Ana Gainaru

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RESEARCH INTEREST	High Performance Computing, Big Data, Parallel Computing, Distributed Systems, Performance modeling, Data Analytics, Storage Systems, Performance optimizations
TEACHING INTEREST	Distributed Systems, Data Analytics, Parallel Computing, Signal Analysis for HPC, Big Data, High Performance Computing

EDUCATION

University of Illinois at Urbana-Champaign, IL, USA   **Aug 2011 - Aug 2015**
PhD in Computer Science
Advisor: Marc Snir

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

PROFESSIONAL EXPERIENCE

Research Assistant Professor   **Jul 2017 - present**
Vanderbilt University, Electrical Engineering and Computer Science Department
Performance analysis and optimization for large sparse structures and algorithms driven by big-data applications and simulations. Developing resource scheduling, fault tolerance and performance scaling techniques for large scale HPC applications.

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 Mellanoxs 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. 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 involving processors, memory, storage and network components.

AWARDS, HONORS AND COMPETITIONS

- 2015 AfterCollege Engineering Student Scholarship recipient, April 2015
- Special Prize for Excellence, Gala of Romanian Students Abroad (LSRS), judged by the Romanian Academy (the most important scientific and cultural forum in Romania), awarded for my entire PhD work, 2015
- 2014 Student of the Year Award, NCSA Employee Recognition Award, 2014
- First place at the Intel Parallel Universe Computing Challenge, 2014
- 2013 Technical Achievement Award, NCSA Employee Recognition Award, 2013

- CS Excellence Fellowship (Saburo Muroga Endowed Fellowship) granted by the University of Illinois at Urbana-Champaign, 2011-2012

- Grad Cohort for Women in Computing Research Association (CRAW) Travel Grant, 2011

- SC Travel Support Grant Scholarship, 2010

- Excellence Title for the Master Program, granted by Automatic Control and Computers Faculty, University Politehnica of Bucharest, graduated first of my class, 2010

- Third prize at the Students Scientific Conference from the University Politehnica of Bucharest for my undergrad thesis: "Mobility Model based on Social Networks for VANETs", 2008.

- Oracle diploma received for my results on Database and Database Design courses studied in Automatic Control and Computer Science Faculty, top 10%, 2007

PUBLICATIONS   For a complete list of publications (18 conference papers and 5 journal papers) visit my dblp page. The following lists the most recent and most relevant publications:

1. <u>Ana Gainaru</u>, Brice Goglin, Valentin Honor, Guillaume Pallez, Padma Raghavan, Yves Robert, Hongyang Sun. *Reservation and Checkpointing Strategies for Stochastic Jobs* [IPDPS 2020]

2. <u>Ana Gainaru</u>, Guillaume Pallez, Hongyang Sun, Padma Raghavan. *Speculative Scheduling for Stochastic HPC Applications* [ICPP 2019]

3. <u>Ana Gainaru</u>, Guillaume Pallez. *Making Speculative Scheduling Robust to Incomplete Data* [SCALA@SC 2019]

4. Guillaume Aupy, <u>Ana Gainaru</u>, Valentin Le Fevrez. *I/O scheduling strategy for periodic applications* [ACM Transactions on Parallel Computing 2019]

5. Guillaume Aupy, <u>Ana Gainaru</u>, Valentin Honor, Padma Raghavan, Yves Robert, Hongyang Sun *Reservation Strategies for Stochastic Jobs* [IPDPS 2019]

6. Richard Graham, <u>Ana Gainaru</u>, Artem Polyaiov and Gilad Shainer *Using InfiniBand Hardware Gather-Scatter Capabilities to Optimize MPI All-to-All* [EuroMPI 2016]

7. Leonardo Bautista Gomez, <u>Ana Gainaru</u>, Swann Perarnau, Franck Cappello, Marc Snir, William Kramer *Reducing Waste in Large Scale Systems through Introspective Analysis* [IPDPS 2016]

