

# COMPUTER SCIENCE NEWSLETTER

## Louisiana State University, Baton Rouge

Volume III

Fall Issue

September 2005



### *Inside this Issue*

Congratulations!	2
Funding Success	3
Events	4
The CS Access Grid	5
Recent Research Initiatives	5
Research Publication	6

Welcome to the Department of Computer Science at Louisiana State University, Baton Rouge. The purpose of this newsletter is to convey to our colleagues in academia and industry the highlights of our progresses in research and education programs, faculty hiring, and student and faculty achievements during the 2004 – 2005 academic year. This has been an exciting time in terms of research and publication. The department has continued to make significant strides in research funding, with external funding amount exceeding one million dollars. The department has also gone through a vigorous search process for faculty jointly with the Center of Computation and Technology to enlarge our research impact areas of interdisciplinary nature. We are pleased to have an outstanding faculty member Dr. Thomas Sterling joined the department starting this Fall. The sponsored research and increased faculty size will enhance the department's competitiveness and visibility in the critical research areas of high-performance computing, visualization, sensor networks and cyber-security. Thanks for taking the time to read this newsletter.



*S. S. Iyengar, Department Chair*

### NEW FACULTY MEMBERS

Three new faculty members have joined the department from this Fall. They are Dr. Thomas Sterling and Dr. Tevfik Kosar for positions jointly between the Department of Computer Science (CS) and the Center for Computation and Technology (CCT) and Dr. Gerald Baumgartner for the full CS position. Now the department has the total 18 professorial faculty members at the department and three adjunct faculty members.

Dr. Thomas Sterling is hired at the position of full professor. In the past, he held a joint appointment as a Principal Scientist at the NASA Jet Propulsion Laboratory and as a Faculty Associate at Caltech's Center for Advanced Computing Research. Since receiving his Ph.D from MIT as a Hertz Fellow in 1984, Dr. Sterling has pursued a career of applied research in parallel computer architecture and high performance computing at Harris Corp, the IDA Supercomputing Research Center, and the NASA Goddard Space Flight Center and University of Maryland, joining Caltech and JPL in 1996. Thomas Sterling is widely recognized for his contributions to commodity cluster computing through the Beowulf project



*Dr. T. Sterling*

which he started in 1994 and is the co-author of two books on clusters including "How to Build a Beowulf" and "Beowulf Cluster Computing". Dr. Sterling is a co-author of a book on "Enabling Technologies for Petaflops Computing." Dr. Sterling was the PI of the several important projects that have conducted the first multidisciplinary multi-institutional in-depth study of future Petaflops scale general-purpose computers and developed the MIND architecture, an advanced PIM computing component sponsored by NASA, Sandia National Laboratory, and DARPA.



*Dr. Baumgartner*

Dr. Gerald Baumgartner received the Diploma degree from the University of Linz, Austria, and his M.S. and Ph.D. degrees in computer science from Purdue University. He began his academic career at the Ohio State University in 1997, and joined the CS department this semester after having been here for one year as a

visitor. His research interests include compiler optimization, the design and implementation of domain-specific and object-oriented languages, desktop grids, and development and testing tools for object-oriented and embedded systems programming. His teaching interest is in the areas of programming languages, compilers, software engineering, and embedded systems.



*Dr. Kosar*

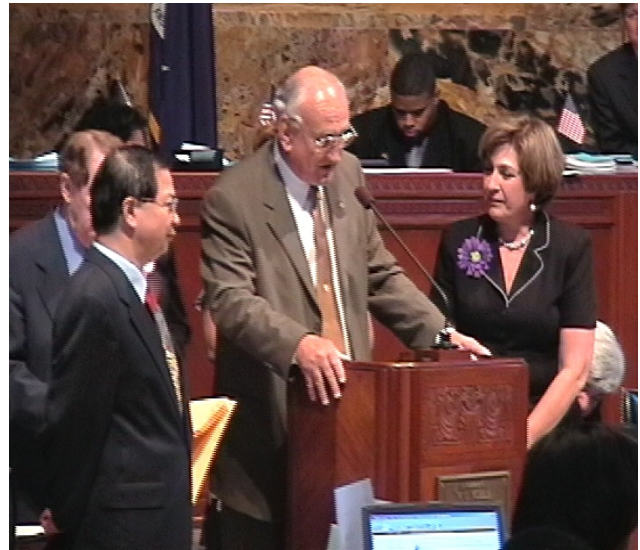
Dr. Tevfik Kosar has joined the CS department this semester. He received his Ph.D. degree in computer science from University of Wisconsin-Madison in 2005. His teaching and research interests are in the area of operating systems, with emphasis on distributed systems, grid and collaborative computing. Dr. Kosar is also interested in the use of distributed

