



BRIDGING THE DIVIDE BETWEEN THE INFORMATION TECHNOLOGY AND SCIENCE COMMUNITIES



# Graduate Fellowship Opportunity for Science and Engineering



## FIU Academic Community Workshop

Date: September 30, 2008



NSF AWARD N°. 0537464



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## Who's Who?

### □ Investigators

- Heidi Alvarez, PI, Director of the Center for Internet Augmented Research and Assessment (CIARA) at FIU
- Peter Arzberger, Co-PI (Calit2)
- Julio Ibarra, Co-PI, Executive Director of CIARA
- Kuldeep Kumar, Co-PI, Professor
- S. Masoud Sadjadi, Co-PI, Assistant Professor of SCIS





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# External Assessment Committee

- **Paul Avery**, Professor of Physics, University of Florida
- **Hugh Gladwin**, Director of the Institute for Public Opinion Research
- **Thomas Greene**, Senior Research Fellow / Director of the Computer Science & Artificial Intelligence Laboratory (CSAIL) at MIT
- **Jane Klobus**, Professor and Senior Research Fellow, Dondena Centre for Social Research, Bocconi University, Milan, Italy & Professorial Fellow, Graduate School of Management, University of Western Australia





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# What is Global CyberBridges?

- ❑ **Cyberinfrastructure Training, Education, Advancement, and Mentoring for Our 21st Century Workforce (CI-TEAM)**
  - National Science Foundation Program Solicitation
  - [http://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=nsf06548&org=NSF](http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf06548&org=NSF)
- ❑ Three year award (Oct. 2006 - Dec. 2009) for \$765,000 total to CIARA at FIU
- ❑ The program expands on CyberBridges, which was initiated in 2005 to help FIU scientists and engineers advance their research through cyberinfrastructure (CI).





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## Global CyberBridges Benefits

- ❑ Brings together graduate students & faculty from various disciplines
- ❑ Offers greater understanding of R&E CI
- ❑ Increases opportunity for cross-disciplinary R&E
- ❑ Increases scientists' rate of discovery
- ❑ Creates a CI empowered workforce.
- ❑ Research fellowship stipend of \$5,000 total for Spring / Summer 2009
  - May be combined with other tuition waivers & stipends
  - May be split between 2 fellows working on a research project together



## Activities

- ❑ 1<sup>st</sup> Semester: Feb. to May 2009
  - ❑ Participating in initial interviews
  - ❑ Attending the GCB training
  - ❑ Learning about HPC and how to use it
  - ❑ Team building
    - ❑ Brainstorming and planning for the project with your team
    - ❑ Weekly group meeting (EVO or Skype for video conferencing)
  - ❑ Preparing a lecture and delivering it in the class
- ❑ 2<sup>nd</sup> Semester: June to Nov. 2009
  - ❑ Working on the project
  - ❑ Running experiments
  - ❑ Attending weekly meetings
  - ❑ Writing a technical paper targeted to a conference
  - ❑ Participating in final interviews



