

Honggao Liu

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Education:

- Ph.D., Chemical Engineering, Louisiana State University, Baton Rouge, LA. 12/2002*
- Master of Science, Chemical Engineering, Louisiana State University, Baton Rouge, LA. 05/2001
- Master of Science, Organic Chemical Technology, Tianjin University, Tianjin, P.R.China. 03/1997
- Bachelor of Science, Chemical Engineering, Xi'an Jiaotong University, Xi'an, P.R.China. 07/1994

Experience:

- **Manager of High Performance Computing Enablement (01/2006-present) , High Performance Computing (HPC), Louisiana State University**
 - Construct an 85 TFlops (trillions of floating point operations per second) Grid, one of Nation's most powerful supercomputing environments, for Louisiana Optical Network Initiative (LONI) that will provide unprecedented computational power to the nation's research scientists and engineers through the National LambdaRail (NLR)
 - Work on LSU/LONI joining the TeraGrid, a backbone of national cyberinfrastructure (TeraGrid is a nationwide, NSF-funded research infrastructure that incorporates high-performance computing resources at nine sites across the country) by leading the user services, software, documentation working groups .
 - Manage analysts/consultants who implement, configure, secure, document, maintain, and support HPC software resources including, but not limited to various commercial and open source scientific codes, libraries, or applications
 - Work on LSU's NSF National Center's proposal (track 2c) "High Performance Computing System Acquisition: Towards a Petascale Computing Environment for Science and Engineering"
 - Configure and administer LSU's supercomputing systems (Tezpur-- a 1440 Intel Xeon 64-bit 2.66 GHz processor cluster. Pelican--a 368 IBM Power5 and Power5+ 1.9 GHz processor cluster. Nemeaux—a 64 Apple Xserve G5 2.0 GHz processor cluster. Santaka—a 32 SGI Itanium 2 1.5 GHz processor cluster) and LONI's supercomputers (Queen Bee – a 5440 Intel Xeon 64-bit 2.33 GHz processor cluster which ranks the 23rd fastest supercomputer in the world. Eric – a 512 Intel Xeon 64-bit 2.33 GHz processor cluster. Bluedawg – a 112 IBM Power5 1.9 GHz processor cluster. Ducky -- a 112 IBM Power5 1.9 GHz processor cluster. Zeke -- a 112 IBM Power5 1.9 GHz processor cluster. Neptune -- a 112 IBM Power5 1.9 GHz processor cluster. LaCumba -- a 112 IBM Power5 1.9 GHz processor cluster)
 - Create a prototype Louisiana Grid which is a virtual statewide supercomputer collectively connecting 5 IBM p575 Power5 cluster systems in 5 universities through Louisiana Optical Network and grants access to researchers around the country through the National LambdaRail (NLR)
 - Work on LSU's NSF National Center's proposal (track 2b) "High Performance Computing System Acquisition: Towards a Petascale Computing Environment for Science and Engineering" (unfunded)
 - Develop a proposal as a senior investigator for National Science Foundation's (NSF) "High-Performance Computing for Science and Engineering Research and Education: Operations (User Support, System Administration and Maintenance) (HPC-OPS)" solicitation to make LONI's HPC systems available to national science and engineering community without restriction to discipline (funded)
 - Develop a proposal as a senior investigator for "NSF EPSCoR Research Infrastructure Improvement: Information Technology" to create advanced services that will place Louisiana among the most

* It should be noted that I would have obtained a M.S. in System Science when I was in Department of Chemical Engineering, except for a Department Policy that prevents me from obtaining dual degrees during the time I am fully supported by chemical engineering. I had finished all the requirements for a M.S. degree in System Science except the Design Project by May 2002.

sophisticated environments for comprehensive computational science and engineering available (funded)

