
SAYAN GHOSH

Richland, WA, USA

sayanghosh5@acm.org \diamond <https://sg0.github.io>

EDUCATION

- **2015 - 2019**

PhD, Computer Science,

Washington State University, School of EECS, Pullman, WA.

Adviser: Dr. Assefaw Gebremedhin

Thesis title: *Supporting Efficient Graph Analytics and Scientific Computation using Asynchronous Distributed-Memory Programming Models*

PhD program committee members: Drs. Assefaw Gebremedhin (WSU), Carl Hauser (WSU), Ananth Kalyanaraman (WSU), Pavan Balaji (ANL) and Mahantesh Halappanavar (PNNL).

- **2012 - 2014**

PhD studies, Computer Science,

University of Houston

Adviser: Dr. Barbara Chapman

- **2010 - 2012**

Master of Science (Thesis), Computer Science,

University of Houston, Houston, TX.

Graduated: August 2012

Thesis title: *Energy Efficiency of Parallel Scientific Kernels*

Adviser: Dr. Barbara Chapman

- **2002 - 2006**

Bachelor of Technology, Information Technology

Asansol Engineering College, Asansol, India.

Graduated: July 2006

EXPERIENCES

Pacific Northwest National Laboratory, Richland, WA

Aug 2019-Present

Computer Scientist

- *Focus:* Graph analytics, One-sided communication models, Combinatorial algorithms, Performance Productivity Models.

Washington State University, Pullman, WA

Jan 2015-May 2019

Graduate Research Assistant

Advisor: Dr. Assefaw Gebremedhin

- *Focus:* Graph analytics, One-sided communication models, Combinatorial algorithms.

University of Houston, Houston, TX

Jan 2011-Dec 2014

Graduate Research Assistant

Advisor: Dr. Barbara Chapman

- *Focus:* Power/energy analysis of scientific kernels, Application parallelization using compiler directives, One-sided communication models.

University of Texas Health Science Center, Houston, TX

Jan-Dec 2010

Graduate Research Assistant

Advisor: Dr. Stefan Birmanns

- *Focus:* Application parallelization using compiler directives.

Thomson Reuters, Bangalore, India

Jul 2008-Dec 2009

Software Engineer

- *Focus:* Database programming and development.

Keane, Inc., Bangalore, India

Jul 2006-Jul 2008

Software Engineer

- *Focus:* Database management, ETL.

- [Journal] **Sayan Ghosh**, Terrence Liao, Henri Calandra and Barbara Chapman. *Performance of CPU/GPU compiler directives on ISO/TTI kernels*. Computing Journal, Springer Vienna (2013).
- **Conferences**
 - **Sayan Ghosh**, Yanfei Guo, Pavan Balaji, Assefaw Gebremedhin. *RMACXX: An Efficient High-Level C++ Interface over MPI-3 RMA*. 21st IEEE/ACM International Symposium on Cluster, Cloud and Internet Computing (CCGrid 2021).
 - **Sayan Ghosh**, Mahantesh Halappanavar. *TriC: Distributed-memory Triangle Counting by Exploiting the Graph Structure*. 24th IEEE High Performance Extreme Computing Conference (HPEC 2020). (*Graph Challenge Champion Award*)
 - **Sayan Ghosh**, Mahantesh Halappanavar, Antonino Tumeo, Ananth Kalyanaraman. *Scaling and Quality of Modularity Optimization Methods for Graph Clustering*. 23rd IEEE High Performance Extreme Computing Conference (HPEC 2019). (*Graph Challenge Innovation Award*)
 - **Sayan Ghosh**, Mahantesh Halappanavar, Ananth Kalyanaraman, Arif Khan, Assefaw Gebremedhin. *Exploring MPI Communication Models for Graph Applications Using Graph Matching as a Case Study*. 33rd IEEE International Parallel and Distributed Processing Symposium (IPDPS 2019).
 - **Sayan Ghosh**, Mahantesh Halappanavar, Antonino Tumeo, Ananth Kalyanaraman, Assefaw Gebremedhin. *Scalable Distributed Memory Community Detection Using Vite*. 22nd IEEE High Performance Extreme Computing Conference (HPEC 2018). (*Graph Challenge Student Innovation Award*)
 - **Sayan Ghosh**, Mahantesh Halappanavar, Antonino Tumeo, Ananth Kalyanaraman, Hao Lu, Daniel Chavarrià-Miranda, Arif Khan, Assefaw Gebremedhin. *Distributed Louvain Algorithm for Graph Community Detection*. 32nd IEEE International Parallel and Distributed Processing Symposium (IPDPS 2018).
 - **Sayan Ghosh**, Assefaw Gebremedhin. *Parallelization of Bin Packing on Multicore Systems*. 23rd International Conference on High Performance Computing, Data, and Analytics (HiPC 2016).
 - **Sayan Ghosh**, Jeff Hammond, Antonio J. Peña, Pavan Balaji, Assefaw Gebremedhin, Barbara Chapman. *One-Sided Interface for Matrix Operations using MPI-3 RMA: A Case Study with Elemental*. 45th International Conference on Parallel Processing (ICPP 2016).
 - Naveen Namashivayam, **Sayan Ghosh**, Dounia Khaldi, Deepak Eachempati, Barbara Chapman. *Native Mode-Based Optimizations of Remote Memory Accesses in OpenSHMEM for Intel Xeon Phi*. 8th International Conference on Partitioned Global Address Space Programming Models (PGAS 2014). (*Best Paper*)
- **Workshops**
 - **Sayan Ghosh**, Mahantesh Halappanavar, Antonino Tumeo, Ananth Kalyanaraman, Assefaw Gebremedhin. *miniVite: A Graph Analytics Benchmarking Tool for Massively Parallel Systems*. Performance Modeling, Benchmarking and Simulation of High Performance Computer Systems (PMBS 2019).
 - Priyanka Ghosh, Jeff Hammond, **Sayan Ghosh**, Barbara Chapman. *Performance Analysis of the NWChem TCE for Different Communication Patterns*. Performance Modeling, Benchmarking and Simulation of High Performance Computer Systems (PMBS 2013).
 - Jeff Hammond, **Sayan Ghosh**, Barbara Chapman. *Implementing OpenSHMEM using MPI-3 one-sided communication*. 1st OpenSHMEM Workshop: Experiences, Implementations and Tools (2013).
 - **Sayan Ghosh**, Sunita Chandrasekaran, Barbara Chapman. *Statistical modeling of power/energy of scientific kernels on a multi-GPU system*. Power Measurement and Profiling Workshop (PMP), in conjunction with International Green Computing Conference (IGCC 2013).
 - **Sayan Ghosh**, Terrence Liao, Henri Calandra, Barbara Chapman. *Experiences with OpenMP, PGI, HMPP and OpenACC directives on ISO/TTI kernels*. 5th International Workshop on Multi/Manycore Computing Systems (MuCoCoS 2012).
 - **Sayan Ghosh**, Sunita Chandrasekaran, Barbara Chapman. *Energy Analysis of Parallel Scientific Kernels on Multiple GPUs*. Symposium of Application Accelerators in High Performance Computing (SAAHPC 2012).
- **Posters**

