Qi Hu

6812 Calverton Dr., Hyattsville, MD 20782 • (240) 476-7582 • huqi@cs.umd.edu • www.cs.umd.edu/~huqi

Objective

Cutting edge R&D in high performance computing and software engineering

Education

- **University of Maryland, College Park** **Maryland, USA**
  Ph.D. Computer Science (GPA 3.81), Advisor: Prof. Ramani Duraiswami (Graduation in May 2013) *2007 – Now*
  Research area: fast multipole method (FMM); GPGPU scientific computing; high performance computing
- **National University of Singapore** **Singapore**
  M.Sc. Mathematics, Advisor: Prof. Harald Niederreiter *2005 – 2007*
  Research area: stream ciphers; linear & k-error linear complexity
- **East China Normal University** **Shanghai, China**
  B.Sc. Applied Mathematics, Advisor: Prof. Xingzhi Zhan *2001 – 2005*

Experience

- **NVIDIA, DevTech** **Santa Clara, CA, USA**
  Summer Internship *2012*
  – GPU Accelerations of LS-DYNA via OpenACC: investigate the leading commercial simulation software LS-DYNA and develop its prototype of OpenACC acceleration models.
  – Explore and compare the performance of automatic parallelizing and optimizing compiler tools including HMPP and Par4All.
- **University of Maryland, College Park** **Maryland, USA**
  Research Assistant (Reference: Prof. Ramani Duraiswami & Nail A. Gumerov) *2009 – present*
  – Develop several scalable FMM algorithms for the heterogeneous architectures with multi-core CPU and many-core GPU (capable of performing *one billion* n-body simulation on 32-node clusters) with the state of the art performance; Develop fast spatial data structures for dynamic problems using FMM.
  – Develop the GPU parallel algorithms and module for the wake computation in the Brownout project.
  – Research on the Krylov subspace method with preconditioning and accelerate the iterative solver for kernel regression problems (GMRES on GPU clusters).
  – Contribute to GPUML, a parallel library to accelerate Machine Learning algorithms on the GPU.
  – Develop the new release of FLAGON, a middle-ware framework that allows use of NVIDIA CUDA in FORTRAN-9X. Extend FLAGON to multi-platforms (Windows, Linux and Mac OS) with new fast matrix decompositions and matrix-vector product functions on GPU.

  Teaching Assistant *2007 – 2009*
  – Teach tutorial sections for undergraduate discrete mathematics and algorithm courses.
- **National University of Singapore** **Singapore**
  Research & Teaching Assistant (Reference: Prof. Harald Niederreiter) *2005 – 2007*
  – Research on problems related to linear complexity, k-error linear complexity, multi-sequences and joint linear complexity in linear recurrence sequences analysis; Teach tutorial sections for undergraduate calculus and linear algebra courses.
- **East China Normal University** **Shanghai, China**
  Undergraduate Research Student (Reference: Prof. Xingzhi Zhan) *2004 – 2005*
  – Research on the special properties and problems of 0-1 matrices and their graph applications.

Honors and Awards

- Best student paper finalist of Supercomputing'11
- Computer science department block fellowship, University of Maryland (2007 & 2008)
- The ECNU excellent undergraduate student award (2005)
- The outstanding prize (1/167) of National Science Base-Mathematics Scholarship (2003)
- The ECNU outstanding freshman scholarship (2001)
- The 1st prize of the 17th Chinese Physics Olympiad in Henan Province (2000)

