal of Parallel and Distributed Computing*, vol 68/8 pp 1135-1145, 2008.
8. Sandip Tikar and Sathish Vadhiyar. Efficient Reuse of Replicated Parallel Data Segments in Computational Grids. *Future Generation Computer Systems*, vol 24/7 pp 644-657, 2008.
9. J. Dongarra, G. Bosilca, Z. Chen, V. Eijkhout, G. Fagg, E. Fuentes, J. Langou, P. Luszczek, J. Pjesivac-Grbovic, K. Seymour, H. You, and Sathish Vadhiyar. Self-adapting Numerical Software (SANS) Effort. *IBM Journal of System Research and Development. Exploratory Systems Research*, volume 50, Number 2/3, pp. 223-238, 2006.
10. Sathish Vadhiyar and J. Dongarra. Self adaptivity in Grid computing. *Concurrency and Computation: Practice and Experience*, volume 17, Issue 2-4, pp. 235-257, Special Issue: Grid Performance . Issue Edited by John Gurd, Tony Hey, Juri Papay, Graham Riley. Copyright ©. John Wiley & Sons, Ltd. Feb 7, 2005.

11. Sathish Vadhiyar and Jack Dongarra. GrADSolve - A Grid-based RPC system for Parallel Computing with Application-level Scheduling. *Journal of Parallel and Distributed Computing*, volume 64, pp. 774-783, 2004.
12. Sathish Vadhiyar, Graham Fagg and Jack Dongarra. Toward an Accurate Model for Collective Communications. *International Journal of High Performance Computing Applications*, volume 18, Number 1, Spring 2004, pp 159-166, ISSN 1094-3420.
13. Sathish Vadhiyar and Jack Dongarra. SRS - A Framework for Developing Malleable and Migratable Parallel Applications for Distributed Systems. *Parallel Processing Letters*, vol. 13, number 2, pp. 291-312, June 2003.
14. M. Beck and D. Arnold and A. Bassi and F. Berman and H. Casanova and J. Dongarra and T. Moore and G. Obertelli and J. Plank and M. Swany and S. Vadhiyar and R. Wolski. Middleware for the use of Storage in Communication. *Parallel Computing*, Volume 28 , Issue 12, pages 1773 - 1787, 2002.
15. A. Petitet, S. Blackford, J. Dongarra, B. Ellis, G. Fagg, K. Roche and Sathish Vadhiyar. Numerical Libraries and The Grid: The GrADS Experiments with ScaLAPACK. *Journal of High Performance Applications and Supercomputing*, Vol. 15, number 4, pp. 359-374, Winter 2001.

Papers at Refereed Conferences

16. Preeti Malakar, Vijay Natarajan, Sathish Vadhiyar. InSt: An Integrated Steering Framework for Critical Weather Applications. In the proceedings of *International Conference on Computational Science (ICCS)*, June 2011, Singapore, pp 116-125.
17. Preeti Malakar, Vijay Natarajan, Sathish Vadhiyar. An Adaptive Framework for Simulation and Online Remote Visualization of Critical Climate Applications in Resource-constrained Environments. In the proceedings of *IEEE/ACM Supercomputing conference, SC 2010*, November 2010, New Orleans, USA.
18. Priyank Raj Khatariya and Sathish Vadhiyar. Phylogenetic Predictions on Grids. In *Proceedings of the 5th IEEE International Conference of e-Science*, Oxford, UK, December 2009.
19. Rakhi Gupta and Sathish Vadhiyar. An Efficient MPI_Allgather for Grids. *In proceedings of High Performance Distributed Computing (HPDC)*, pp 169-178, Monterey, California, USA, June 2007.
20. Jay Yagnik, H. A. Sanjay and Sathish Vadhiyar. Performance Modeling based on Multidimensional Surface Learning for Performance Predictions of Parallel Applications in Non-Dedicated Environments. *In proceedings of 35th International Conference on Parallel Processing (ICPP)*, pp 513-520, Columbus, Ohio, USA, August 2006.
21. Rakhi Gupta and Sathish Vadhiyar. Application-Oriented Adaptive MPI_Bcast for Grids. *In proceedings of 20th IEEE International Parallel & Distributed Processing Symposium (IPDPS)*, Rhodes Island, Greece, April 2006.
22. Sathish Vadhiyar, Jack Dongarra and Asim Yarkhan. GrADSolve - RPC for High Performance Computing on the Grid. *Euro-Par 2003, 9th International Euro-Par Conference*, Proceedings, Springer, LCNS 2790, p. 394-403, August 26 -29, 2003.
23. Sathish Vadhiyar and Jack Dongarra. A Performance Oriented Migration Framework for the Grid. *Proceedings of The 3rd IEEE/ACM International Symposium on Cluster Computing and the Grid (CCGrid 2003)*, pp 130-137, Tokyo, Japan, May 2003.