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# Publications

1. Selim Kalayci, Onyeka Ezenwoye, Balaji Viswanathan, Gargi Dasgupta, S. Masoud Sadjadi, and Liana Fong. Design and implementation of a fault tolerant job flow manager using job flow patterns and recovery policies. In *Proceedings of the 6th International Conference on Service Oriented Computing (ICSOC'08)*, Sydney, Australia, December 2008. Accepted for publication (acceptance rate 20.4%).
2. Hector A. Duran Limon, S. Masoud Sadjadi, *et al.* **Grid enablement and resource usage prediction of weather research and forecasting.** In *Proceedings of the Collaborative and Grid Computing Technologies Workshop*, Cancun, Mexico, April 2008.
3. Gargi Dasgupta<sup>1</sup>, Onyeka Ezenwoye, Liana Fong, Selim Kalayci, S. Masoud Sadjadi, and Balaji Viswanathan. **Design of a fault-tolerant job-flow manager for grid environments using standard technologies, job-flow patterns, and a transparent proxy.** In *Proceedings of the 20th International Conference on Software Engineering and Knowledge Engineering (SEKE'2008)*, San Francisco Bay, USA, July 2008.
4. Chi Zhang, Bin Liu, Xun Su, Heidi Alvarez, and Julio Ibarra. **Integrating heterogeneous network monitoring data.** In *Telecommunication Systems*, February, 2008, DOI 10.1007/s11235-008-9073-5.
5. Khalid Saleem, S. Masoud Sadjadi, and Shu-Ching Chen. **Towards a self-configurable weather research and forecasting system.** In *Proceedings of the 5th IEEE International Conference on Autonomic Computing (ICAC-2008)*, Chicago, IL, June 2008. (38% acceptance rate).
6. Yanbin Liu, S. Masoud Sadjadi, Liana Fong, Ivan Rodero, David Villegas, Selim Kalayci, Norman Bobroff, and Juan Carlos Martinez. **Enabling autonomic meta-scheduling in grid environments.** In *Proceedings of the 5th IEEE International Conference on Autonomic Computing (ICAC-2008)*, Chicago, IL, June 2008. (38% acceptance rate).
7. Gargi Dasgupta, Onyeka Ezenwoye, Liana Fong, Selim Kalayci, S. Masoud Sadjadi, and Balaji Viswanathan. **Runtime fault-handling for job-flow management in grid environments.** In *Proceedings of the 5th IEEE International Conference on Autonomic Computing (ICAC-2008)*, Chicago, IL, June 2008. (38% acceptance rate).
8. Norman Bobroff, Liana Fong, Selim Kalayci, Yanbin Liu, Juan Carlos Martinez, Ivan Rodero, S. Masoud Sadjadi, and David Villegas. **Enabling interoperability among meta-schedulers.** In *Proceedings of 8th IEEE International Symposium on Cluster Computing and the Grid (CCGrid-2008)*, Lyon, France, 2008.





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# Publications

9. S. Masoud Sadjadi, Shu Shimizu, Javier Figueroa, Raju Rangaswami, Javier Delgado, Hector Duran, and Xabriel Collazo. **A modeling approach for estimating execution time of long-running scientific applications.** In *Proceedings of the 22nd IEEE International Parallel & Distributed Processing Symposium (IPDPS-2008), the Fifth High-Performance Grid Computing Workshop (HPGC-2008)*, Miami, Florida, April 2008.
10. S. Masoud Sadjadi, Liana Fong, Rosa M. Badia, Javier Figueroa, Javier Delgado, Xabriel J. Collazo-Mojica, Khalid Saleem, Raju Rangaswami, Shu Shimizu, Hector A. Duran Limon, Pat Welsh, Sandeep Pattnaik, Anthony Praino, David Villegas, Selim Kalayci, Gargi Dasgupta, Onyeka Ezenwoye, Juan Carlos Martinez, Ivan Rodero, Shuyi Chen, Javier Muñoz, Diego Lopez, Julita Corbalan, Hugh Willoughby, Michael McFail, Christine Lisetti, and Malek Adjouadi. **Transparent grid enablement of weather research and forecasting.** In *Proceedings of the Mardi Gras Conference 2008 - Workshop on Grid-Enabling Applications*, Baton Rouge, Louisiana, USA, January 2008.
11. S. Masoud Sadjadi, Selim Kalayci, and Yi Deng. **A self-configuring communication virtual machine.** In *Proceedings of the 2008 IEEE International Conference on Networking, Sensing and Control (ICNSC-08)*, Sanya, China, April 2008. (accepted for publication.)
12. Xing Hang, David Villegas Castillo, S. Masoud Sadjadi, and Heidi Alvarez. **Formative assessment of the effectiveness of collaboration in gcb.** In *Proceedings of the International Conference on Information Society (i-Society 2007)*, Merrillville, Indiana, USA, October 2007.
13. Heidi L. Alvarez, David Chatfield, Donald A. Cox, Eric Crumpler, Cassian Dê™ Cunha, Ronald Gutierrez, Julio Ibarra, Eric Johnson, Kuldeep Kumar, Tom Milledge, Giri Narasimhan, Rajamani S. Narayanan, Alejandro de la Puente, S. Masoud Sadjadi, and Chi Zhang. **Cyberbridges: A model collaboration infrastructure for e-Science.** In *Proceedings of the 7th IEEE International Symposium on Cluster Computing and the Grid (CCGrid'07)*, Rio de Janeiro, Brazil, May 2007. (acceptance rate 33.5%).
14. S. Masoud Sadjadi, Javier Muñoz, Diego Lopez, Javier Figueroa, Xabriel J. Collazo-Mojica, Alex Orta, Michael McFailand, David Villegas, Rosa Badia, Pat Welsh, Raju Rangaswami, Shu Shimizu, and Hector A. Duran Limon. **Transparent grid enablement of WRF using a profiling, code inspection, and modeling approach.** In *Poster Presented in the 5th Latin American Grid (LA Grid) Summit*, The IBM T.J. Watson Research Center, NY, U.S.A., September 2007.





