

Curriculum Vitae

Byoung-Do (BD) Kim, Ph.D.

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Profile

- Proven track record of success in developing and leading advanced research computing and informatics programs at top-tier universities, driving significant advancements in scientific capabilities.
- Skilled in identifying strategic opportunities and providing support for a wide range of interdisciplinary scientific research projects.
- Extensive experience in the acquisition and development of High-Performance Computing systems, spearheading the establishment of advanced cyberinfrastructure in the academic environment.
- Published expert in various technology fields including computer science, bioinformatics, mechanical/industrial engineering, and HPC/Cloud computing
- Seasoned expertise in system architecture design & benchmarks, software maintenance, application performance optimization in HPC environment
- In-depth knowledge in parallel programming and performance engineering for large-scale scientific computing applications

Education

**Ph.D., School of Aeronautics and Astronautics Engineering,
Purdue University, West Lafayette, IN (2002)**

- Thesis: Study of Hydrodynamic Instability of Shear Coaxial Injector Flow in a Recessed Region
- Area of Specialization: Computational Science and Engineering (CS&E)

**M.S., School of Aeronautics and Astronautics Engineering,
Purdue University, West Lafayette, IN (1998)**

- Research Project: Nonlinear Modeling of Secondary Droplet Atomization by Using Boundary Element Method (BEM).

**B.S., Department of Aerospace Engineering,
Kon-Kuk University, Seoul, Korea (1995)**

Certifications

Group on Information Resources Leadership Institute (Feb, 2018) by AAMC (Association of American Medical Colleges)

Applied Management Principles (AMP) Program (May, 2002), Krannert School of Management, Purdue University, West Lafayette, IN

- Intensive MBA boot-camp program for scientists and engineers

Professional Experience

**Associate Chief Research Information Officer, Information Technology Services
Director, Center for Advanced Research Computing, Information Technology Services
Adjunct Professor of Data Science, Marshall School of Business,
University of Southern California, Los Angeles, CA (2019 – Present)**

- Program Operation and Management
 - Successfully rebuilt and launched a new advanced research computing program at University of Southern California (USC)
 - Responsible for program oversight and development of strategic plan for the Center for Advanced Research Computing (CARC) at USC.
 - Collaborate with the faculty-led advisory committees to improve research computing program and meet the needs of the USC researchers.
 - Support the USC research enterprise with advanced cyberinfrastructure development and expertise in advanced computing and data solution.
 - Managed external relationship for development of multi-institutional HPC-related research projects and grant proposals in collaboration with peer universities and national laboratories.
- Research Support, User Education and Outreach
 - Launched a new CARC website (<https://carc.usc.edu/>), providing comprehensive user support resources including user guide, ticketing system, system information, communication venues, etc.
 - Implemented CARC user portal, a self-service online platform for CARC project and user allocation management (<https://carc.usc.edu/user-information/user-guides/research-computing-user-portal>).
 - Developed a knowledge-based portal for the research computing user community at USC, promoting direct user engagement and community knowledge development (<https://hpc-discourse.usc.edu/categories>).
 - Developed various user education classes and various workshops with the team of computational scientists in practical programming, high-performance computing, and advanced research applications, etc. (<https://www.carc.usc.edu/education-and-resources/workshops>).
- Infrastructure Development and Operation
 - Lead HPC System and Cloud Dev/Ops Engineering teams for advanced research cyberinfrastructure operation and the acquisition of the next-generation HPC system for USC.
 - Introduced a new HPC cluster system (Discovery) with newly built application stack and new user environment, and deployed 10PB research data storage system.
 - Established new Condo Cluster Program (CCP) to provide more flexible compute resource pool to the USC research community.
 - Maintain strong partnerships with industrial vendors including Dell/EMC, Cray, Intel, AMD, NVidia, HPE, Mellanox, and others.

