

Ana Gainaru

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RESEARCH INTEREST High Performance Computing, Big Data, Performance modeling, Data Analytics, Large-scale workflows, Storage Systems, Performance optimizations, HCP/AI workflows

PROFESSIONAL EXPERIENCE **Computer Scientist** **Sep 2020 - present**
Oak Ridge National Laboratory, CSMD

Develop techniques for profiling, managing, and analyzing large-scale data from simulations and experiments. Focus on data streaming and campaign management designed for large workflows coupling AI digital twins and analysis with traditional HPC high fidelity simulations and experiments.

Research Assistant Professor **Jul 2017 - Aug 2020**
Vanderbilt University, Electrical Engineering and Computer Science Department

Performance analysis and optimization for large sparse structures and algorithms driven by big-data simulations. Developing resource scheduling, fault tolerance and performance scaling techniques for large scale HPC applications. Working with the neuroscience department on understanding their needs and designing methods and tools to facilitate their deployment on HPC.

HPC Architect **Oct 2015 - Jun 2017**
Mellanox Technologies Inc

Designed and optimized Mellanox' internal collective communication library for extreme-scale systems. Implemented a small data all-to-all algorithm using different data layout patterns at intermediate steps by selectively replacing the CPU based buffer packing and unpacking with Mellanox's InfiniBand support for Host Channel Adapter (HCA) hardware scatter/gather.

Research Assistanship at NCSA **Aug 2011 - May 2015**
National Center for Supercomputing Applications, Integrated Systems Console (ISC)

Worked done in the context of the NCSA/UIUC/INRIA Joint Lab for Petascale Computing and the Blue Waters project. Designed and implemented parts of the fault tolerance framework used by the Blue Waters system. Developed methods for studying "big data" system logs from different production HPC systems and investigated the best way to model failure distribution and characteristics for several hardware failures.

EDUCATION **University of Illinois at Urbana-Champaign, IL, USA** **Aug 2011 - Aug 2015**
PhD in Computer Science

Advisor: Marc Snir

Thesis: Failure avoidance techniques for HPC systems based on failure prediction (Link: <https://www.ideals.illinois.edu/items/89296>)

University Politehnica of Bucharest, Romania **Oct 2008 - Jul 2010**
Master of Science in Computer Science

Ranked 1st in my year.

University Politehnica of Bucharest, Romania **Oct 2003 - Jul 2008**
Bachelor of Science in Computer Science

Performance Scholarship 6 semesters out of 10

PUBLICATIONS For a complete list of publications, visit my dblp page (<https://dblp.org/pers/hd/g/Gainaru:Ana>). The following list reflects the most recent and/or most relevant publications:

1. Frédéric Suter, Rafael Ferreira da Silva, [Ana Gainaru](#), Scott Klasky. *Driving Next-Generation Workflows from the Data Plane* [e-Science 2023: 1-10]
2. Eric Suchyta, Jong Youl Choi, Seung-Hoe Ku, David Pugmire, [Ana Gainaru](#), Kevin A. Huck, Ralph Kube, Aaron Scheinberg, Frédéric Suter, Choong-Seock Chang, Todd S. Munson, Norbert Podhorszki, Scott Klasky. *Hybrid Analysis of Fusion Data for Online Understanding of Complex Science on Extreme Scale Computers* [CLUSTER 2022: 218-229]
3. [Ana Gainaru](#), Lipeng Wan, Ruonan Wang, Eric Suchyta, Jieyang Chen, Norbert Podhorszki, James Kress, David Pugmire, Scott Klasky: *Understanding the Impact of Data Staging for Coupled Scientific Workflows*. [Parallel Distributed Syst. 33(10): 4134-4147 (2022)]
4. [Ana Gainaru](#), Brice Goglin, Valentin Honoré, Guillaume Pallez. *Profiles of Upcoming HPC Applications and Their Impact on Reservation Strategies* [IEEE Trans. Parallel Distributed Syst. 32(5): 1178-1190, 2021]
5. Hongyang Sun, [Ana Gainaru](#), Manu Shantharam and Padma Raghavan. *Selective Protection for Sparse Iterative Solvers to Reduce the Resilience Overhead* [IEEE 32nd International Symposium on Computer Architecture and High Performance Computing (SBAC-PAD), 2020]
6. [Ana Gainaru](#), Guillaume Pallez, Hongyang Sun, Padma Raghavan. *Speculative Scheduling for Stochastic HPC Applications* [ICPP 2019]
7. Guillaume Aupy, [Ana Gainaru](#), Valentin Honoré, Padma Raghavan, Yves Robert, Hongyang Sun *Reservation Strategies for Stochastic Jobs* [IPDPS 2019]
8. Richard Graham, [Ana Gainaru](#), Artem Polyaiov and Gilad Shainer *Using InfiniBand Hardware Gather-Scatter Capabilities to Optimize MPI All-to-All* [EuroMPI 2016]
9. [Ana Gainaru](#) , Franck Cappello, Marc Snir, William Kramer *Fault prediction under the microscope: A closer look into HPC systems* [SC 2012]