- Design, configure, and deploy a 50 TFlops supercomputer, 300 terabytes of disk storage and six 5 TFlops supercomputers for LONI
 - Design, configure, and deploy a 15 TFlops supercomputer named Tezpur (the university's next supercomputer) from DELL, 2 new IBM p575 Power5 cluster systems (256 processors), and 28.8 terabytes of IBM GPFS storage filesystems for LSU
 - Design, implement, configure, document, administer, and maintain performance monitoring and optimization of hardware and software resources within HPC
 - Work with researchers to aid their development of effective software for HPC resources and support researchers via a ticketing system to make efficient use of HPC resources for their research
 - Design training programs or seminars based on researcher needs and train them to new technologies
 - Represent LSU-HPC in statewide, national, or international forums or partnerships
 - Research emerging trends in HPC and develop potential HPC solutions for LSU HPC
- **Manager of Scientific Computing and Applications (08/2005-12/2005), High Performance Computing (HPC), Louisiana State University**
 - Work on LSU's NSF National Center's proposal "High Performance Computing System Acquisition: Towards a Petascale Computing Environment for Science and Engineering" (unfunded)
 - Work on enabling LSU to become a new TeraGrid, is a grid computing project for building the world's largest, most comprehensive distributed infrastructure for open scientific research) partner by integrating SuperMike to TeraGrid
 - Design, implement, configure, document, administer, and maintain performance monitoring and optimization of hardware and software resources within HPC
 - Configure and administer LSU's supercomputing systems (SuperMike--a cluster of 1,024 Pentium IV 3.0GHz processors and one of the top 100 supercomputers in the world. Casper/Pelican--an IBM SP, RS/6000, pSeries and P5 cluster. SuperHelix--256 Intel Pentium IV 1.8 GHz processor cluster. Nemeaux--64 Apple Xserve G5 2.0 GHz processor cluster. Santaka--32 SGI Itanium 2 1.5 GHz processor cluster. MiniMike--32 Pentium IV 3.0GHz processor cluster)
 - Work with researchers to aid their development of effective software for HPC resources and support researchers via a ticketing system to make efficient use of HPC resources for their research
 - Design training programs or seminars based on researcher needs and train them to new technologies
 - Represent LSU-HPC in statewide, national, or international forums or partnerships
 - Research emerging trends in HPC and develop potential HPC solutions for LSU HPC
- **Scientific Computing and Applications Consultant (10/2002—08/2005), High Performance Computing, Louisiana State University**
 - Work with researchers in scientific programming and interdisciplinary computational research and the efficient use of LSU supercomputing facilities.
 - Configure and administer two large supercomputer systems-SuperMike and Casper/Pelican (SuperMike, a cluster of 1,024 Pentium IV 3.0GHz processors and one of the top 100 supercomputers in the world. Casper/Pelican, an IBM SP, RS/6000, pSeries and P5 cluster), and four medium size clusters (SuperHelix--256 Intel Pentium IV 1.8 GHz processor cluster, Nemeaux--64 Apple Xserve G5 2.0 GHz processor cluster, Santaka--32 SGI Itanium 2 1.5 GHz processor cluster, and MiniMike--32 Pentium IV 3.0GHz processor cluster.)
 - Work with researchers to aid their development of effective software for HPC resources and prepares documentation, tutorials and workshops on issues of HPC relevant.
 - Research on Grid Computing by deploying Globus Toolkit and MPICH-G2 on AIX, Linux and Windows machines and implementing applications on the testing grid.
 - Research on High Throughput Computing by using Condor system on AIX, Linux and Windows machines.
 - Work on supporting a wide variety of research projects in the chemistry, biology, physics, astronomy, fluid mechanics, geology, geography, statistics, coastal and environmental studies as well as in engineering and mathematics.
 - Administer and improve High Performance and Parallel Computing installations for scientists,