- Industry Partnership Program
 - In collaboration with General Counsel Office of USC and Business Development Offices at schools, established an industry partnership program at CARC
 - Working with big tech companies for innovative system design and testbeds deployment, aiming for engagement with research community
- Major Projects
 - Research data network improvement – running network throughput tests across University Park Campus, Health Science Campus, and other satellite campuses, aiming for identifying performance bottlenecks and developing solutions for improving data transfer throughput.
 - Development of a hybrid cloud system (NSF funded) - Developing hybrid cloud computing solutions utilizing OpenNebula-based HPC system for a reproducible computational research environment.
 - Computing and data solution development for CryoEM facility – collaboration with Dornsife College of Letters, Arts and Sciences at USC and Amgen. Deployed a GPU cluster system and developed a computation and data workflow management platform for CryoEM facility.
 - Secure computing platform development - Leading the development of a secure (HIPAA/CUI compliant) computing and data enclave that supports research with sensitive data.
- Coursework at Viterbi School of Engineering, USC
 - ITP 450 – High-Performance Computing in Applied Machine Learning

Founding Director of Research Computing Infrastructure, University of Virginia School of Medicine, Charlottesville, VA (2015 - 2019)

- Established the research computing program at UVA School of Medicine (SOM), developed Research IT strategic plan for UVA SOM (<https://www.rc.virginia.edu>).
- Created a cross-campus advanced cyberinfrastructure program, CADRE (Computational And Data Resources Exchange), by working with Office of VP of IT (OVPIT), University IT, Health System IT, InfoSec, UVA Compliance Office, and the university libraries in the support of academic and clinical research, as well as interdisciplinary projects between science & engineering, biomedical, and digital humanity areas.
- Supported NIH CTSA program at UVA for Informatics Core development: designing and implementing informatics infrastructure for translational and clinical research.
- Worked with OVPIT, received NSF CC* Science DMZ grant from the National Science Foundation
- Developed an online learning management platform for cross-campus user training classes and various workshops
- Initiated and coordinated multiple collaborative research projects, participated in various publications and grant proposals (<https://www.rc.virginia.edu/project>)

- Led and managed a secure (HIPAA/CUI compliant) private cloud platform (PaaS) development project that supports research with sensitive data
- Developed Hybrid Cloud Computing solutions utilizing container-based HPC system for the university
- Led HPC and storage system upgrade project in 2017 through the collaboration with the University IT and the College of Arts and Sciences

Associate Director of Research Computing, Harvard Medical School, Boston, MA (2014-2015)

- Managed a team of research computing specialists and IT contractors, supporting faculty research at Harvard Medical School in coordination with other research cores
- Worked closely with system/infrastructure teams for new cluster and storage systems deployment and software stack build and management
- Led the HPC cluster system upgrade project during HMS data center renovation in downtown Boston
- Worked with Bioinformatics Core at T.H. Chan Harvard School of Public Health in support of cross-institutional research and development of workshops for post-docs and research scientists
- Developed a user education program for biomedical computational research and data management using advanced computing environment
- Selected committee work:
 - NextGen IT Support Committee
 - Identified the gap between HMS researchers needs and current IT resources/services, proposed and implemented solutions
 - Resulted in establishing Research IT Solution team (RITS)
 - Data Management Working Group
 - Supporting research data lifecycle management with effective tools and technology
 - Coordinated data management workshops for post-docs and students

Director of HPC, Advanced Research Computing, Virginia Tech, Blacksburg, VA (10/2011 – 10/2013)

- Led the Advanced Research Computing HPC program at Virginia Tech
- Coordinated with VT's faculty advisory committee (HPC Investment Committee) for strategic planning of the research computing program
- Supported computational research projects and grant proposals in academic departments and research groups in various science and engineering domains across campus
- Planned and operated VT's program at annual supercomputing conference in coordination and collaboration with UVA
- Developed HPC & Vis educational curriculum for HPC user community at VT
- Hosted numerous multi-day HPC workshops and training camps (NVIDIA CUDA workshop, SW Carpentry, HPC boot-camp, etc.)