Publications

- **Refereed Paper**
  - **Q. Hu**, N. A. Gumerov, and R. Duraiswami, "Scalable distributed fast multipole methods," 14th International Conference on High Performance and Communications (HPCC-2012), Liverpool, UK, June 2012.
  - **Q. Hu**, N. A. Gumerov, and R. Duraiswami, "GPU accelerated fast multipole methods for dynamic N-body simulation," 24th International Conference on Parallel Computational Fluid Dynamics (ParCFD 2012) , Atlanta, USA, May 2012.
  - **Q. Hu**, N. A. Gumerov, and R. Duraiswami, "Scalable fast multipole methods on distributed heterogeneous architectures," in Proceedings of 2011 International Conference for High Performance Computing, Networking, Storage and Analysis, SC'11, (New York, NY, USA), pp. 36:1–36:12, ACM, November 2011. (*Best Student Paper Finalist*)
  - **Q. Hu**, M. Syal, N. A. Gumerov, R. Duraiswami, and J. G. Leishman, "Toward improved aeromechanics simulations using recent advancements in scientific computing," in Proceedings 67th Annual Forum of the American Helicopter Society, May 2011.
  - B. V. Srinivasan, **Q. Hu**, and R. Duraiswami, "GPUML: Graphical processors for speeding up kernel machines," Workshop on High Performance Analytics - Algorithms, Implementations, and Applications, Siam Conference on Data Mining, April 2010.
  - **Q. Hu**, Y. Q. Li and X. Z. Zhan, "Possible number of ones in 0-1 matrices with a given rank," Linear and Multilinear Algebra, vol.53, no.6, pp. 435-443, 2005.
- **Poster**
  - **Q. Hu**, N. A. Gumerov, R. Yokota, L. Barba and R. Duraiswami,"Scalable Vortex Methods Using Fast Multipole Methods", Technical Poster 2012 International Conference for High Performance Computing, Networking, Storage and Analysis, SC'12, Salt Lake City, UT, November 2012.
  - **Q. Hu**, N. A. Gumerov, and R. Duraiswami, "Fast N-body Algorithms for Dynamic Problems on the GPU," GPU Technology Conference, NVIDIA Research Summit, San Jose, CA, October 2010.
  - N. A. Gumerov, Y. Luo, R. Duraiswami, K. DeSpain, B. Dorland, and **Q. Hu**, "FLAGON: Fortran-9X Library for GPU Numerics," GPU Technology Conference, NVIDIA Research Summit, San Jose, CA, October 2009.
- **Other**
  - **Q. Hu**, "Fast Multipole Methods on Heterogeneous Architectures", Doctoral Showcase - Dissertation Research Showcase, 2012 International Conference for High Performance Computing, Networking, Storage and Analysis, SC'12, Salt Lake City, UT, November 2012. (acceptance ratio 25.5%)
  - **Q. Hu**, N. A. Gumerov, R. Yokota, L. Barba and R. Duraiswami,"Scalable Fast Multipole for Vortex Methods ", *submitted* to 27th ACM International Conference on Supercomputing (ICS 2013).
  - **Q. Hu**, N. A. Gumerov, and R. Duraiswami, "Parallel algorithms for constructing data structures for fast multipole methods," *under review* for Journal of Parallel Computing.
  - B. V. Srinivasan, **Q. Hu**, N. A. Gumerov, R. Duraiswami, and R. Murtugudde, "Preconditioned Krylov solvers for kernel regression," *under review* for Transactions on Pattern Analysis and Machine Intelligence.

Relevant Graduate Coursework

Computer Science: CMSC858K Combinatorial Optimization • CMSC711 Computer Networks • CMSC722 Artificial Intelligence Planning • CMSC660 Scientific Computing I • CMSC651 Analysis of Algorithms • CMSC661 Scientific Computing II • CMSC724 Database Management • CMSC760 Advanced Linear Numerical Analysis • CMSC754 Computational Geometry

Mathematics: MA5203 Graduate Algebra I • MA5204 Graduate Algebra II • CS6209 Topics in Cryptography

---

Computer Skills

Language: *Main* (C • CUDA), *Experienced* (C++ • Matlab • Fortran • LaTeX), *Familiar* (Python • Bash script)
Tool: *Proficient* (MPI • OpenMP • OpenACC), *Familiar* (OpenGL)
Operating System: *Proficient* (Linux/Unix), *Familiar* (Windows • Mac OS)