- engineers, and students to conduct cutting-edge research on the most complex questions of science, engineering, and technology.
- Monitor emerging scientific computing technologies and assist with the implementation of computing solutions that promote better use of the LSU supercomputing resources.
 - Work with other system managers with deployment and management issues, and coordinate problem resolution and 24-hr availability of UNIX and LINUX services.
 - Coordinate training and support with LSU-OCS HelpDesk personnel.
- **Research Assistant (08/1997-10/2002), Department of Chemical Engineering, Louisiana State University**
 - Developed and implemented a new numerical simulator to model polymer flow and reaction in porous media that has the potential to be used in the manufacture of composite materials, the hydraulic fracturing of oil wells (Enhanced Oil Recovery), and certain types of polymer processing.
 - Developed a new type of algorithm that allows computation of the dynamic molecular weight distribution during polymer processing (as opposed to a single polymer concentration, which was the previously accepted procedure)
 - Discovered a new type of flow instability that can occur under certain combinations of conditions (i.e. certain polymer reaction rates combined with heterogeneity in catalyst packing).
 - Developed a sphere-packing model to generate large-scale sphere pack with given domain size, radius distribution and correlation length.
 - Designed and implemented coreflood experiments to study the effects of polymer-gel treatments on multiphase flow in porous media (Data Acquisition using LabView).
 - **Research Assistant (09/1994-03/1997), Department of Chemical Engineering, Tianjin University, P.R. China**
 - Proposed a new functional group, OCOO, that greatly improved the accuracy of prediction using the UNIFAC model in Vapor-Liquid Equilibrium.
 - Coordinated chemical engineering senior student's internship (76 students) in Beijing Yanshan Petrochemical Corporation, SINOPEC.
 - Researched Vapor-Liquid Equilibrium on special binary systems concerned with Diethyl Oxalate by Vapor phase catalytic coupling of CO.
 - Researched reactant pre-treating and product separation of the preparation of Diethyl Oxalate by Vapor Phase catalytic coupling reaction of CO.
 - Researched separation of dilute organic aqueous solutions by Pervaporation.
 - **Internship (07/1993-09/1993), Lanzhou Petrochemical Corporation, SINOPEC, Lanzhou, P.R. China**
 - Assisted and worked with process engineers on the production of Polyethylene. Learned process control techniques.

Dissertation Research Projects:

- "Reactive polymer flow in porous materials." This project is to study polymer flow and crosslinking reaction in porous media that has the potential to be used in the manufacture of composite materials, the hydraulic fracturing of oil wells (Enhanced Oil Recovery), and certain types of polymer processing. A geological model, which can represent porous media with certain permeability distribution and correlation length using Hybrid-Kriging method, was developed and implemented. A multi-dimensional, multiphase, polymer flow model was developed to study the dynamics of reactive polymer flow in porous media. A new computational modeling technique in which the traditional dependent variables in the conservation equations (i.e., species concentrations) are replaced with moments of the polymer molecular weight distribution was developed. This approach allows for the efficient modeling of polymerization reactions in which orders-of-magnitude polymer molecular weight changes can occur during flow. (08/1998-10/2002)
- "Random sphere packing." A sphere packing model was developed to generate large-scale random sphere packing with given domain size, radius distribution and correlation length. (08/97-08/98)

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Computer Skills:

- **Programming Languages:** FORTRAN, C, C++, MPI, VB, MatLab, Shell scripts, HTML, PHP, Perl, and Java.
- **Operating Systems:** UNIX, AIX, LINUX, IRIX, Win 3.x, Win 9x, Win NT, Win 2000, Win XP, MS-DOS.
- **Applications:** Compilers (Fortran, C, C++), debuggers, MPICH, OpenMPI, POE, LoadLeveler, PSSP, Maui, Moab, Open PBS, PBS Pro, Condor, Big Brother, Nagios, SAS, MatLab, Gaussian, Jaguar, NWCHEM, Amber, Abaqus, Fluent, Cactus, GridChem, Mathematica, Lotus, StudioWeb, Globus, MPICH-G2, QBank, Gold, PVFS, MS Office, Visual Studio Basic/C++, Apache, GAMS, Maple, PVM, MM5, NCL, FFTW, Texlive, and lots of open source applications.
- **Database Systems:** IBM DB2, POSTGRESQL, MS Access, Oracle8i, SQL, AOL-Server.
- **Data Acquisition:** LabView.