- Deployed a \$2M HPC cluster system, \$1.4M GPU cluster (NSF-funded), and \$0.7M Shared memory system
- Deployed a large-scale Lustre storage system and re-organized HPC file systems services
- Upgraded the HPC runtime user environment for a unified user interface and optimal management of the software stack on the cluster system

Research Associate, High Performance Computing group, Texas Advanced Computing Center (TACC), The University of Texas at Austin, Austin, TX (2007 – 2011)

- Conducted research in performance optimization and scalability of large scale, parallelized scientific applications running on world class HPC platforms
- Collaborated with University's Computer Science department to develop advanced performance optimization tool (PerfExpert) for HPC applications
- Provided technical user services including advanced application support and local HPC workshops and training
- Managed software packages on HPC systems in various domains including computational biology, mathematics, and engineering
- Restructured TeraGrid/XSEDE proposal review process across affiliated computing centers for improved quality control and process automation
- Served as an advisor for UT student team for Student Cluster Challenge at SC'10, received *Highest Linpack Award* and led the team to second place overall
- Presented at numerous national and international computer science symposia, conferences, and workshops

Lecturer, Division of Statistics and Scientific Computing, The University of Texas at Austin (Fall, 2010 – Spring, 2011)

- Introduction to Scientific & Technical Computing (SSC 335/394)

Research Programmer, Performance Engineering & Computational Methods group, National Center for Supercomputing Applications (NCSA), University of Illinois at Urbana-Champaign, Urbana, IL (2003 – 2007)

- Performed system & application benchmarks for new HPC system acquisitions
- Provided advanced technical user support for wide-ranging research disciplines
- Led multiple collaborative projects in inter-disciplinary research
 - Enterprise strategic planning simulation by applying system-of-systems optimization methods (UIUC-NCSA-Seoul Univ.)
 - Development of a Grid portal for parallel CFD modeling (NCSA-KISTI)
 - Multi-phase flow research through parallel CFD simulations (Purdue-NCSA)
- Developed and taught a semester-long lecture series at UIUC, "Introduction to Parallel Computing for Scientific Applications using MPI: for better scalability & performance", Fall 2006

Research Assistant, School of Aeronautics and Astronautics Engineering, Purdue University, West Lafayette, IN (1996 – 2002)

- Studied and conducted research on spray atomization and combustion instability in a coaxial injector of liquid rocket engines (Sponsorship: Air Force Office of Scientific Research)
- Developed 2D and 3D parallel CFD models using MPI for two-phase flow simulation and analysis for hydrodynamic instability of coaxial shear/swirl injector of liquid rocket engine combustion systems