8. <u>Ana Gainaru</u>, Guillaume Aupy, Anne Benoit, Franck Cappello, Yves Robert, Marc Snir *Scheduling the I/O of HPC applications under congestion* [IPDPS 2015]

9. <u>Ana Gainaru</u> , Franck Cappello, Marc Snir, William Kramer *Fault prediction under the microscope: A closer look into HPC systems* [SC 2012]

10. Eric Heien, Derrick Kondo, <u>Ana Gainaru</u> , Dan LaPine, Bill Kramer, Franck Cappello *Modeling and Tolerating Heterogeneous Failures in Large Parallel Systems* [SC 2011]

PANEL   *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, <u>Ana Gainaru</u> , Satoshi Matsuoka

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: <u>Ana Gainaru</u> and Franck Cappello

PROFESSIONAL AND COMMUNITY	• NSF Panel review member, 2019
	• Organizer for the Convergence Computing Infrastructure Workshop (CCIW), 2019/2020
	• Journal editorial board:
	– International Journal for High Performance Computing Applications (IJHPCA), since January 2019
	– Journal of Parallel and Distributed Computing (JPDC) as as a subject area editor (AE) since August 2019
	• Vice chair or Co-chair:
	– Vice chair for the Tutorials SC 2020 Committee
	– Vice chair for the Poster SC 2018 Committee
	– Co-chair for the FTS 2017 Workshop on Fault Tolerant Systems in conjunction with CCGRID 2017
	• Member of the Program Committee for:
	– HPDC 2020, the International Symposium on High-Performance Parallel and Distributed Computing
	– SC 2019/2018/2017/2016, the International Conference for High Performance Computing, Networking, Storage and Analysis, technical papers program committee for the Algorithms area
	– ICPP 2019, the International Conference on Parallel Processing
	– IPDPS 2019/2018/2014, the IEEE International Parallel and Distributed Processing Symposium, technical program committee for the System software track
	– ICS 2017, External Review Committee for the ACM International Conference on Supercomputing
	– CCGRID 2016, the 16th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing
	– EuroMPI 2017, 2016, the MPI users and developers conference
	• Reviewer for the following international journals: IJHPCA since June 2014, TPDS since October 2015, FGCS since November 2015, JPDC since January 2016, PARCO since March 2017, SUSCOM since June 2017

TEACHING EXPERIENCE	**Course instructor**	**Spring 2019, Vanderbilt**
	Course: SC 3260 / SC 5260 High Performance Computing	
	Invited lecture on MPI	**Fall 2019, Vanderbilt**
	Course: CS 6320 Algorithms for parallel computing	
	Teaching assistant	**Fall 2014, UIUC**
	Course: CS 425 Distributed systems	
	Invited instructor	**Spring 2011, UIUC**
	Course: CS 498 Hot Topic in High Performance Computing: *Networks and Fault Tolerance*	
	Teaching assistant	**Spring 2008 - Fall 2009, UPB**
	Courses: Architecture of Computing Systems (400 level course), *Parallel Processing Architecture (500 level course)* *and The Utilization of Operating Systems (100 level course)*	

PATENTS	Richard Graham, Ana Gainaru
	Using Hardware Gather-Scatter Capabilities to Optimize MPI All-to-All [U.S. Provisional Application No. 62/377,616, filed 21 August 2016]

All my software is available on my github account (user anagainaru).

HPCWalltime
A tool for generating the sequence of walltime requests an application needs to use for submission on an HPC system (optimal sequence based on a historic log of execution times for an application on a given system configuration).

ScheduleFlow
A python package consisting of series of scripts and classes that offer an API allowing users to create simulation scenarios for online and reservation-based batch schedulers for large-scale computational systems.

HELO (Hierarchical Event Log Organizer)
A tool for extracting event templates from large datasets and updating them as new events get generated. HELO presents an intuitive output to system administrators. It is currently integrated in the Blue Water software stack.