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# Publications

15. S. Masoud Sadjadi, Steve Luis, Khalid Saleem, Donald Llopis, Javier Munoz, Diego Lopez, Javier Figueroa, David Villegas Castillo, Selim Kalayci, Pat Welsh, Shu-Ching Chen, Anthony Praino, and Hugh Willoughby. **The latin american (la) grid weather research and forecast (WRF) portal.** In *Poster Presented in the 5th Latin American Grid (LA Grid) Summit*, The IBM T.J. Watson Research Center, NY, U.S.A., September 2007.
16. Liana Fong, S. Masoud Sadjadi, Yanbin Liu, Ivan Rodero, David Villegas, Selim Kalayci, Norman Bobrof, and Julita Corbalan. **The LA Grid meta-scheduling project.** In *Poster Presented in the 5th Latin American Grid (LA Grid) Summit*, The IBM T.J. Watson Research Center, NY, U.S.A., September 2007.
17. Gargi B Dasgupta, Liana Fong, S. Masoud Sadjadi, Onyeka Ezenwoye, Balaji Viswanathan, Selim Kalayci, David Villegas Castillo, and Norman Bobroff. **Fault-tolerant job-flow management in grid environment.** In *Poster Presented in the 5th Latin American Grid (LA Grid) Summit*, The IBM T.J. Watson Research Center, NY, U.S.A., September 2007.
18. S. Masoud Sadjadi, David Villegas, Javier Munoz, Diego Lopez, Alex Orta, Michael McFail, Xabriel J. Collazo-Mojica, and Javier Figueroa. **Finding an appropriate profiler for the weather research and forecasting code.** *Technical Report FIU-SCIS-2007-09-03*, School of Computing and Information Sciences, Florida International University, 11200 SW 8th St., Miami, FL 33199, August 2007.
19. S. Masoud Sadjadi, Javier Munoz, Diego Lopez, David Villegas, Javier Figueroa, Xabriel J. Collazo-Mojica, Michael McFail, and Alex Orta. **Weather research and forecasting model 2.2 documentation: A step-by-step guide of a model run.** *Technical Report FIU-SCIS-2007-09-02*, School of Computing and Information Sciences, Florida International University, 11200 SW 8th St., Miami, FL 33199, August 2007.
20. Onyeka Ezenwoye, S. Masoud Sadjadi, Ariel Carey, and Michael Robinson. **Grid service composition in bpel for scientific applications.** In *Proceedings of the International Conference on Grid computing, high-performance and Distributed Applications (GADA'07)*, Vilamoura, Algarve, Portugal, November 2007. (accepted for publication.).