Grants & Awards

- Co-PI, NSF 23-520 “CyberTraining Pilot: Fostering Computational Excellence (FOCEX): Addressing the Disconnect between Advanced Cyberinfrastructure and Educational Preparedness”, (PI: Carlos Alejandro Pantano-Rubino, University of Southern California), Awarded (2320943, \$300K), 2023
- Co-PI, NSF 22-582 “Campus Cyberinfrastructure (CC*): Regional Computing: Building Cyberinfrastructure to Forge a Regional Research Computing Alliance in Southern California”, (PI: Carl Kesselman, University of Southern California), Awarded (#2232917, \$1M), 2022
- Co-PI, NSF 21-528 “Campus Cyberinfrastructure (CC*): Regional: A Purpose-Built SoCal Science DMZ for Catalyzing Scientific Research Collaborations”, (PI: Carl Kesselman, University of Southern California), Awarded (#2126319, \$1M), 2021
- Co-PI, NSF 20-507 “Campus Cyberinfrastructure (CC*): Compute: A customizable, Reproducible, and Secure Cloud Infrastructure as a Service for Scientific Research in Southern California” (PI: Carl Kesselman, University of Southern California), awarded (#2019220, \$400K), 2020
- Co-PI, NSF 19-514 “Cybersecurity Innovation for Cyberinfrastructure (CICI): RDP: Automatics Security and Privacy Policy Enforcement for Mobile and IoT Research” (PI: Yuan Tian, University of Virginia), awarded (#1920462, \$925K), 2019
- Sr. Personnel, NIH PAR-18-464 Clinical and Translational Science Award (CTSA) “The Integrated Translational Health Research Institute of Virginia (iTHRIV) (PI: Karen Johnston, UVA School of Medicine), awarded (\$22M), 2018
- NSF 16-567 “Campus Cyberinfrastructure (CC*): Data Driven Networking Infrastructure for the Campus and Researcher – Scalable Secure Science DMZ for Academic and Clinical Research at The University of Virginia” (PI: Ronald Hutchins, University of Virginia), awarded (\$470K), 2016
- Sr. Personnel, NSF 15-562 “BD Hubs: Collaborative Proposal: The North East Big Data Innovation Hub” (PI: Kathleen McKeown, Columbia University), collaboration with multiple universities and organizations in North East region, awarded (\$3M), 2015
- PI, “Study on Performance Optimization and Scalability of HPC Applications”, funded by KISTI (\$100K), 2011
- Co-PI, “Deployment of Advanced Bioinformatics Infrastructure on TeraGrid HPC Systems” funded by KISTI (\$100K), 2010

- PI, “International Collaboration between NCSA and KISTI: Building Grid Application Portal for Parallel CFD Model”, TeraGrid Development Allocation Committee (DAC) Award, 2006
- Co-PI, “Numerical Modeling of Swirl Coaxial Injector”, TeraGrid Medium Resources Allocation Committee (MRAC) Award, 2005
- IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS 2011), **Best Paper Award**.

Professional Services

- Program Committee for Technical Symposium 2019, Korean Computer Scientists and Engineers Association in America (KOCSEA)
- Program Committee, Cloud Computing Session for Fall Meeting 2017, Coalition for Academic Scientific Computation (CASC)
- Advisor for the University of Texas student team for Student Cluster Challenge at SC’10, received **Highest Linpack Award** and led the team to *second place overall*

Leadership & Activities

- Director, Young Generation Program, Korean-American Scientists and Engineers Association (KSEA), 2013-2014
- Conference Chair, Korean Students Technical Leadership Conference (KSTLC), Chicago, March 2012
- Conference Chair, KSEA Virginia Regional Conference, Blacksburg, VA 2011
- Chapter President (KSEA): Austin TX chapter, Central VA chapter, Southern VA chapter

Selected Tutorials, Lectures, and Workshop Presentations

- Invited Lecture, “Advanced Computing Solutions for Biomedical Research”, 7th Annual Conference on Computational Biology & Bioinformatics, Louisiana Biomedical Research Network (LBRN), Louisiana State University, April, 2019
- Special Interest Group presentation, “Hybrid Cloud Solutions at UVA”, Cloud Computing Solution Working Group, Fall meeting of Coalition for Academic Scientific Computation (CASC), Denver, CO, 2017
- Invited Lecture, “My Other Computer is A Supercomputer”, Dept. of Computer Science, Virginia Military Institute, May, 2016
- Panel: Student Cluster Competition, SC’10, New Orleans, LA, 2010
- 2-Day Tutorial, “Applications Performance Optimization on Multi-core, Multi-socket Cluster systems”, Cluster 2009, New Orleans, LA, September, 2009
- Full-day Tutorial, “Hybrid Parallel Programming and Multi-Core Optimization on Ranger Supercomputer”, SC’08, Austin, TX, 2008.
- Full-day Tutorial, “Parallel Computing for Scientific Numerical Model using MPI”, Linux Cluster Institute Conference, Lake Tahoe, NV, 2007

