Dr. Singhal Rekha

Senior Scientist and Head Computing System (Software) Research Area

Education

- Visiting Research Scholar, Computer Science, Stanford University, CA, USA
- Ph.D., Computer Science from Indian Institute of Technology, Delhi, India
- M.Tech, Computer Science from Indian Institute of Technology, Delhi, India
- B.E, Computer Science from Delhi Institute of Technology, Delhi, India

Research Interests

- **Performance for AI** - Acceleration of ML/DL Workloads and High Performance architectures for ML/DL systems.
- **AI for Performance**- Use of AI to accelerate systems performance
- Convergence of Big Data and High Performance computing
- Performance modelling, benchmark, analysis, tuning, optimization and prediction of Big data analytics workloads
- SQL query performance optimizations
- Distributes systems and Networking

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Patent & Publications

Patents (Granted)

1. Systems and methods for generating performance prediction model and estimating execution time for applications ,Rekha Singhal and Amit Sangroya, TCS Innovation Lab, Mumbai , #3182288 in EPO, US
2. A method and system for efficient performance prediction of structured query for big data, , Rekha Singhal, TCS Innovation lab, Mumbai,#10061802 US China, Australia.
3. System and method predicting effect of cache on query elapsed response time during application development stage, Rekha Singhal and Manoj Nambiar, TCS Innovation Lab, Mumbai, Granted in US, China, Singapore,
4. System and method to predict elapsed response time for a query during application development stage, Rekha Singhal and Manoj Nambiar, TCS Innovation Lab, Mumbai, Granted in US 2015 https://www.google.com/patents/US9117030, and Europe- https://www.google.com.ar/patents/EP2843599A1, Singapore, Japan

5. A system and method for predicting query elapsed response time transparent to database system, "Rekha Singhal", TCS Innovation Lab, Mumbai, 2012 -1528/MUM/2012 filed on 18/5/2012
6. Method and System for Business Continuity and Disaster Recovery between a primary data centre and a secondary data centre with zero recovery point objective (zero RPO), Zia Saquib, Rekha Singhal and Shreya Bokare, CDAC, 2010, Granted in India.

Publications:

Conference & Journal Publications , Book chapters, Books

Articles

1. Application Performance Monitoring: What it means in today's complex software world, https://sdtimes.com/monitor/application-performance-monitoring-what-it-means-in-todays-complex-software-world/, SD Times, April 2020.
2. http://insidehpc.com/2015/10/lustre-accelerates-the-convergence-of-big-data-and-hpc-in-financial-services/
3. http://www.intel.com/content/dam/www/public/us/en/documents/product-briefs/lustre-big-data-white-paper.pdf
4. Software blog 2.0 https://www.tcs.com/blogs/programming-a-paradigm-shift-software
5. Article on Stanford Story in Life@R&I in TCS knowme platform.

Book Chapter

6. Chapter "Segment One" in the book Reimagination TCS.
7. Chapter "High Performance Computing" the book Reimagination TCS – part 2

International Conferences/Workshops

1. Vision on Accelerating Enterprise IT systems 2.0, Rekha Singhal, Dheeraj Chahal, Shruti Kunde, Mayank Mishra and Manoj Nambiar, DEEM workshop in ACM SIGMOD 2020.
2. Tutorial on Benchmarking big data analytic systems, Rekha Singhal and Todor Ivanov, ICPE 2020.
3. Efficient Multiway Hash Join on Reconfigurable Hardware, , Rekha Singhal, Jeffrey D.Ullman, Yaqi Zhang, Kunle Olukotun and Raghu Prabhakar ,In Nambiar R., Poess M. (eds) Performance Evaluation and Benchmarking for the Analytics Era. TPCTC 2019. Lecture Notes in Computer Science, vol 10661. Springer, held in conjunction with VLDB 2019 Singhal R., Singh P. (2018) Performance Assurance Model for Applications on SPARK Platform. In: Nambiar R., Poess M. (eds) Performance Evaluation and Benchmarking for the Analytics Era. TPCTC 2019. Lecture Notes in Computer Science, vol 10661. Springer, held in conjunction with VLDB 2019
4. Polystore++: Accelerated Polystore System for Heterogeneous Workloads, Rekha Singhal, Nathan Zhang, Luigi Nardi, Muhammad Shahbaz, Kunle Olukotun, ICDCS 2019, Texas.