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## Outcomes & Evaluation

- ❑ A new generation of scientists & engineers
  - Capable of fully integrating CI into the whole educational, professional, and creative process of their diverse disciplines.
- ❑ Short Term Outcome Measurement:
  - Proposed and realized timeline for implementing the activities
- ❑ Longer term Outcome Measurements:
  - Publication, presentation, and other metrics determined by the outside experts to be appropriate for the research activities



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## Fellowship Requirements

- ❑ Course begins in Spring 2009 at end of February
  - Advanced Networking
  - Grids/Distributed Computing
  - Virtual Teams
  - Scalable Adaptive Graphics Environment (SAGE)
- ❑ Course Continues through Summer 2009
  - Students and faculty will collaborate on a paper based on the research
  - Research results to be published & presented at a conference
  - Student's travel expenses covered
- Attendance at major conference in Fall 09 or Spring 10
  - Usually SuperComputing to present research findings



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## Fellowship Qualifications

- ❑ Candidates must be on a research path that can be augmented by CI
- ❑ Open to graduate students in science or engineering
  - PhD students preferred
- ❑ Some programming background desired
  - C or C++ preferred, JAVA or Fortran OK





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## How to Apply

- ❑ Submit a 1 page proposal
  - Describe a problem in your area of research
  - Provide a hypothesis on how the use of CI would benefit the research process.
- ❑ Attach a one-page bio/CV
  - Show any networking, grid, or related CI experience
- ❑ Submit all documents to [info@cyberbridges.net](mailto:info@cyberbridges.net)
  - Faculty advisor must indicate support via letter of support
- ❑ Due by **November 14<sup>th</sup>, 2008**
- ❑ Selection announced by **December 1<sup>st</sup>, 2008**



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## Projects in 2006

- ❑ Unsupervised Pattern Discovery in Protein Structures
  - ❑ Computer Science & Bioinformatics
- ❑ Modeling Biological Tissue Scaffolds in Three Dimensions
  - ❑ Biomedical Engineering
- ❑ Interplay between Random Matrix Theory and Quantum Field
  - ❑ Physics
- ❑ Functionalities of a specific enzyme for certain reactions
  - ❑ Chemistry/Biochemistry



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## Projects in 2007

- ❑ Grid Enablement of Hurricane Simulation Application
  - ❑ Earth Sciences
- ❑ On Demand Weather Forecast Visualization via Efficient Resource Utilization in Grid Computing
  - ❑ Visualization
- ❑ Computational Modeling & Simulation of Biodegradable Starch based polymer composites
  - ❑ Computational Chemistry
- ❑ Collaboration Platform
  - ❑ e-Science and e-Society



## Projects in 2008

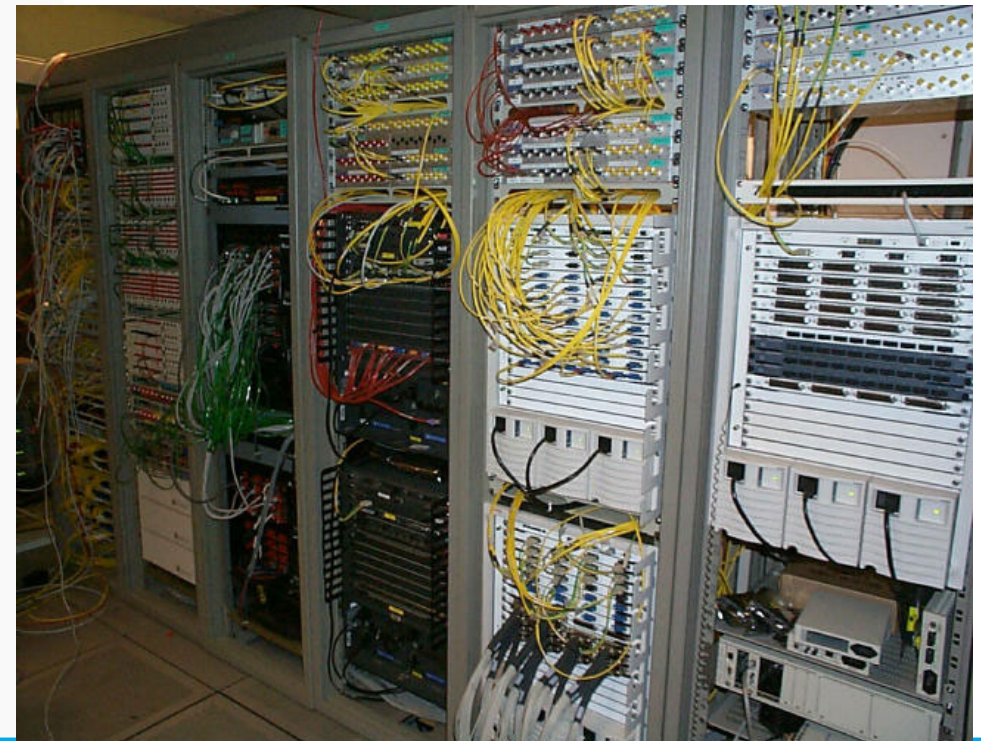
- ❑ The Development of Collaborative Platform Based on SAGE
  - ❑ Computer Science - Visualization
- ❑ Innovative Grid-Enable Multiple-Scale Hurricane Modeling System
  - ❑ Earth Sciences
- ❑ Finding Repeat Structures in Genomic Sequences
  - ❑ Computer Science – Bioinformatics
- ❑ A Distributed Multimedia Data Management over the Grid
  - ❑ Computer Science – Multimedia