24. Sathish Vadhiyar and Jack Dongarra. A Metascheduler for the Grid. *Proceedings of the 11th IEEE International Symposium on High Performance Distributed Computing*, pp 343-351, Edinburgh, Scotland, July, 2002.
25. K. Kennedy, M. Mazina, J. Mellor-Crummey, K. Cooper, L. Torczon, F. Berman, A. Chien, H. Dail, O. Sievert, D. Angulo, I. Foster, D. Gannon, L. Johnsson, K. Kasselmann, R. Aydt, D. Reed, J. Dongarra, Sathish Vadhiyar and R. Wolski. Toward a Framework for Preparing and Executing Adaptive Grid Programs. *Proceedings of NSF Next Generation Systems Program Workshop (International Parallel and Distributed Processing Symposium 2002)*, Fort Lauderdale, Florida, USA, 2002.
26. A. Petitet, S. Blackford, J. Dongarra, B. Ellis, G. Fagg, K. Roche and S. Vadhiyar. Numerical Libraries and The Grid: The GrADS Experiments with ScaLAPACK. *Proceedings of Supercomputing 2001 (SC)*, Denver, Colorado, 2001.
27. Sathish Vadhiyar, G. Fagg and J. Dongarra. Performance Modeling For Self Adapting Collective Communications for MPI. *Proceedings of Los Alamos Computer Science Institute (LACSI) Symposium*, Santa Fe, USA, October 2001.
28. M. Beck, D. Arnold, A. Bassi, F. Berman, H. Casanova, J. Dongarra, T. Moore, G. Obertelli, J. Plank, M. Swamy, Sathish Vadhiyar, R. Wolski. Logistical Computing and Internet-working: Middleware for the Use of Storage in Communication. *Third Annual International Workshop on Active Middleware Services (AMS)*, San Francisco, CA, August, 2001.
29. Sathish Vadhiyar, Graham Fagg and Jack Dongarra. Towards an Accurate Model for Collective Communications. *In Proceedings of International Conference on Computational Science - ICCS 2001*, San Francisco, CA. Lecture Notes in Computer Science, Vol. 2073 (Berlin: Springer Verlag), pp 41-50, 2001.
30. Graham Fagg, Sathish Vadhiyar and Jack Dongarra. ACCT: Automatic Collective Communications Tuning. *Proceedings of the 7th European PVM/MPI Users' Group Meeting on Recent Advances in Parallel Virtual Machine and Message Passing Interface*, pages 354-362, Hungary, 2000.
31. Sathish Vadhiyar, Graham Fagg and Jack Dongarra. Automatically Tuned Collective Communications. *Proceedings of Supercomputing 2000*, Dallas, Texas, 2000.
32. Sathish Vadhiyar and Harold Grossman. Static Assignment of Multithreaded Systems. *ACM Southeast Regional Conference* 1999.

Book Chapters

33. H. Dail, O. Sievert, F. Berman, H. Casanova, A. YarKhan, Sathish Vadhiyar, J. Dongarra, C. Liu, L. Yang, D. Angulo, I. Foster. Scheduling in the Grid Application Development Software Project. *in Grid Resource Management: State of the art and future trends, Edited by Jarek Nabrzyski, Jennifer Schopf and Jan Weglarz, Kluwer Academic Publisher, 2003, ISBN 1-4020-7575-8.*
34. Sudesh Agrawal, Jack Dongarra, Keith Seymour, and Sathish Vadhiyar. NetSolve: Past, Present, and Future - a Look at a Grid Enabled Server. *in Grid Computing: Making the Global Infrastructure a Reality, Edited by F. Berman, G. Fox, and A. Hey, Wiley Publisher, 2003, ISBN 0-470-85319-0.*

Technical Reports

35. Sathish Vadhiyar, Graham Fagg and Jack Dongarra. Toward an Accurate Model for Collective Communications. *Computer Science Department, University of Tennessee, ut-cs-05-550*, 2005.
36. Typically a team of 8-10 including S Vadhiyar. User's guide to NetSolve, versions 1,1.4,1.4.1,2.0. Computer Science Department, University of Tennessee, Technical Reports.
37. Sathish Vadhiyar. A Preemption-Based Meta-Scheduling System for Distributed Computing. *Ph.D Dissertation, Computer Science, University of Tennessee*, 2003.