- Keita Iwabuchi, **Sayan Ghosh**, Roger Pearce, Mahantesh Halappanavar, Maya Gokhale. *miniVite + Metall: A Case Study of Accelerating Graph Analytics Using Persistent Memory Allocator*. General poster, International Conference for High Performance Computing, Networking, Storage, and Analysis (SC 2020).
- **Sayan Ghosh**, Sunita Chandrasekaran, Barbara Chapman. *Statistical Power and Energy Modeling of multi-GPU kernels*. General poster, International Conference for High Performance Computing, Networking, Storage, and Analysis (SC 2012).
- **Sayan Ghosh**, Barbara Chapman. *Programming Strategies for GPUs and their Power Consumption*. General poster, International Conference on Parallel Architectures and Compilation Techniques (PACT 2012).

INTERNSHIPS

- Pacific Northwest National Laboratory, Richland, WA** May-Aug 2018
Supervisor: Drs. Mahantesh Halappanavar and Arif Khan
Focus: Distributed-memory graph analytic algorithms, such as community detection and matching.
- Pacific Northwest National Laboratory, Richland, WA** May-Aug 2017
Supervisor: Dr. Mahantesh Halappanavar
Focus: Distributed-memory network community detection.
- Argonne National Laboratory, Chicago, IL** May-Aug 2016
Supervisors: Drs. Pavan Balaji and Yanfei Guo
Focus: C++ bindings to MPI-3 RMA.
- Argonne National Laboratory, Chicago, IL** May-Aug 2014
Supervisors: Drs. Pavan Balaji, Antonio J. Peña, and Jeff Hammond
Focus: Asynchronous interface for updating distributed matrices in Elemental, a distributed-memory dense linear algebra library.
- Argonne National Laboratory, Chicago, IL** May-Aug 2013
Supervisor: Dr. Jeff Hammond
Focus: Design and prototype of a one-sided communication runtime on top of MPI-3, that led to development of an OpenSHMEM implementation over MPI-3 RMA.
- Total R&T, Houston, TX** May-Aug 2012
Supervisors: Drs. Terrence Liao and Henri Calandra
Focus: Evaluation of directive based programming models like OpenMP, PGI, HMPP and OpenACC on Finite Difference kernels used in Oil and Gas exploration, on GPU and multicore CPUs.
- Pacific Northwest National Laboratory, Richland, WA** Jun-Sept 2011
Supervisors: Drs. Darren Kerbyson, Kevin Barker and Abhinav Vishnu
Focus: Power/energy profiling of scientific kernels on a multi-GPU platform.

