Ana Gainaru

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Office 218, 200 Prosperity Dr, Knoxville, TN

Research Interest Parallel Computing, High Performance Computing, Distributed Systems, Signal Analysis, Performance modeling, Data Analytics, Storage Systems

Teaching Interest Distributed Systems, Data Analytics, Parallel Computing, Signal Analysis for Data Mining, Big Data

Education

University of Illinois at Urbana-Champaign, IL, USA — **Aug 2011 - Aug 2015**
PhD Candidate 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

Work Experience

HPC Architect — **Oct 2015 - present**
Mellanox Technologies

Research Assistanship at NCSA — **Aug 2011 - May 2015**
National Center for Supercomputing Applications
Member of the Integrated Systems Console (ISC) team,
part of the Blue Waters project

Collaboration internship ENS Lyon — **Oct 2013 - Nov 2013**
Ecole normale superieure, Lyon, France

Summer Intern at ANL — **May 2013 - Aug 2013**
Argonne National Laboratory, IL, USA

Summer Intern at Tokyo Tech — **Jun 2012 - Sep 2012**
Tokyo Institute of Technology, Tokyo, Japan

Visiting scholar at NCSA/UIUC — **Jan 2010 - Aug 2011**
NCSA/UIUC/INRIA Joint Lab for Petascale Computing, IL, USA

Publications

Leonardo Bautista Gomez, Ana Gainaru, Swann Perarnau, Franck Cappello, Marc Snir, William Kramer
Reducing Waste in Large Scale Systems through Introspective Analysis [Accepted at IPDPS 2016]

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

Ana Gainaru, Franck Cappello, Marc Snir, William Kramer
Failure prediction for HPC systems and applications: current situation and open issues [IJHPC, Volume 27 Issue 3 Pages 272 281, August 2013]

Mohamed Slim Bouguerra, Ana Gainaru , Franck Cappello, Leonardo Bautista Gomez, Naoya Maruyama, Satoshi Matsuoka
Improving the computing efficiency of HPC systems using a combination of proactive and preventive checkpointing [IPDPS 2013]

Franck Cappello, Ana Gainaru
Resilience through failure avoidance: New detectors of failure precursors and improved prediction workflow [Position paper Operating Systems and Runtime Software for Exascale Systems, 2012]

Ana Gainaru , Franck Cappello, Marc Snir, William Kramer
Fault prediction under the microscope: A closer look into HPC systems [SC 2012]

Ana Gainaru , Franck Cappello, William Kramer
Taming of the Shrew: Modeling the Normal and Faulty Behavior of Large-Scale HPC Systems [IPDPS 2012]

Joshi Fullop, Ana Gainaru, Joel Plutchak
Real Time Analysis and Event Prediction Engine [Cray User Group 2012]

Ana Gainaru , Franck Cappello, Joshi Fullop, Stefan Trausan-Matu, William Kramer
Adaptive Event Prediction Strategy with Dynamic Time Window for Large-Scale HPC Systems [SLAML 2011]

Eric Heien, Derrick Kondo, Ana Gainaru , Dan LaPine, Bill Kramer, Franck Cappello
Modeling and Tolerating Heterogeneous Failures in Large Parallel Systems [SC 2011]

Ana Gainaru , Franck Cappello, Stefan Trausan-Matu, Bill Kramer
Event log mining tool for large scale HPC systems [EuroPar 2011]

Ana Gainaru , Emil Slusanschi
Framework for mapping data mining applications on GPUs [ISPDC 2011]

Ana Gainaru , Emil Slusanchi, Stefan Trausan-Matu
Mapping Data Mining Algorithms on a GPU Architecture: A Study [ISMIS 2011]

Ana Gainaru , Ciprian Dobre and Valentin Cristea
A Realistic Mobility Model Based on Social Networks for the Simulation of VANETs [VTC 2009 Spring]

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, Ana Gainaru , 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: Franck Cappello and Ana Gainaru

Awards, Honors and Competitions

- 2015 AfterCollege Engineering Student Scholarship recipient, April 2015
- 2014 Student of the Year Award, NCSA Employee Recognition Award, 2014
- 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
- 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