5. Fast Online "Next Best Offers" using Deep Learning, Rekha Singhal, Gautam Shroff, Mukund Kumar, Sharod Roy, Sanket Kadarkar, Rupinder virk, Siddharth Verma, Vartika Tiwari, COMAD-COD, 2019, India.
6. SPARK Job Performance Analysis and PredictionTool, Rekha Singhal, Chetan Phalak, Praveen Singh, Demo Paper, ICPE 2018, Berlin, Germany.. (https://link.springer.com/book/10.1007/978-3-319-72401-0#toc)
7. ATA: Architecture-based technology advisor for functional application domains. SysCon2018
8. Technology Migration Challenges in a Big Data Architecture Stack, Rekha Singhal and Shruti Kunde, ICPE 2017.
9. SQL Query Volume Performance Estimation Tool, Rekha Singhal and Chetan Phalak, ICPE 2017.
10. R.Singhal and Manoj Nambiar, "Predicting SQL Query Execution Time for Large Data
11. Volume", in Proceedings of IDEAS, Montreal, Canada, July, 2016.
12. Database Buffer Cache Simulator to Study and Predict Cache Behavior for Query Execution, Chetan Phalak, Rekha Singhal and Tanmay Jhunjhunwala, proceedings of conference DATA, Portugal, July 2016.
13. Efficient Synthetic Data Generator for structured Data" Chetan Phalak, Rekha Singhal, CMG USA San Deigo, November 2016.
14. R.Singhal and Abhsihek Verma, "Predicting Job Completion Time in Heterogeneous MapReduce Environments", in Proceedings of IPDPS: Heterogeneous computing workshop, IPDPS, May, 2016.
15. A. Sangroya and R. Singhal, "Performance Assurance Model for HiveQL on Large Data Volume," in Proceedings of the International Workshop on Foundations of Big Data Computing in conjunction with 22nd IEEE International Conference on High Performance Computing, HiPC '15, December 2015.
16. Reducing Structure Big Data Benchmark Cycle time using Query Performance Prediction Model, IEEE International conference on Computing, Communication Systems (ICCCS) 2015, Mauritius, December 2015.
17. Performance analysis of Big Data Analytics on HDFS and Luster file Systems, Rekha Singhal and Chetan Phalak, CMG US, Texas, November, 2015
18. "Performance Comparison of SQL based Big Data Analytics with Lustre and HDFS file systems", Rekha Singhal, Gabriele Pacciucci, TeraTec, Paris, 2015.
19. Performability comparison of Lustre and HDFS for MR application", Rekha Singhal, Manoj Nambiar, Kishore Trivedi, IEEE ISSRE Industry Track, Naples, Italy, 2014
20. "Performance comparison of Lustre and HDFS for MR application", Rekha Singhal, Gabriele Pacciucci and Mukesh Gangadhar, LAD2014, Reims, France, 2014
21. "Measurement based model to study the affect of increase in data size on query response time", Rekha Singhal, Manoj Nambiar, Performance and Capacity CMG 2013, La Jolla, California, November 2013.
22. "Extrapolation of SQL Query Elapsed Response Time at Application Development Stage", Rekha Singhal, Manoj Nambiar, Proceedings of INDICON 2012, Kochi, India, December 2012.
23. "Influence of senior citizens opinion on functional design of Cloud Based Senior Citizens Wellness Management System ", Vijayalakshmi Ravi , Rekha Singhal, Proceedings of ICFC 2012, Bangalore, October 2012.