Refereed Conference Short Papers and Posters

38. Rajath Prasad, Sathish Vadhiyar. Scheduling Strategies for Multi-Physics Applications. *Student Research Symposium poster, International Conference on High Performance Computing (HiPC)*, Bangalore, India, 2011.
39. Archana Venkatesh, Sathish Vadhiyar. Asynchronous Parallelism for Molecular Dynamics on GPU cores. *Student Research Symposium poster, International Conference on High Performance Computing (HiPC)*, Bangalore, India, 2011.
40. Rajath Prasad, Sathish Vadhiyar. Scheduling Strategies for Multi-Physics Applications. *Poster. IBM I-CARE*, 2011.
41. Archana Venkatesh, Sathish Vadhiyar. Asynchronous Parallelism for Molecular Dynamics on GPU cores. *Poster. IBM I-CARE*, 2011.
42. Sivagama Sundari M., Sathish Vadhiyar, Ravi Nanjundiah. Morco: Middleware Framework for Long-running Multi-component Applications on Batch Grids. Short paper. In the proceedings of the *ACM High Performance Distributed Computing (HPDC)*, pp 328-331, June 2010, Chicago, USA.
43. Preeti Malakar, Vijay Natarajan, Sathish Vadhiyar and Ravi Nanjundiah. An Integrated Simulation and Visualization Framework for Tracking Cyclone Aila. *Student Research Symposium poster, International Conference on High Performance Computing (HiPC)*, Kochi, India, 2009. **Best Paper Award**.
44. Sivagama Sundari M., Sathish Vadhiyar and Ravi Nanjundiah. Middleware for Long-Running Applications on Batch Grids. *Student Research Symposium poster, International Conference on High Performance Computing (HiPC)*, Kochi, India, 2009.
45. Preeti Malakar, Vijay Natarajan, Sathish Vadhiyar and Ravi Nanjundiah. An Integrated Simulation and Visualization Framework for Tracking Cyclone Aila. *Student poster in ATIP First Workshop on HPC in India: Indigenous Hardware, Software, and Infrastructure Research*, held in conjunction with IEEE/ACM Supercomputing (SC), Portland, Oregon, USA, 2009.
46. Sivagama Sundari M., Sathish Vadhiyar and Ravi Nanjundiah. Middleware for Long-running Applications on Batch Grids. *Student poster in ATIP First Workshop on HPC in India: Indigenous Hardware, Software, and Infrastructure Research*, held in conjunction with IEEE/ACM Supercomputing (SC), Portland, Oregon, USA, 2009.
47. Sivagama Sundari M., Sathish Vadhiyar and Ravi Nanjundiah. Executing Long-running Multi-component Applications on Batch Grids. *Student Research Symposium poster, International Conference on High Performance Computing (HiPC)*, Bangalore, India, 2008.

48. H. A. Sanjay and Sathish Vadhiyar. Performance Modeling Based Scheduling and Rescheduling of Parallel Applications on Computational Grids. *International Conference on High Performance Computing (HiPC)*, Goa, India, 2007.
49. Sivagama Sundari M., Sathish Vadhiyar and Ravi Nanjundiah. Coupled Climate Models on Grids. *International Conference on High Performance Computing (HiPC)*, Goa, India, 2007.