Teaching experience

Teaching assistant at UIUC **Aug 2014 - Dec 2014**
Course: CS 425 Distributed systems

Instructor for CS498 UIUC **Jan 2011 - May 2011**
Course: CS 498 Hot Topic in High Performance Computing: Networks and Fault Tolerance

Teaching assistant at UPB **Feb 2008 - Jul 2009**
Courses: Architecture of Computing Systems (400 level course), Parallel Processing Architecture (500 level course) and The Utilization of Operating Systems (100 level course)

Professional and Community

- Graduate Student representatives for the UIUC FAA (Fellowships, Assistantships, and Admission) Committee, "Architecture, Compilers, and Parallel Programming" group - application reviewer assisting with the 2015 admission cycle
- Member of the NCSA Colloquium Committee, 2014 - 2015
- Serving on the Academic Integrity Appeals Committee, UIUC, 2012 - 2013
- Serving on the Engineering Graduate Student Advisory Committee, UIUC, 2011 - 2012
- Member of the Program Committee for:
  - Class A conferences:
    - SC 2016, the 28th International Conference for High Performance Computing, Networking, Storage and Analysis
    - CCGRID 2016, the 16th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing
    - IPDPS 2014, the 28th IEEE International Parallel and Distributed Processing Symposium
  - FTXS 2015, 2014, 2013, 2012 The Workshop on Fault Tolerance for HPC at Extreme Scale
  - HPCe 2011 High Performance Computing with application in environment @ SYNASC 2011
- Reviewer for the following international journals:
  - International Journal High Performance Computing IJHPCA since June 2014
  - Future Generation Computer Systems Journal FGCS since November 2015
  - International Journal "Transactions on Parallel and Distributed Systems" TPDS since October 2015

Open Source Projects and Research

Fault tolerance framework for the Blue Waters systems
On-going project, Integrated System Console at NCSA
I work on designing and implementing parts of the fault tolerance framework used by the Blue Waters system. The main focus of this project is fault detection, diagnosis and prediction by characterizing the state of the system at each moment of interest.

Study the applications I/O interference on HPC systems
On-going collaboration with ENS Lyon
The project focuses on analyzing the congestion experienced by multiple IO intensive applications running concurrently and sharing resources in a cluster. The main goal is to design different I/O scheduling policies that mitigate/decrease this effect. Experiments are being done on Vesta, the development platform for Argonne's Mira supercomputer.

Correlating I/O performance degradation and GPFS failures
On-going collaboration with ANL
I work on the Mira and Intrepid systems, analyzing their failures and the correlation between different FS failure types and performance degradation at the system and application level. The project was extended to include the analysis of the Lustre FS used by the Blue Waters system.

Hybrid proactive/preventive checkpointing protocol
Summer internship in the fault tolerance team of Tsubame 2.0, Tokyo Institute of Technology
I worked with the developer of FTI (Fault Tolerance Interface) and implemented the first hybrid fault tolerance solution that combines a proactive with a preventive checkpoint strategy for dealing with failures in Petascale systems. Experiments were done with the Gadget-2 application.

Modeling the behavior of failures in HPC systems
UIUC/INRIA Joint Laboratory for Petascale Computing
This project focuses on the study of system logs from different production HPC systems and investigates the best way to model failure distribution and characteristics for several hardware failures involving processors, memory, storage and network components, with the purpose of designing different fault tolerance protocols depending on the resources used by an application.

Mapping data mining algorithms on GPU architectures
Politehnica University of Bucharest, Master thesis
My master thesis focused on analyzing how different data mining algorithms can be efficiently mapped on a GPU architecture and on offering a general methodology for parallelizing all types of data mining applications on hybrid architectures.

Software

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. In the process of being included in SyslogNG.

ELSA (Event Log Signal Analyzer)
A set of algorithms that combine signal analysis with data mining for characterizing the behavior of events generated by HPC systems. In the process of being integrated in the Blue Waters system. ELSA was integrated into FTI (currently used by Argonne) to form a hybrid checkpointing solution for HPC.