Computer Projects:

- **Grid Computing:** Deployed and tested Globus Toolkit 3.2 and MPICH-G2 on IBM AIX 5.1 and 5.2, RedHat Linux 9.0, RedHat Linux Fedora Core 2 and 3, and Windows 2000 and XP Professional machines and implementing applications on the LSU-HPC grid. Deployed IBM Grid Toolkit 2.4 and MPICH-G2 on IBM AIX 5.1, and RedHat Linux 8.0 and 9.0 machines on a testing grid and run some simulations on this system.
- **High Throughput Computing:** Deployed and tested Condor system on IBM AIX 5.2, RedHat Linux 9.0, RedHat Linux Fedora Core 2 and 3, and Windows XP Professional machines to effectively harness wasted CPU power from otherwise idle desktop workstations.
- **Parallel Computing:** Assisting researchers with their parallel C and FORTRAN programming on a lot of projects in chemistry, biology, physics, engineering, etc. Developed a parallel C program and FORTRAN program to computing the Convex Hull of a set of random points in a two-dimensional domain. Developed a Parallel Molecular Dynamics C program based on the serial MD program.
- **Workload Management Systems:** Developed and implemented enhancements to the PBS Pro and MOAB workload management system on SuperMike, a cluster of 1,024 Pentium IV 3.0GHz processors. Deployed and implemented LoadLeveler workload management system on Casper, an IBM SP, RS/6000, and pSeries cluster.
- **Allocation System:** Deployed and tested an external Allocation Manager, QBank, working with PostgreSQL database system and the MOAB workload management system to facilitate reservation-based allocation of resources.
- **Database Management Systems:** Developed a relational PostgreSQL database system of SuperMike users for the fair allocation of LSU supercomputing resources. Developed a relational database system for a NCAA case study using the full function of MS Access with a team on the Sun workstation using the SQL-PLUS supported by the Oracle system.
- **Dynamic Web Application:** Developed LSU HPC web site using StudioWeb and Lotus Notes. Developed HTML files for LSU HPC System Administrators Guide and Casper documents. Developed an HTML file and two CGI-Perl programs that allow users to access and execute remote Molecular Dynamics programs from the Web through a Web browser.
- **Optimization Applications:** Developed computer programs to solve a refinery optimization problem using GAMS and EXCEL. Modified an On-Line Optimization program to solve the Monsanto process for sulfuric acid.
- **Visual Basic Application:** Developed a course registration application using Visual Basic, MS Access,

DAO, ActiveX, SQL, Flex grid, Crystal report.

- **C++ Applications:** Developed a time-driven program that simulates a multiple-teller bank in order to calculate the average waiting time per customer. Designed and implemented a program that simulates a simple computer using the technique of software-based simulation.
- **Java Applications:** Designed and developed a multiple-classes software that helps manage the manufacturing of residential lawn irrigation products. Developed a program that can implement all appropriate behaviours for points in Cylindrical Coordinate System.

Publications:

- Liu, H., “Numerical Studies of Reactive Polymer Flows in Porous Media,” Ph.D. Dissertation (2002).
- Liu, H., and K. E. Thompson, “Numerical Modeling of Reactive Polymer Flow in Porous Media,” *Comp. Chem. Eng.*, 26 (11), 1595-1610 (2002).
- Liu, J., H. Liu, and J. Li, “Determination and Correlation of Vapor-Liquid Equilibrium for Preparation of Diethyl Oxalate by Coupling Reaction of CO,” *Chem. Eng.*, 28 (1), 55-60 (2000).
- Liu, H., J. Liu, and J. Li, “Application of UNIFAC Model in Diethyl Oxalate Synthesis System,” *J. Chem. Eng. Chinese Univ.*, 12 (2), 113-117 (1998).
- Ding, Y., H. Liu, and J. Liu, “Separation of Dilute Organic Aqueous Solutions by Pervaporation,” *Chem. Ind. Eng.*, 15 (2), 27-35 (1998).

Professional Affiliations:

- Member of American Institute of Chemical Engineer (AIChE)
- Member of IEEE Computer Society
- Member of Association for Computing Machinery (ACM)

References Available Upon Request