Invited Talks

1. A Comprehensive Framework for Real Time Visualization and Steering of Critical Weather Applications. Garuda-NKN Partners Meet. July 2011.
2. Research in Parallel Computing. Workshop in Computational Science (WCP). Supercomputer Education and Research Centre, Indian Institute of Science, Bangalore, India. February 2011.
3. Tracking and Steering Critical Weather Events on Garuda. CDAC Round-Table Meeting on Weather and Climate Modeling, Centre for Development of Advanced Computing (CDAC), Bangalore, India. February 2011.
4. Middleware Frameworks for Adaptive Executions and Visualizations of Climate and Weather Applications on Grids. Hadoop India Summit, Indian Institute of Science, Bangalore, India. February 2011.
5. Scheduling and Rescheduling in Grid. Workshop on Grid Computing, Madras Institute of Technology (MIT), Chennai, India. February 2011.
6. Coupled Climate Models on Grids. EU-India Grid2 Workshop on Climate Change, Indian Institute of Technology (IIT) Delhi, India. December 2010.
7. Middleware Framework for Online Remote Visualization of Cyclone Events using Garuda. *5th CDAC Garuda Partners Meet*, Bangalore, India. May 2010.
8. Middleware Frameworks for Climate Simulations on Multiple Parallel Systems, *IBM Software Lab, Bangalore, India*. April 2010.
9. Biology on Clouds and Climate Science on Grids, *Yahoo! India, Bangalore, India*. February 2010.
10. Grid Middleware for High Performance Computing, *Indian National Academy of Engineering (INAE) Annual Convention, Kalpakkam, India*. December 2009.
11. Grid Middleware for High Performance Computing, *ATIP First Workshop on HPC in India: Indigenous Hardware, Software, and Infrastructure Research, held in conjunction with IEEE/ACM Supercomputing (SC) conference, Portland, Oregon, USA*. November 2009.
12. Top Supercomputers-India, *Centre for Development of Advanced Computing (CDAC), Bangalore, India*. October 2009.
13. Top Supercomputers-India, *International Conference on High Performance Computing (HiPC), Bangalore, India*. December 2008.
14. Towards Uniform Map-Reduce Communications. *Yahoo!, Bangalore, India*. October 2008.

15. High Performance Computing in Grids. *Computational Research Lab (CRL) Ltd., Pune, India.* March 2008.
16. Grid Scheduling, Rescheduling and Applications for Garuda. *Third Garuda Partners Meet, Bangalore, India.* March 2008.
17. Performance Modeling of Parallel Applications for Grids. *Wipro Technologies, Bangalore, India.* January 2008.
18. GrADSolve: A Performance Oriented Grid System & Grid Activities in GARL. *Supercomputer Education and Research Centre (SERC), Indian Institute of Science (IISc), Bangalore, India.* April 2005.
19. GrADSolve Resource Management System and Grid Research Activities in SERC, IISc. *Tata Institute of Fundamental Research (TIFR), Mumbai, India.* January 2005.
20. Self Adaptive Scientific Applications in Computational Grids. *IBM, Bangalore, India.* November 2004.
21. GrADSolve - Grid Resource Management System. *Centre for Development of Advanced Computing (CDAC), Bangalore, India.* August 2004.
22. Rescheduling, Redistribution and Towards Dynamic Tuning of Grid Policies. *Indo-UK eScience Workshop, IIT, Delhi, India.* February 2004.
23. Application-Level Scheduling and Metascheduling for the Grid. *Indo-UK eScience Workshop, IIT, Delhi, India.* February 2004.
24. GrADSolve - Grid Resource Management System. *Tata Institute of Fundamental Research (TIFR), Indian Institute of Science (IISc), Bangalore, India.* February 2004.

Invited Lectures

1. HPC and Parallel Computing. *Centre for Development of Advanced Computing (CDAC), Bangalore, India.* January 2011.
2. Parallel and Distributed Computing. *Workshop on Large Scale Computing for SAP Research Group, Bangalore in Indian Institute of Science, India.* September 2010.
3. Grid Computing. Lecture. *Vellore Institute of Technology, India.* July 2009.
4. Parallel Programming. Lecture. *Vellore Institute of Technology, India.* July 2009.
5. Writing Parallel Programs. Lecture. *Supercomputer Education and Research Centre (SERC), Indian Institute of Science (IISc), Bangalore, India.* February 2009.
6. Parallel Programming for Distributed Memory Machines. Lecture. *Atria Institute of Technology, Bangalore, India.* August 2007.