ACHIEVEMENTS/AWARDS

- MIT/IEEE/Amazon Graph challenge awards: 2018 and 2019, Innovation awards; 2020 Champion award.
- DOE ASCR user representative, NERSC User Group Executive Committee (NUGEX), May 2020-2023.
- Participant, 2020 DOE ECP SOLLVE OpenMP hackathon. Brookhaven National Laboratory, Upton, NY.
- PNNL PCSD Outstanding Performance Award (OPA), FY 2019.
- SIAM Student Travel Award, SIAM Conference on Computational Science and Engineering (CSE19), Spokane, WA
- Participant, 2018 Argonne Training Program on Extreme-Scale Computing (ATPESC), St. Charles, IL
- NSF/IEEE TCPP Travel grant, 32rd International Parallel and Distributed Processing Symposium (IPDPS 2018), Vancouver, BC, Canada

-
- NSF/IEEE TCPP Travel grant, 23rd International Conference on High Performance Computing, Data, and Analytics (HiPC 2016), Hyderabad, India

INVITED TALKS/PRESENTATIONS

- *ECP Performance Portability Panel Series: Panel 3, Pre-panel Discussion on Exagraph Co-Design center.*
- *UPC++ implementation of Half-approximate Graph Matching.* 2020 Annual UPC++ Users Group Meeting and BoF. Lawrence Berkeley National Laboratory, Berkeley, CA.
- *miniVite: A Proxy Application for Graph Community Detection.* Tutorial on ExaGraph: Graph and Combinatorial Methods for Enabling Exascale Applications. 2019 DOE ECP Annual Meeting, Houston, TX.
- *Scalable Graph Community Detection using the Louvain Method.* Distributed-Memory Graph Analytics: Programming Models, Algorithms and Applications Minisymposium. SIAM Conference on Computational Science and Engineering (CSE19)
- *Distributed-memory Graph Algorithms: Case studies with Community Detection and Weighted Matching.* Chesapeake Large-Scale Analytics Conference (CLSAC 2018).
- *Towards a More Asynchronous GraphBLAS.* SIAM workshop on Combinatorial Scientific Computing (CSC 2016).
- *Performance of ISO/TTI kernels on CPU/GPU using OpenMP, PGI, HMPP and OpenACC directives.* Rice Oil and Gas HPC Workshop (OGHPC 2013).
- *Power and Energy Prediction of Multi-GPU kernels Using Non-linear Regression.* Nvidia GPU Technology Conference (GTC 2013).
- Classroom session on OpenACC at Nvidia Global Technology Conference (GTC 2013)

SERVICE

- IEEE Symposium on High Performance Interconnects (HOTI). 2021 Chair for IEEE Micro.
- Supercomputing 2021, Technical Program: Birds of a Feather (BOFs) committee.
- Journal/Conference paper reviewer: JPDC, TPDS, TPDS-AI-ML, JCST, PARCO, TOPC, IEEE Access, ICS (2020) and HiPC (2018 and 2019)
- Mystery Application (*miniVite*) judge, Virtual Student Cluster Competition, Supercomputing 2020, Atlanta, GA
- Student Volunteer: Supercomputing (SC 2016), Salt Lake City, Utah
- Booth setup personnel, Gulf Coast Advanced Supercomputing (GCAS) booth, Supercomputing 2014, New Orleans, Louisiana
- Booth duty at Gulf Coast Advanced Supercomputing (GCAS) booth, Supercomputing 2013, Denver, Colorado
- Student Volunteer, Architectural Support for Programming Languages and Operating Systems (ASPLOS 2013) conference, Houston, TX
- Booth duty at OpenMP booth and Gulf Coast Advanced Supercomputing (GCAS) booth, Supercomputing 2012, Salt Lake City, UT
- Represented University of Houston in OpenMP booth at Multicore Developers Conference, San Jose, CA (2011 and 2012)

TEACHING ASSISTANTSHIPS

- Spring 2016, Washington State University, EECS, Distributed Computing, CPTS 464/564 (*Course Instructor: Dr. David Bakken*)
- Fall 2015, Washington State University, EECS, Computer Communication Networks, CPTS 455 (*Course Instructor: Dr. Carl Hauser*)
- Spring 2015, Washington State University, EECS, Distributed Computing, CPTS 464/564 (*Course Instructor: Dr. Dave Bakken*)

-
- Fall 2010, University of Texas Health Science Center, Introductory Course on Data Structures (*Course Instructor*: Dr. Stefan Birmanns). Unofficial appointment, prepared course materials and helped students.

MEMBERSHIPS

- ACM Special Interest Group in High Performance Computing (SIGHPC)
- Institute of Electrical and Electronics Engineers (IEEE), IEEE Computer Society
- Society for Industrial and Applied Mathematics (SIAM)