Curriculam Vitae

Summary

- Currently a PostDoc at Lawrence Berkeley. Working on "Application Readiness for Exascale Architectures"" as a NESAP PostDoc in the NERSC department.
- Previously worked on the Moose project, a simulation model of neural connections in human brain.
    - It is a multiscale problem which provides an opportunity for both distributed and thread-based parallelism.
- Experience in the areas of compiler and runtime development for parallel programming models.
    - Introduced new compiler directives and the necessary runtime support in the StarSs framework to handle synchronization of multiple threads.
- Knowledge and experience in the area of Transactional Memory framework.
    - Worked extensively with the TinySTM library.
- Experience in sequential and parallel algorithm development.
    - Designed and implemented a Breadth First Search (BFS) algorithm that takes advantage of low memory on IBM's Cell B/E. processor.
    - Parallelized Graph500 benchmarks, SPECFEM3D, linear iterative solvers on an SMP machine using the StarSs programming model.
- Worked with Pthreads, OpenMP, OMPSs and MPI programming models.
- Experience in collaborating with other researchers and engineers to achieve the set goals.
- Experience in exploiting the underlying processor arhitecture to enchance the application performance.
- Familiarity with tools like valgrind profiler, gdb, google performance tools, latex software.
- Basic knowledge of GPU, Cuda Programming and Intel Xeon Phi.

Education

1. **Doctor of Philosophy (PhD) in Computer Science** (2015)
   Barcelona Supercomputing Center
   Thesis Title - "Increasing Parallelism through Speculation in Task-Based Programming Model."

2. **Master of Technology** (2009)
   Specialization in Computer Science, Sri Sathya Sai University (SSSU)

3. **Master of Science** (2007)
   Specialization in Computer Science, SSSU

4. **Bachelor of Science** (2005)
   Specialization in Mathematics, SSSU

Programming Languages and Models	Languages:	C,C++ , python
	Scripting:	Shell, LaTeX, Sed, awk, gnuplot
	Programming Models:	StarSs, OpenMP, Pthreads, MPI, STM
	Profiling Tools:	gdb, valgrind, google-performance tools

Publications

1. *Rahulkumar Gayatri, Rosa M. Badia, Eduard Ayguade* "Loop level speculation in a task based programming model."

2. *Rahulkumar Gayatri, Rosa M. Badia, Eduard Ayguade* "Transactional access to shared memory in StarSs, a task based programming model."

3. *Rahulkumar Gayatri, Rosa M. Badia, Eduard Ayguade* "Analysis of the overheads incurred due to speculation in a task based programming model."

4. *Roberto Giorgi et al.* "TERAFLUX: Harnessing dataflow in next generation teradevices."

5. *Rahulkumar Gayatri, Rosa M. Badia, Eduard Ayguade* "Presented a Poster on the benefits of using CellSs (a programming model for Cell Processor) in the ACACES 2010 summer school of HiPEAC."

6. *Rahulkumar Gayatri,Pallav Baruah* "Parallelizing Breadth First Search Using Cell BE, HiPC, Student Symposium, 2008"

Previous Projects

1. **MOOSE** - The software simulates the neural systems ranging from subcellular components and biochemical reactions to models of single neurons. The simulation environment uses various ODE system solvers to understand the chemical and electrical interactions inside a cell. It is developed by National Center for Biological Sciences (NCBS), India. In this project my role was to parallelize the ODE solvers that simulate the behavior of a cell over multiple timesteps. I successfully implemented an OpenMP based parallelization for the kinetic and stochastic solvers in the simulation. That included solving a system of linear equations that use the Runge-Kutta method of order 5. The solvers were used in simulating the effect of a chemical impulse input to a given cell. Kinetic solver achieved a 5.3X speedup with 8 threads whereas the stochastic solver gained a 6.8X speedup.

2. **Doctoral Thesis** - Focused in the area of parallel programming models, specifically on providing compiler and runtime support for synchronization of multiple threads in StarSs. The synchronization was achieved using TinySTM, a Software Transactional Memory Library (STM). This approach along with improving the performance and the efficiency also offers an opportunity to exploit higher degree of parallelism from an application. Papers published in this project: [1],[2] and [3].

3. **StarSs** - A task-based programming model to make parallel programming easier. It consists of compiler directives and the required runtime support. My contribution to the project was to maintain the runtime framework and resolve conflicts when new directives and their required implementation were introduced. I also worked on design and implementation of parallel applications using the framework for the application repository.

4. **Teraflux** - It was a project supported and funded by European Union which focused on exploiting dataflow parallelism in a Teracomputing device. My contribution to the project was to introduce STM-based concurrency to handle simultaneous access to shared memory. Papers published in this project: paper [4].

5. **MTech Thesis** - An efficient Breadth First Search (BFS) implementation that exploits memory locality in the IBM's Cell.B.E architecture. Poster[5] presented the results achieved in this project.

Professional Career

1. Currently NESAP Post-doc at NERSC department, Lawrence Berkeley Lab.
2. Technical Specialist, High Performance Computing (HPC), Wipro Infotech August, 2015 - September 2016
3. Doctoral student at Barcelona Supercomputing Center - September, 2009 - March, 2015

Honors

Received a Pre-Doctoral scholarship, FI AGAUR grant, by Generalitat de Catalunya