24. " A Framework for Predicting Query Response Time", Rekha Singhal, The Fifth INTERNATIONAL SYMPOSIUM ON ADVANCES OF HIGH PERFORMANCE COMPUTING AND NETWORKING (AHPCN) held in conjunction with the 14th IEEE International Conference on High Performance Computing and Communications (HPCC), Liverpool, UK, 25-27 June, 2012.
25. "GIS based model to study the impact of Environmental Parameters on Human Health", Swati Vitkar and Rekha Singhal, In proceedings of International Conference on Emerging Trends in Computer Science and Information Technology- ICETCSIT April 2012 , India
26. " Integrating SOA and Cloud Architecture for Senior Citizens Wellness Management", VijayLakshi and Rekha Singhal, In proceedings of International Conference on Emerging Trends in Computer Science and Information Technology- ICETCSIT April 2012 , India.
27. "Efficient model for multipoint to multipoint Disaster Recovery as a Service System", Rekha Singhal and Siddharth Patankar, In proceedings of ICNCC, March, 2011, Delhi
28. "A Multi-site Disaster Recovery Solution based on IP Storage Networking", Rekha Singhal, In proceedings of ICICN, Feb, 2012, Singapore.
29. "Cloud based Model for Senior Citizens Wellness Management", Vijay Lakshmi and Rekha Singhal, WICT 2011.
30. "Design and Implementation of efficient semi-synchronous replication Solution for Disaster Recovery",Rekha Singhal, Shreya Bokare and Prasad Pawar,", WSEAS (SEPADS), University of Cambridge, February 2010.
31. "Enterprise Storage Architecture for Optimal Business Continuity", Rekha Singhal, Shreya Bokare and Prasad Pawar, 2010 International Conference on Data Storage and Data Engineering (DSDE 2010), Bangalore, India, February 2010
32. Comparative Analysis and Design of an Efficient and Reliable iSCSI Target- Soumen Debgupta, Smita Vishwakarma, Shubhada Nandarshi, Rekha Singhal, IEEE IACC, March, 2009, Thapar, India
33. Architecture for Reliable DR Solution- Shreya Bokare, Rashmi Kale, Rekha Singhal, IEEE IACC, March, 2009, Thapar, India
34. DCT: The CDP Solution for Audit Applications- Prasad Pawar, Shreya Bokare, Rashmi Kale, Rekha Singhal, IEEE IACC, March, 2009, Thapar, India
35. Design for Intelligent Storage Controllers in IP SAN- Shreya Bokare, Rashmi Kale, Rekha Singhal, IEEE IACC, March, 2009, Thapar, India
36. Performance Behavior of Efficient iSCSI in NS, Sankalp Bagaria and Rekha Singhal, IEEE IACC, March, 2009, Thapar, India
37. 'Use of Operation Semantics for Parallel iSCSI Protocol", Ranjana Singh, Rekha Singhal, SEPADS, WSEAS, 2008.
38. "An Architecture for Continous Available Commodity Storage", Rekha Singhal and Zia Saquib, Storage Workshop at HiPC 2007.
39. 'Use of Operation Semantics for Parallel iSCSI Protocol", Ranjana Singh, Rekha Singhal, CISSE 2007.
40. "Transparent Parallel Replication of Logically Partitioned Databases", Rekha Goel and Gautam Shroff, 3rd International Conference on High Performance Computing December 19-22, 1996 - Trivandrum, India.

41. "Transparent parallel transactions on replicated autonomous databases", Rekha Goel and Gautam M. Shroff In book Algorithms for Parallel Processing, Editors: Robert Schreiber, Michael T. Heath, and Abhiram Ranade, IMA Volumes in Mathematics and its Applications, Springer, New York, page 117, Volume 105, 1999,

Journals

1. "Model Driven Software performance Engineering: Current Challenges + way ahead", Manoj Nambiar, Ajay Kattepur, Gopal Bhaskaren, Rekha Singhal and Subhasri Duttagupta, in journal of ACM Performance Evaluation Review-PER, 2016.
2. "A Framework for Predicting Query Response Time at Application Development Stage", Rekha Singhal, International Journal of Scientific & Engineering Research, Volume 4, Issue 9, Spetember 2013, ISSN 2229-5518.
3. "Framework to Study Impact of Environmental Parameters on Human Health Using GIS and Data Mining", Swati Vitkar1, Dr. Rekha Singhal, Journal of Computing Technologies, ISSN 2278 – 3814, Volume 1 issue 1, August, 2012.
4. "High Level Architecture for Senior Citizens Wellness Management System ", Vijayalakshmi Ravi , Rekha Singhal, "Journal of Computing Technologies, Volume 1 issue 1, 25th May, 2012
5. "Design of Enterprise Storage Architecture for Optimal Business Continuity", Rekha Singhal, Shreya Bokare , Yogender Pal, Rashmi Singh and Prasad Pawar, International Journal of Electronic Science and Technology (JEST)., Sept, 2010.
6. Design of Parallel Transaction Manager on Autonomous Replicated databases, IETE Journal of Research, 1 (4), June 1997.

National Conferences

1. DB Volume Emulator, Rekha Singhal, Amol Khanapurkar, CMG India 2016 Annual Conference, December 2016.
2. Survey of Big Data Framworks for Different Application Characteristics, Pravin Singh, Rekha Singhal, CMG India 2016 Annual Conference, December 2016.
3. Scalable Resource Monitoring Tool for Hadoop 2" , Istiaqye Shaikh, Rekha Singhal, CMG India 2015 Annual Conference, November 2015.
4. Efficient Synthetic Data Generator for structured Data" Chetan Phalak, Rekha singhal, CMG India 2015 Annual Conference, November 2015
5. Model for SQL Performance Assurance on Growing Data Volume, Rekha Singhal, Tactics Performance Engineering, TCS, India, Mumbai, June 2015
6. Towards Building a Performance Prediction Model for MapReduce Applications, Amit Sangroya, Rekha Singhal, Tactics Performance Engineering, TCS, India, Mumbai, June 2015
7. Predicting Cache Behaviour for Non-Unique Index Access with Data Growth ", Rekha Singhal, Manoj Nambiar, TACTics, TCS, India, Pune, March 2014.
8. IO based model for predicting Query elapsed response time for varying size database", Rekha Singhal, Manoj Nambiar, TACTics, Chennai, India, April 2013.
9. "Mobile Health Information System", Sherya Bokare and Rekha Singhal, Proceedings of National Conference on 3T trends in IT, Sies College, Navi Mumbai, 2011.