# Grid Enablement of Scientific Applications

- ❑ Dr. S. Masoud Sadjadi, Computer Science
- ❑ Time of class must be coordinated with Chinese and Brazilian collaborators
- ❑ May be early in the morning (7:30 – 10 am) TBD





## Topics that will be covered:

- ❑ HPC Concepts:
  - ❑ Concurrency: Concurrent, Parallel, Distributed, Reasons, and History.
  - ❑ Concurrent Computers: Within a CPU, a “box”, or Boxes, and Taxonomy.
  - ❑ Process: Partitioning, Communication, Agglomeration, and Mapping.
  - ❑ Performance: Benchmarks, Speedup, Amdahl’s Law, Profiling.
- ❑ HPC Hardware, Software, :
  - ❑ Cluster Computing: Hardware (Architecture, Planning, Installation) and Software (Rocks, MPICH).
  - ❑ Grid Computing: Standards (OGSA, OGSI, WSRF) and Toolkits (GT4, GSI, GRAM, MPICH-G2, and Condor).
- ❑ HPC Programming:
  - ❑ Cluster Programming: Open MP and MPI
  - ❑ Grid Programming: Globus Toolkit, Web Services and Grid Services



# Using TeraGrid

- ❑ Connecting to TeraGrid systems via ssh
  - ❑ [linux, mac, windows clients]
- ❑ Data Management, Your Account, and Allocation
  - ❑ Maintaining a persistent connection to your office
  - ❑ How to make the most out of your allocated credit
  - ❑ Managing your system directory
- ❑ HPC software
- ❑ Batch system basics
- ❑ MPI
- ❑ OpenMP
- ❑ Debugging techniques
- ❑ Multi-core





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## Important Dates

- ❑ Submit a 1 page proposal by November 14<sup>th</sup> to [info@cyberbridges.net](mailto:info@cyberbridges.net)
- ❑ Advisory Committee Meets by November 29<sup>th</sup>
- ❑ Announcement of fellowships by December 1<sup>st</sup>





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# Proposal Information Summary

- ❑ 1 Page
- ❑ Submitted by student and faculty advisor
  - Faculty letter of support required
- ❑ Describe research interest and problem
- ❑ How might CI augment the research?
- ❑ Is there any multidisciplinary synergy?
- ❑ Include qualifications including any previous programming experience



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## Questions?



LambdaVision 100-Megapixel display and SAGE (Scalable Adaptive Graphics Environment) software developed by the Electronic Visualization Laboratory at the University of Illinois at Chicago. Major funding provided by NSF.

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Website [www.cyberbridges.net](http://www.cyberbridges.net)