- Workshop presentation, "CoaxSim Grid: Application Portal for CFD Model," SC'06: Grid Computing Environments 2006 Workshop, Tampa Bay, FL, 2006
- Lecture series, "Introduction to Parallel Computing for Scientific Applications using MPI", NCSA/UIUC educational workshop series, 2006
- Tutorial, "MPI Implementation for Better Application Scalability and Parallel Performance", TeraGrid 2006 Conference, Indianapolis, IN, 2006
- Invited Lecture, "Hydrodynamic Instability of Coaxial Shear Injectors" Dept. of Aerospace and Mechanical Engineering at Seoul National University, Seoul, Korea, September, 2003
- Invited Talk, "Two-phase Modeling of Hydrodynamic Flow Instability of Coaxial Injector" Korea Aerospace Research Institute, Taejeon, Korea, September, 2003

Selected Publications

1. Mohammed Alser, et al. "Packaging, Containerization, and Virtualization of Computational Omics Methods: Advances, Challenges, and Opportunities", *Nature Protocols*, Accepted 2023.
2. Tomasz Osinski, Mats Rynge, James Hong, Karan Vahi, Rulin Chu, Cesar Sul, Ewa Deelman, B.D. Kim, "An Automated Cryo-EM Computational Environment on the HPC System using Pegasus WMS", SC'22: Scientific Workflow Management Workshop, Dallas, TX, 2022
3. Nam Pho, Dino R.C. Magri, Fernando F. Redigolo, **B.D. Kim**, et al. "Data Transfer in a Science DMZ using SDN with Applications for Precision Medicine in Cloud and High-Performance Computing," SC'15: ESnet SDN Workshop, Austin, TX, 2015
4. J. Diamond, M. Burtscher, J. McCalpin, **B.-D. Kim**, S. Keckler, J. Brown, "Evaluation and Optimization of Multicore Performance Bottlenecks in Supercomputing Applications," IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS 2011), **Best Paper Award**.
5. Martin Burtscher, **Byoung-Do Kim**, Jeff Diamond, John McCalpin, James Browne, "PerfExpert: An Easy-to-Use Performance Diagnosis Tool for HPC Application Optimization," Proceedings of the ACM/IEEE International Conference for High Performance Computing, Networking, Storage and Analysis (SC'10), New Orleans 2010
6. Kim, H. M., Lu, S., **Kim, B.-D.** and Kim, J.-S., "Parallel, Multistage Model for Enterprise System Planning and Design," *IEEE Systems Journal*, Vol. 4, No. 1, pp. 6-14, 2010.
7. **Byoung-Do Kim**, John Cazes, " Performance and Scalability Study of Sun Constellation Cluster 'Ranger' using Application-Based Benchmarks", TeraGrid Conference, Las Vegas, NV, 2008.

8. **Byoung-Do Kim**, Seung-Do Hong, Stephen D. Heister “A Study on Scalability and Parallel Performance of a Numerical Model on TeraGrid,” TeraGrid 2006 Conference, Indianapolis, IN, 2006
9. **Byoung-Do Kim**, Nam-gyu Kim, Jung-hyun Cho, “CoaxSim Grid: building an application portal for a CFD model,” SC’06: Grid Computing Environments 2006 Workshop, Tampa Bay, FL, 2006
10. **Byoung-Do Kim**, Stephen D. Heister, Steven H. Collicott “Three-Dimensional Flow Simulations in the Recessed Region of a Coaxial Injector,” *Journal of Propulsion and Power*, Vol. 21, No. 4, pp. 728-742, 2005
11. **Byoung-Do Kim**, Stephen D. Heister “Two-phase Modeling of Hydrodynamics Instabilities in Coaxial Injectors,” *Journal of Propulsion and Power*, Vol. 20, No. 3, pp. 468-479, 2004
12. **Byoung-Do Kim**, Stephen D. Heister, “Two-phase Modeling and Hydrodynamic Instability Study on Shear Coaxial Flow,” 38th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, Indianapolis, IN, 2002

References

Will be provided upon request