10. "Optimal Cascaded Configuration for IP SAN on NetBSD ",Rekha Singhal, Rashmi Kale, Soumen Debgupta and Yogender Pal, Recent Trends in Information, Telecommunication and Computing (ITC 2010), Cochin, India. March 2010
11. "A National Framework for Public Health using GRID", Rekha Singhal, Proceedings of First Conference of Women in Computing in India: Emerging trends in Computing Proceedings, Published in ACM-digital library, Sept, 2010.
12. "FACT for improving iSCSI performance", Shubhada Nandrishi, Rekha Singhal, NCAICT, Allahabad, 2008
13. "Design and Implementation of an Effficient iSCSI Target", Soumen Debgupta, Rekha Singhal, NCAICT, Allahabad, 2008
14. "Role of Internet in Social Services in India", Rekha Singhal, In the magazine 'Philanthropy', a publication of Center of Advanced Philanthropy, Mumbai, 1998.

Tutorials

1. Benchmarking big data analytic systems
2. Tutorial in Tactics
3. Tutorial in PABS on Big Data Performance
4. Database Query Performance Modelling, Rekha Singhal, Tutorial, CMG India, Pune, December 2014.
5. "OLAP and Data Analysis Tools", tutorial by Rekha Singhal, In the workshop, Business Intelligence, CDAC, Mumbai, 2010.
6. Tutorial on "Continuous Available Commodity Storage" in Storage Networking World, Florida, 2008.
7. Nano Tutorial on Big Data

Invited Talks

1. Performance Assurance for Large Scale Big Data Systems, Workshop on Large Scale Testing & Benchmarking (LTB) , ICPE 2017.
2. Big Data Analytics for Management, IIM Indore, 2016.
3. Performance Issues and Solutions for IPSAN, Workshop on IP Storage Networking for ICT Disaster Recovery, CDAC, Mumbai, 2015
4. Performability comparison of Lustre and HDFS for MR application", Rekha Singhal, HiPC 2014, Intel BOF, Goa ,India, 2014
5. "Know-how of research in Industry", talk by Rekha Singhal, in Research Panel of International conference and workshop on emerging trends in Technology (ICWET 2012), Thakur Engineering College, Mumbai, 24 Feb 2012.
6. "Revival 1000- An IP SAN product for DR solution", talk by Rekha Singhal, in the workshop, INDO-UK Workshop on Critical National Infrastructure Protection (CNIP), Ramada Hotel, Mumbai, 2010
7. Eminence 1 SQL Performance Assurance
8. Eminence 2 Convergence of HPC and Big Data

Workshops Chaired & Conducted

1. Performance Analysis of Big Data Systems", Rekha Singhal, Dheeraj Chahal, Workshop in ICPE 2017, Berlin, Germany, 2018.
2. "Performance Analysis of Big Data Systems", Rekha Singhal, Dheeraj Chahal, Workshop in ICPE 2017, L'aquila, Italy, 2017.
3. "Performance Analysis of Big Data Systems", Rekha Singhal, Dheeraj Chahal, Workshop in ICPE 2016, Delft, Netherlands, 2016.
4. "Performance Analysis of Big Data Systems", Rekha Singhal, Dheeraj Chahal, Workshop in ICPE 2015, Austin, Texas, 2015.
5. "Research Methodology", two days workshop conducted by Rekha Singhal, MGM Engineering college, Navi Mumbai, June, 2011.
6. "High Performance Storage", a two days workshop conducted by Rekha Singhal, CDAC, Mumbai, 2009.

PhD Thesis Guided:

- Predictive Analysis using Data Mining and GIS to Study impact of water and air pollutants as one of factor affecting human health:case study, Swati Vitkar, at SHRI JAGDISHPRASAD JHABARMAL TIBREWALA UNIVERSITY
- Cloud based Model for Senior Citizens, Vijaylaksmi Ravi at SHRI JAGDISHPRASAD JHABARMAL TIBREWALA UNIVERSITY

TPC and Associations

- TPC of IEEE Graph Computing 2020
- TPC of IEEE Big data Congress 2019
- TPC of workshops- WOSSP with SC 2017, BigDF-HiPC 2017, HiPC-2017, ICPE-2018
- TPC of workshop- WOSSP with SC 2016, ParLearning-IPDPS 2017, BigDF-HiPC 2016
- TPC of ICPE 2017 Conference
- TPC of CMG India 2014, 2015
- CMG US Member, ACM Member
- Chair for PABS workshop in conjunction with ICPE 2015, 2016 and 2017