systems to solve problems in biology, astronomy, high energy physics, and Earth sciences. He is currently working on distributed data scheduling and management in heterogeneous distributed systems. He is the primary designer and developer of the Stork data scheduling system, which has been adopted by several national and international institutions. Dr. Kosar has also spent three summers at IBM T.J. Watson Research Center in Hawthorne, NY doing research on several state-of-the-art topics, such as on-demand computing, storage area networks, and web capacity planning. He has published 18 journal and conference papers, and a book chapter.

**CONGRATULATIONS!**

**Faculty**

- ❖ Don Kraft is now a Visiting Distinguished Professor in the Department of Computer Science for 2005-2006 at the United States Air Force Academy in Colorado Springs, Colorado.
- ❖ Dr. Peter Chen was honored as one of the LSU distinguished faculty members by Governor Kathleen Blanco and LSU System President William Jenkins at the State Capitol.



*Dr. P. Chen (left), Dr. W. Jenkins (middle) and Governor K. Blanco (right)*

- ❖ Dr. S.S. Iyengar was presented the Fellow of the Society for Design and Process Sign (SDPS) at the Eighth Biennial World Conference on Integrated Design & Process Technology, June 12-16, 2005, Beijing, China,
- ❖ Dr. Durrezi and his research group won an Excellent Paper Award at the 11<sup>th</sup> IEEE ICPADS 2005 conference in Japan. This paper has been selected among 331 papers presented/submitted for the conference.



*Dr. Durrezi*

- ❖ Dr. Durrezi is Guest Editor for the *International Journal of Wireless and Mobile Computing* – Special Issue on Wireless Sensor Networks; *Journal of Interconnection*

*Networks* - Special Issue on Heterogeneous Wireless Networks; *International Journal of Distributed Sensor Network*, Special Issue on Wireless Sensor Networks. He has also joined the Editorial Board of *Journal of Ubiquitous Computing and Intelligence* and *International Journal of Computing and Informatics*. Besides, Dr. Duresi has recently served the program committees of several international workshops and conferences. Recently, he received the *IEEE* Certificate of Appreciation for Service.

- ❖ Dr. Park was Publicity Chair at SenMetrics: 3<sup>rd</sup> International Workshop on Measurement, Modeling, and Performance Analysis of Wireless Sensor Networks, San Diego, CA, July 21, 2005.

### Ph.D. Degree Awardees

Luis Gabriel Moscovich, "Learning Discrete Hidden Markov Models from State Distribution Vectors," Major professor: Jianhua Chen, Associate Professor.

Kirk Vincent Norton Spence, "Automatic Segmentation of Magnetic Resonance Images of the Brain," Major professor: John M. Tyler, Professor Donald H. Kraft.

Lydia Ray, "Active Security Mechanisms for Wireless Sensor Networks and Energy Optimization for Passive Security Routing" Major Professor: Rajgopal Kannan, Assistant Professor.

Sumanth Yenduri, "An Empirical Study of Imputation Techniques for Software Data Sets", Major Professor: S.S. Iyengar, Roy Paul Daniels Distinguished Professor.

### M.S. Degree Awardees

*Spring 2005*: Karthik Prasad Chepudira, Erwin Raymond Johnson, Jr., Gaurav Khanduja, Cariappa Devaiah Mallanda, Meyyappan Palaniappa, Vishal Pramodkumar Saraf, Neelay Sharad Shah, David William Simmons and Jin Zhang.