Sponsored Projects

- US \$24500. Centre for Development of Advanced Computing (CDAC). August 2010 - March 2012. With Dr. Vijay Natarajan, CSA, IISc and Prof. Ravi Nanjundiah, CAOS, IISc. *Middleware for Online Remote Visualization of Weather Applications.*

- US \$13000. European Commission. October 2010 - September 2011. With Prof. Ravi Nanjundiah, CAOS, IISc. *Sustainable e-infrastructures across Europe and India*.
- US \$2000. Yahoo! India. Consultancy project. May 2008 - July 2008. *Exploration of Research Challenges and Methods in Yahoo!'s Hadoop Infrastructure*.
- US \$76,600. Ministry of Information Technology. May 2007 - May 2010. With Prof. Ravi Nanjundiah, CAOS, IISc. *Coupled climate models on grids*.
- US \$44,568. Department of Science and Technology. July 2006 - Jan. 2010. *A Checkpointing infrastructure for parallel scientific applications on computational grids*.
- US \$16,000. Indian Institute of Science. Part (2A) Grant (252/SERC). November 2004 - December 2005. With Prof. R. Govindarajan, SERC, IISc. *Connecting 2 clusters*.
- US \$35,000. Microsoft Research. February 2005 - March 2006. *Parallel Numerical Applications as Web Services*.
- US \$24,000. Indian Institute of Science. Part (2A) Special Grant (45/SERC). January 2003 - January 2004. *Development of Grid Computing*.

Other Projects

- Top Supercomputers-India. A project that lists the top supercomputers in India. URL: <http://topsupercomputers-india.iisc.ernet.in>.

Honors, Awards

- Yahoo! Faculty Research Award, 2011.
- Indian National Academy of Engineering (INAE) Young Engineer Award, 2009.
- University of Tennessee citation for Extraordinary Professional Promise, 2003.

Professional Activities

Chair

- Chair, Student Affairs Committee, 15th ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPoPP), 2010.
- Track Chair, Parallel/Grid Computing Systems track, 17th International Conference on Advanced Computing and Communications (ADCOM), 2009.
- Chair, Session on Garuda usage policies. 3rd Garuda Partners Meet, Bangalore, India. 2008.
- Chair, Session on Performance, 3rd IEEE International Conference on e-Science and Grid Computing, 2007.
- Tutorial Chair, 3rd IEEE International Conference on e-Science and Grid Computing, 2007.

Program Committee

- Student Research Symposium, International Conference on High Performance Computing, HiPC: 2009, 2010, 2011.
- International Conference on High Performance Computing, HiPC: 2008, 2010, 2011.
- International Symposium on Cluster, Cloud and Grid Computing, CCGrid: 2006, 2010, 2011.
- IEEE International Conference on High Performance Computing and Communications, HPCC: 2005, 2009, 2011.
- International Conference on Parallel Programming, ICPP: 2009.
- International Conference on Advanced Computing and Communications (ADCOM), 2009.
- Workshop on Scheduling and Resource Management for Parallel and Distributed Systems, SRMPDS: 2007, 2008.
- IEEE International Conference on e-Science and Grid Computing: 2005, 2007.
- IEEE International Parallel and Distributed Processing Symposium, IPDPS: 2007.
- Joint Workshop on High-Performance Grid Computing and High-Level Parallel Programming Models, HIPS-HPGC: 2005.

Reviewer

- IEEE Transactions on Parallel and Distributed Systems, TPDS: 2010, 2011.
- ACM Transactions on Computers: 2011.
- Journal of Parallel and Distributed Computing, JPDC: 2004, 2005, 2008, 2009, 2010, 2011.
- ACM Computing Surveys: 2011.
- Future Generation Computer Systems, FGCS: 2007, 2008.
- ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming, PPOPP: 2008.
- EuroPar: 2005.
- Journal of Grid Computing: 2005.
- International Conference on High Performance Computing, HiPC: 2004.

Graduate Students

1. Preeti Malakar, Ph.D, *August 2008 – date.*
2. Sivagama Sundari, Ph.D, *August 2005 – July 2011.*
3. H.A. Sanjay, Ph.D, *August 2005 – June 2009.*
4. R. Vasudevan, M.Sc (Engg.), *August 2011 – date.*
5. Cijo George, M.Sc (Engg.), *August 2010 – date.*
6. Hari Raghavan, M.Sc (Engg.), *August 2010 – date.*
7. Rajath Kumar, M.Sc (Engg.), *August 2010 – date.*