PANEL

Challenges to scale model training on HPC systems [Workshop on Advancing Neural Network Training (WANT) at NeurIPS, 2023] Panelists: [Ana Gainaru](#), Lionel Eyraud-Dubois, Tunji Ruwase, Natalia Vassilieva, Mohammad Shoeybi, Jean Kossaifi

Panel on Unspoken Challenges [The 16th Scheduling for Large Scale Systems workshop, 2023] Panelists: George Bosilica, Franck Cappello, [Ana Gainaru](#), Al Geist, Yves Roberts

Data staging and coordination strategies for coupled simulation workflows [ECP 2021]

Moderator: Ana Gainaru,

Panelists: Hank Childs, Dave Pugmire, Greg Eisenhauer, Scott Klasky, Bogdan Nicolae, Pradeep Subedi, Stephane Ethier

Fault Tolerance/Resilience at Petascale/Exascale: Is it Really Critical? Are Solutions Necessarily Disruptive? [SC 2013]

Moderator: Franck Cappello,

Panelists: Marc Snir, Bronis De Supinski, Al Geist, John Daly, [Ana Gainaru](#) , Satoshi Matsuoka

INVITED TALKS

Benchmarking Large Language Models on Large Scale Systems [Blueprinting AI for Science Project STFC UKRI, 2024]

A data-centric view on workflows that couple HPC with large-scale models. [Workshop on Advancing Neural Network Training (WANT) at NeurIPS, 2023]

I/O patterns in AI workflows and their impact on the performance of HPC simulations [Dagstuhl Seminar: Integrating HPC, AI, and Workflows for Scientific Data Analysis, 2023]

How to efficiently abuse your HPC system in the age of AI workflows [Seminar Series, Science and Technology Facilities Council (STFC), 2023]

Scheduling the I/O of AI applications with a focus on medical imaging [The 16th Scheduling for Large Scale Systems workshop, 2023]

PATENTS

Richard Graham, Ana Gainaru

Using Hardware Gather-Scatter Capabilities to Optimize MPI All-to-All

U.S. Patent No. 15/681, 390, 20 August 2017

BOOK CHAPTER *Fault-Tolerance Techniques for High-Performance Computing* [Springer Book, Computer Communications and Networks series, 2015], Editors: Thomas Herault and Yves Robert
Chapter 1: Fault and failures (including: source detection, root cause analysis, silent errors, predictors), Authors: Ana Gainaru and Franck Cappello

PROFESSIONAL
AND COMMUNITY

- NSF Panel review member, 2019/2020/2021; ASCR Panel Review member 2021/2022/2023
- Organizer for the 9th International Workshop on Data Analysis and Reduction for Big Scientific Data (at SC22/23)
- Organizer for the Convergence Computing Infrastructure Workshop (CCIW), 2019/2020
- Journal editorial board:
 - IEEE Transactions on Parallel and Distributed Systems (TPDS), part of the Review Board for an 18 month term since February 2020
 - Journal of Parallel and Distributed Computing (JPDC) as as a subject area editor (AE) since August 2019
 - International Journal for High Performance Computing Applications (IJHPCA), since January 2019
- Vice chair or Co-chair:
 - Vice chair for the Tutorials SC 2020 Committee, Poster SC 2018 Committee, HPC Asia 2023
 - Co-chair for the CCGrid 2024 for Track 2: Software Systems and Platforms, FTS 2017 Workshop on Fault Tolerant Systems in conjunction with CCGRID 2017
- Member of the Program Committee for over 30 conferences and reviewer for 6 international journals.