*Summer 2005*: Lini Abraham, Praveen Chintalacheruvu, Luis Edgardo Cuellar, Jun Cui, Milind Joshi, Ramaraju Kalidindi, Karthik Poobalashubramanian, Petrica Trifas, Ayyappa Chowdary Veerapaneni, Yutao Wang, Venkarasrirama Pavan Kumar Yerraguntla.

### B.Sc. Degrees Awardees

*Spring 2005*: Brenna Eileen Bennett, Jesse Edmund Blazek, William Brandon Crismon, Aaron Joseph Daly, Tyler Carmichael Durrett, Rolando Jose' Estrada (Honors), Andrew Ralph Feller, Petr Filipchyk (Honors), Michael Allen Guidry, Christopher Jason Holbrook, Brandon Jerome Johnson (Honors), Imaduldin Krad, Michael Austin Langford, Ly Cong Le, Lance Anthony Lohman (Honors), David Leroy McDavid, Jr., Michael Anthony Monteleone, Steven Thomas Nichols, Christopher Kyle Varisco and Matthew Michael Vince.

*Summer 2005*: James Alt, Richard Brown, Cleeta Bujol, Emrah Ceyhan, Bert Hall, Reuben Hawkins, Ashley Henderson, Jingyi Li, Steven Nichols, Oluwole Olubadewo.

### Students

- ❖ Department chair Dr. Iyengar presented top departmental honors to Lance Anthony Lohman, Rolando Jose' Estrada Jerome Johnson and Petr Filipchyk.
- ❖ Mr. Cornelius Toole, Jr currently working as a Graduate Research Assistant in CCT has been offered a prestigious "Huel D Perkins Doctoral Fellowship for a period of 3 years. These Fellowships are available to qualified African-American doctoral students.

### FUNDING SUCCESS

- NSF MRI grant on "Development of Viz tangibles and VizNet: Instrumentation for interactive visualization, simulation and collaboration, " \$397,121; 2005-07; PIs: B. Ullmer, S.S. Iyengar, E. Seidel, S.D. Beck.
- AFOSR grant on "Research on a mathematical framework and practical applications of systems architecture," \$329,000; 2005-07; PI: P. Chen.
- NSF IGERT on "Multi-scale computations of fluid dynamics", Lead-PI: Sumanta Acharya (Mechanical Engineering); CS involvements: G. Allen (Co-PI), S.S. Iyengar, B.B. Karki and B. Ullmer (participants), Total award: \$3 millions, 2005-09.
- RCS Louisiana Board of Regents grant on "QoS and Secure Protocol in Heterogeneous Sensor and Actor Networks," \$ 73,000, 2005-07, PI: Arjan Duresi.
- LEQSF grant on "Recruitment of superior students in areas of high-end computation and visualization at

Louisiana State University,” \$88,000; 2005-08; PIs: S.S Iyengar, D. Kraft and B. B. Karki.

- AFOSR grant on “Cognitive adhoc network suppression logic”, \$13,500; 2005-06; PIs: R. Kannan and S. Wei.
- DOE grant on “Distributed sensor network design for efficient plume mapping of chemical, biological and nuclear radiation events,” \$193,913; 2005-08; PIs: S.S. Iyengar and R. Kannan.
- NSF AES grant on "An integrated framework for compile-time/run time support for multi-scale applications on high-end systems," \$145,500; 2005-07, PI's: P. Sadayappan, J. Ramanujam and G. Baumgartner.
- LSU Faculty Research Council Grant on “Developing an adaptive and parallel transport protocol for large-scale scientific applications over high speed networks,” \$10,000; 2005-06; PI: S. Park.
- NSF CISE grant on “A General DDDAS Framework with Coast and Environment Modeling Applications, ” \$220,000, 2005-06; PI's: G. Allen, J. Westerink, G. Stone, I. van Heerden, B. Aksoylu.
- NSF CISE grant on ‘EnLIGHTened Computing: Highly-dynamic Grid E-science Applications Driving Adaptive Optical Control Plane and Compute Resources,’ \$50,000, 2005-06, PI's: G. Karmous-Edwards, G. Allen, S.J. Park, E. Seidel, D. Reed, A. Blatecky.

