



Announcing the Induction of

Dr. David Bader

Into the  Innovation Hall of Fame

November 9, 2022

A. JAMES CLARK SCHOOL OF ENGINEERING
UNIVERSITY OF MARYLAND, COLLEGE PARK

David A. Bader (Ph.D. '96, electrical and computer engineering) is a distinguished professor, founder of the Department of Data Science, and inaugural director of the Institute for Data Science at New Jersey Institute of Technology. He previously served as founding professor and chair of the School of Computational Science and Engineering, College of Computing, at the Georgia Institute of Technology.

Bader is a leading expert in solving global grand challenges in science, engineering, computing, and data science. His interests are at the intersection of high-performance computing and real-world applications, including cybersecurity, massive-scale analytics, and computational genomics.

Before the early 2000s, only elite technical organizations and governments used high-performance computing due to the cost of systems that required proprietary processor architectures, software, and programmers. Bader designed the first high-performance supercomputer based on commodity parts, reducing expenses by an order of magnitude. From a prototype he built in 1998 using commodity off-the-shelf parts and a high-speed low-latency interconnection network, Bader led the design of the first Linux Supercomputer RoadRunner for open use by the national science and engineering community via the National Science Foundation's (NSF) National Technology Grid. His computer was first used in April 1999.

Bader then led the technical design team of the NSF Alliance's LosLobos system, the first-ever Linux production system built by IBM. IBM turned Bader's design into the industry's first pre-assembled and configured Linux server clusters for business. By 2018, all of the top 500 supercomputers in the world traced back to Bader's technical contributions and leadership. Further, Bader and his team pioneered the general-purpose use of accelerators such as

the IBM Cell Broadband Engine Processor and the NVIDIA Graphics Processing Unit (GPU). In 2022, Hyperion Research's HPC Qview tracking of servers and the broader HPC ecosystem estimated the total economic value of Linux supercomputing pioneered by Bader over the 25 years prior to be more than \$100 trillion.

Bader is also widely known for his long-standing research efforts on novel parallel graph algorithms that use high-performance implementations. He has produced multiple firsts, including the evaluation of parallel single-source shortest path algorithms on large and real-world graphs, scalable parallel betweenness centrality calculation, scalable parallel community detection algorithm (winner of the 10th Center for Discrete Mathematics and Theoretical Computer Science Implementation Challenge), streaming community maintenance algorithm, and many of the best-performing graph algorithms for GPUs. He has applied streaming graph analysis to detect insider threats in real

corporate networks. The STINGER streaming graph package (winner of the Institute of Electrical and Electronics Engineers' [IEEE] HPEC Best Paper) is the first of its kind.

Bader is a Fellow of IEEE, the Association of Computing Machinery, the Society for Industrial and Applied Mathematics, and the American Association for the Advancement of Science. He is a recipient of the IEEE Sidney Fernbach Award. He has served as a lead scientist in several DARPA programs including High Productivity Computing Systems with IBM, Ubiquitous High Performance Computing with NVIDIA, Anomaly Detection at Multiple Scales, Power Efficiency Revolution For Embedded Computing Technologies, Hierarchical Identify Verify Exploit, and Software-Defined Hardware. Bader directed the Sony-Toshiba-IBM Center of Competence for the Cell B.E. Processor, the chip used in the Sony PlayStation 3 and, with his co-designed software, accelerated the world's first supercomputer to break the petaflops barrier. He also directed an NVIDIA GPU Center of Excellence.