8. Yadnyesh Joshi, M.Sc (Engg.), *August 2005 – November 2007.*
9. Rakhi Gupta, M.Sc (Engg.), *August 2004 – March 2007.*
10. Sandip Tikar, M.Sc (Engg.), *January 2004 – December 2006.*
11. Gowthami Manogna Gottipati, M.Tech, *August 2010 – date.*
12. T. Santanu, M.Tech, *August 2010 – date.*
13. Sharat Chandra Racha, M.Tech, *August 2010 – date.*
14. Jitender Singh, M.Tech, *August 2008 – July 2010.*
15. J. Sivabhavani, M.E., *August 2008 – July 2010.*
16. Priyank Raj, M.Tech, *August 2007 – July 2009.*
17. Karthikeyan Raman, M.Tech, *August 2006 – July 2008.*
18. Antoine Henry, Student Intern from INSA, Lyon, France, *January 2007 – July 2007.*

Teaching

1. Indian Institute of Science, SE 295, *Parallel Programming*: Spring 2004-2011.
2. Indian Institute of Science, SE 292, *High Performance Computing*: Fall 2009-2011.
3. Indian Institute of Science, SE 293, *Topics in Grid Computing*: Fall 2004-2007.

Memberships

IEEE, ACM.

Research Statement

I am the founder-convener of Grid Applications Research Lab (GARL) in Supercomputer Education and Research Centre (SERC), Indian Institute of Science (IISc). The lab (<http://garl.serc.iisc.ernet.in>), established in 2004, focuses on research in High Performance Computing (HPC) involving challenging parallel applications (large-scale, long-running, dynamic, irregular, multi-component etc.) and challenging parallel systems, namely, GPUs, state-of-art supercomputers and grids. We are specifically interested in four primary areas, namely, *Application Optimization*, *Adaptivity and fault-tolerance*, *Intelligent middleware for batch systems* and *Performance modeling and scheduling*.

Application Optimization

This work involves application optimization/refinement/tuning, and developing parallel algorithms for large-scale applications in GPUs, state-of-art supercomputers like BlueGene and grids. We focus on developing scheduling, load balancing and rescheduling strategies for applications including multi-component, long-running, dynamic and irregular applications. Our research attempts to build generic middleware or enabling frameworks encapsulating our optimization techniques for performance improvement and seamless execution of the applications. Our lab has conducted application-oriented research for effective execution of climate modeling, weather modeling and bioinformatics applications on grids.

Our research in climate modeling has developed various techniques for long-running climate modeling applications on grids with multiple parallel systems including inter-component load balancing, a novel execution model, and a practical grid middleware framework. Our research in weather modeling has built an integrated framework for simultaneous parallel simulations and remote visualizations of critical climate applications, including tracking tropical cyclones and depressions. The objective of the work is to enable climate science community to interact and collaborate through our remote visualization and steering framework for tracking critical climate events. In bioinformatics, we proposed a novel grid framework for predictions of future DNA sequences on grids.

Adaptivity and Fault Tolerance

Our lab conducts research on various aspects related to adaptivity and fault tolerance, namely, checkpointing, fault-detection and prediction, rescheduling and load balancing policies. We have been developing various extensions to a user-level semi-transparent checkpointing library, called SRS, developing during my PhD for enabling MPI parallel applications to reschedule to different number of processors and different clusters in the middle of the execution. Our lab has developed strategies for determining efficient checkpointing intervals, and a source-to-source precompiler for automatically inserting checkpointing calls in a parallel application. Our research has also developed novel algorithms for rescheduling large-scale multi-phase parallel applications in response to both resource and application dynamics.

Intelligent Middleware Framework for Batch Systems

Batch systems and queues are used in many production and research-based supercomputer systems. We are interested in conducting research in analysis and predictions of batch queue dynamics, and development of an intelligent advisor framework that interfaces between users' jobs and batch queues of supercomputing system(s), and automatically decides and allocates users' applications among the batch queues.

Performance Modeling and Scheduling

We also developed a comprehensive set of performance modeling strategies for predicting execution times of parallel applications on both dedicated and non-dedicated grid resources. We developed different scheduling strategies that efficiently use the performance model functions for selecting a set of processors for execution of tightly-coupled parallel applications on multi-cluster grids.

Other Research

Our lab has also developed generic solutions for enabling executions of high performance applications on grids. In our research, we developed a comprehensive set of adaptive techniques for efficient broadcast and allgather collective operations for long running MPI parallel applications executing on computational grids. In our work on data grids, we have developed novel algorithms for optimal selection of data segments, needed by a parallel application executing on a set of resources, from many possible data replica sites and downloading to the parallel computational resources.