## EVENTS

The department jointly with CCT hosted the I.T. Eminent Lecture by Dr. Alfred V. Aho, Lawrence Gussman Professor, Columbia University, IEEE John von Neumann medal Winner, and Member of National Academy of Engineering, June 1, 2005. The other I.T. Eminent Lecture was given by Dr. Robert E. Kahn, CEO and President of CNRI Winner of National Medal of Technology and ACM Turing Award Winner, August 26, 2005.

Dr. D. Kraft gave a series of talks on information retrieval systems models and artificial intelligence methods and the social impact of such systems at the Universidad de



*Dr. A.V. Aho (left) and Dr. P. Chen (right)*



*Dr R. Kahn (middle), Dr. S.S. Iyengar (left) and Dr. P. Chen (right).*

Santiago de Compostela, Universidad de Granada, and the Universidad Carlos III de Madrid in Spain in May and June, 2005.

Dr. B. B. Karki gave a talk in the 1<sup>st</sup> V-Lab workshop organized by University of Minnesota Supercomputing Institute, July, 2005.

The ACM held the first meeting of the semester on Thursday September 22. The ACM Chairman, John Douthat, led the meeting and Dr. Iyengar welcomed the students and presented a brief overview of the department and faculty with emphasis on opportunities for undergraduate students to participate in research endeavors. Scott St. Cyr was the featured guest speaker and stressed the benefits of entrepreneurship in the software development workplace. Dr. Baumgartner, the ACM Advisor, explained changes in the works for the computer

science curriculum. Finally the ACM Webmaster presented a rundown of the technical features to be incorporated into the new website.

### THE CS ACCESS GRID

The CS department has recently acquired the **Access Grid** facility. It is an ensemble of resources consisting of multimedia large-format displays, presentation and interaction environments, and interfaces to Grid middleware and to visualization environments. These resources are used to support group-to-group interactions such as distributed meetings, lectures, seminars, etc. across the Grid. The AG is now used at several hundreds of institutions worldwide. Our AG node consists of a large projection wall, one projector, one computer system, cameras, and a seating area for about 10 people. It is located in 140 Coates.

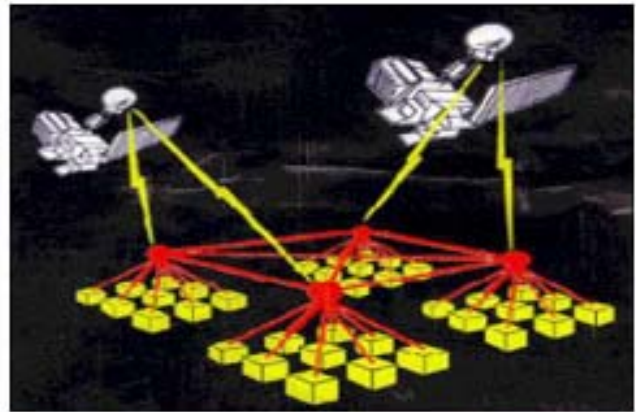


*Access Grid facility at the CS department*

### RECENT RESEARCH INITIATIVES BY CS-CCT FACULTY

The CS department is currently taking a major initiative in a very challenging problem of restoring a successful dynamic Gulf Coast. A system approach for this involves an integration of various components: The first component is to enable large-scale data analysis. The high-end computational and storage requirements of coastal data necessitate the use of distributed resources owned by collaborating institutions to meet the demand. The end-to-end process needs to be managed and coordinated very well to enable reliable and efficient processing and analysis of the large amounts of coastal data. The second important

component is to access real-time information through implementation of sensor grids. It will enable a faster transfer of critical data around the globe and send warnings even though the center of activity may be far away from a particular coastal area, giving enough time to evacuate these regions and save many lives. Many problems in the aftermath of Hurricane Katrina were caused by a lack of information flow between different Federal/State/City agencies, so solutions to the problem of data/knowledge integration will be very useful in the rebuilding effort and the prevention of future disasters. The third component is



*Distributed framework for successful dynamic Gulf Coast*

to efficiently handle Internet and telephone management under emergency conditions. To resolve this issue, an ad hoc mode for cellular networks is urgently needed. The availability to communicate is very critical for first responders, who conduct operations to save lives, restore the infrastructure and return the population to normal living conditions. The experience has shown that among the telecommunications infrastructures, the Internet can serve as the prime way for personal communication, news, and recovery information. By dynamically restructuring the data grid in response to network failures and by dynamically migrating some of the data processing applications to idle compute resources close to the sensors

(such as to desktop PCs), it will be possible to minimize that data loss. The last important component is to exploit the power of interdisciplinary approach. The scale and complexity of warning systems for hurricanes, coastal erosion, drought, cyclones, and typhoons presents fundamentally new research challenges in distributed systems paradigms. An interdisciplinary team is required to develop the computational models, data structures and algorithms, simulation and analysis tools for this effort. The Department of Computer Science at LSU together with the Center for Computation and Technology (CCT), which brings interdisciplinary application groups together, can take a leading role in this effort. For details, contact the departmental chair Dr. S. S. Iyengar.

### RESEARCH PUBLICATIONS (SELECTED)

R. Kannan, "The KR-Benes Network: A Control-Optimal Rearrangeable Permutation Network," *IEEE Transactions on Computers*, 54, 534, 2005.

A. Durresi, V. Paruchuri, S. S. Iyengar, R. Kannan, "Optimized Broadcast Protocol for Sensor Networks," *IEEE Transactions on Computers*, 54, 1013, 2005.

A. Durresi, V. Paruchuri, S. S. Iyengar, R. Kannan, "Data Integrity for Sensor Networks," *International Journal of Distributed Sensor Network*, 1, 205, 2005.

M. Zhu, Q. Wu, N. S. V. Rao, S. S. Iyengar, "Optimal pipeline decomposition and adaptive network mapping to support remote visualization," *Journal of Computer Animation and Virtual World*, 2005 (in press).

V. K. Prasanna, S. S. Iyengar, P. G. Spirakis, M. Welsh, "Distributed Computing in Sensor Systems," *First IEEE International Conference, DCSS 2005*, Marina del Rey, CA, June 30 - July 1, 2005, Proceedings Springer 2005

A. Durresi, V. Paruchuri, L. Barolli, R. Kannan, "Anonymous Communication Protocol for Sensor Networks," *International Journal of Wireless and Mobile Computing (IJWMC)*, 1, 2005.

E. Triantaphyllou and K Baig, "The Impact of Aggregating Benefit and Cost Criteria in Four MCDA Methods," *IEEE Trans. on Engineering Management*, 25, 213, 2005.

V. I. Priklonsky, D.D. Reible and J.M. Tyler, "Consistent Unconfined Contaminated Disposal Facilities Dike Tidal Flow and Transport Model," *Environmental Modelling and Software*, 20, 1071, 2005.

S. Kundu and N. Gwee, "A Formal Approach to Designing a Class-Subclass Structure Using a Partial-Order on The Functions," *International Computer Software and Applications Conference*, Edinburgh, July 26-28, 2005.

G. Ding, J. Chen, R. Lax and P. Chen, "Efficient Learning of Pseudo-Boolean Functions from Limited Training Data," *Lecture Notes in Artificial Intelligence (LNAI)*, May, 2005.

A. Durresi, "Routing of Real-time Traffic over a Multilayered Satellite Architecture," *International Journal of Wireless and Mobile Computing (IJWMC)*, Vol. 1, Issue 6, 2005.

A. Durresi, V. Paruchuri, "Geometric Broadcast Protocol for Heterogeneous Wireless Networks," *Journal of Interconnection Networks (JOIN)*, September 2005.

M. Durresi, A. Durresi, L. Barolli, "Scalable Inter-Vehicle Communication Protocol," *Journal of Mobile Multimedia (JMM)*, September 2005.

V. Paruchuri, A. Durresi, L. Barolli, "Network Life Expectancy aware Routing Protocol for Heterogeneous Wireless Sensor Networks," in *Proceedings of 8<sup>th</sup> International Workshop on Network-Based Information Systems (NBIS-2005)*, Copenhagen, Denmark, August 22-26, 2005.

A. Durresi, V. Paruchuri, L. Barolli, "Delay-Energy Aware Routing Protocol for Sensor and Actor Networks," in *Proceedings of ICPADS 2005*, Fukuoka, Japan, July 20-22, 2005, won Excellent Paper Award.

M. Durresi, A. Durresi, L. Barolli, "Optimized Geographical Routing Protocol for Inter-Vehicle Communications", in *Proceedings of ICDCS-MNSA-2005*, Columbus, Ohio, June 2005, pp. 749, 2005

A. Durresi, Vamsi Paruchuri, "Geometric Broadcast Protocol for Sensor and Actor Networks," in *Proceedings of IEEE AINA 2005*, Taipei, Taiwan, March 27-29, pp. 343, 2005.

A. Durresi, V. Paruchuri, "Adaptive Clustering for Sensor Networks," in *Proceedings of 2005 IEEE Aerospace Conference*, Big Sky, Montana, March 6-15, 2005

S. Kota, A. Durresi, "QoS Routing Over Satellite IP Networks", *ITU Contribution*, ITU-R 263/4, April 25, 2005.

V. Yerraguntla, B.B. Karki, H. Kikuchi and S. Saini, "A parallel molecular dynamics algorithm for polycrystalline

minerals,” in *Proceedings of The 2005 International Conference on Modeling Simulation and Visualization Methods (MSV'05)*, Las Vegas, June 27-30, pp. 201, 2005.

L. Stixrude and B.B. Karki, “Structure and Freezing of MgSiO<sub>3</sub> liquid in Earth’s Mantle,” *Science*, 2005 (in press).

Y. Zhu, R. Vedantham, S. Park and R. Sivakumar, "A Scalable Correlation Aware Aggregation Strategy for Wireless Sensor Networks," *IEEE International Conference on Wireless Internet (WICON)*, Budapest, Hungary, July 2005.

R. Vedantham, S. Park and R. Sivakumar, "Sink-to-Sensors Congestion Control," *IEEE International Conference on Communications (ICC)*, Seoul, Korea, May 2005.

T. Kosar, George Kola, and Miron Livny, “Building Reliable and Efficient Data Transfer and Processing Pipelines,” *Concurrency and Computation: Practice and Experience*, 2005 (in press).

T. Kosar and Miron Livny, “A Framework for Reliable and Efficient Data Placement in Distributed Computing Systems,” *Journal of Parallel and Distributed Computing*, 2005 (in press).

A.J. Chakravarti, G. Baumgartner, M. Lauria, “The Organic Grid: Self-Organizing Computation on a Peer-to-

Peer Network,” To appear in *IEEE Transactions on Systems, Man, and Cybernetics*, 35., May 2005.

G. Baumgartner, A. Auer, D.E. Bernholdt, A. Bibireata, V. Choppella, D. Cociorva, X. Gao, R.J. Harrison, S. Hirata, S. Krishnamoorthy, S. Krishnan, C. Lam, Q. Lu, M. Nooijen, R.M. Pitzer, J. Ramanujam, P. Sadayappan, A. Sibiryakov, “Synthesis of High-Performance Parallel Programs for a Class of Ab Initio Quantum Chemistry Models,” *Proceedings of the IEEE*, 93, pp. 276, February 2005.

B. Ullmer, H. Ishii, R.J.K. Jacob, “Token+constraint systems for tangible interaction with digital information,” *ACM Trans. Comput.-Hum. Interact.* 12, 81, 2005.

### **Further Information**

The Computer Science Newsletter serves as a guide to activities in the department and other functions on and off campus. The Newsletter is published by the Department of Computer Science, Louisiana State University (Baton Rouge). Items to be included in the Newsletter should be submitted to Bijaya B. Karki in 283 Coates ([karki@bit.csc.lsu.edu](mailto:karki@bit.csc.lsu.edu)). Previous issues of the Newsletter can be found on the departmental homepage at <http://www.csc.lsu.edu/newsletter/>