

Resume

Name and Designation

Arnab Sarkar, Associate Professor

Organization

Advanced Technology Development Centre

Indian Institute of Technology Kharagpur, West Bengal 721302, India

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Educational Qualification

- **Ph.D.:** Computer Science and Engineering, Indian Institute of Technology Kharagpur, 2012
- **M.S.:** Computer Science and Engineering, Indian Institute of Technology Kharagpur, 2006
- **B.Tech.:** Information Technology, Calcutta University, Kolkata, India, June 2003
- **B.Sc.:** Computer Science (Hons.), Calcutta University, Kolkata, India, June 2000

Professional Experience

2019 Dec – Present: Associate Professor, Advanced Technology Development Centre, IIT Kharagpur

2018 Mar – 2019 Dec: Associate Professor, Computer Science and Engineering, IIT Guwahati

2012 Nov – 2018 Mar: Assistant Professor, Computer Science and Engineering, IIT Guwahati

2011 Nov – 2012 Nov: Chief Engineer, Android Platforms Group, Samsung India Software Operations

2011 Sep – 2011 Oct: Visiting Scientist, Advanced Computing and Microelectronics Unit, Indian Statistical Institute

2011 July – 2011 Aug: Post-Doctoral Research Consultant, General Motors Collaborative Research Lab, IIT Kharagpur

Specialization and Expertise

- Scheduling Strategies in Real-time and Embedded Systems
- Bandwidth Allocation in Wireless Cellular Networks
- Scheduling and Control Algorithms for Smart Grids
- Computer Organization and Architecture

Ph.D. Students (Thesis Defended/Submitted)

1. **Dr. Satish Kumar;** Area: QoS / QoE Aware Radio Resource Allocation in Futuristic Wireless Networks; Thesis Defended in March 2018
2. **Mr. Rajesh Devaraj** (TCS Fellow); Area: Formal Approaches towards Real-time Scheduler Design for Safety-critical Systems; Thesis Defended in December 2018
3. **Mr. Sangeet Saha** (TCS Fellow); Area: Spatio-temporal Real-time Scheduling Strategies for FPGAs; Thesis Defended in November 2018
4. **Mr. Piyoosh P** (TCS Fellow); Area: Energy-aware and Fault-resilient Real-time Multiprocessor Scheduling; Thesis Submitted in July 2019
5. **Mr. Sanjay Moulik;** Area: Energy / Temperature and Architecture Aware Real-time Multiprocessor Scheduling; Thesis Submitted in July 2019

Ph.D. Students (Ongoing)

1. **Mr. Sanjit Kumar Roy;** Area: Real-time Task Scheduling Strategies in Automotive Systems

2. **Mr. Basina Deepakraj**; Area: Scheduling and Control Algorithms in Smart Grids
3. **Mr. Cherinet Kejela Addise** (Foreign Candidate); Area: Formal Approaches Towards Real-time Scheduling in Reconfigurable Systems
4. **Mr. Debabrata Senapati**; Area: Latency-Aware Resource Allocation Mechanisms in Fog/Edge Computing Environments
5. **Ms. Ashwathi N S**; Area: Memory Controller Design Strategies for Real-time Embedded Systems
6. **Mr. Anirban Lekharu**; Area: QoS / QoE Aware Radio Resource Allocation in Futuristic Wireless Networks

Journal Publications (Published / Accepted)

1. S. K. Roy, R. Devaraj, **A. Sarkar**, K. Maji, S. Sinha. Contention-aware Optimal Scheduling of Real-time Precedence-constrained Task Graphs on Heterogeneous Distributed Systems. Accepted in: Journal of Systems Architecture (JSA), Elsevier, December, 2019.
2. P.P. Nair, **A. Sarkar**, S. Biswas. Fault-tolerant Real-time Fair Scheduling on Multiprocessor Systems with Cold-standby. Accepted in: IEEE Transactions on Dependable and Secure Computing (IEEE TDSC)
3. S. Moulik, R. Devaraj, **A. Sarkar**. HEALERS: A Heterogeneous Energy-Aware Low-overhead Real-time Scheduler. IET Computers and Digital Techniques, Vol. 13, no. 6, pp. 470-480, 2019.
4. J. Mayank, A. Mondal, **A. Sarkar**. Control-schedule Co-design for Fast Stabilization in RT Systems. Design Automation of Embedded Systems (DAES), Springer, Vol. 23, no. 3-4, pp. 79-101, 2019.
5. S. Kumar, R. Devaraj, **A. Sarkar**, A. Sur. Client-side QoE Management for SVC Video Streaming: An FSM Supported Design Approach. IEEE Transactions on Network and Service Management (IEEE TNSM), Vol. 16, no. 3, pp. 1113-1126, 2019.
6. S. Kumar, R. Devaraj, **A. Sarkar**. A Hybrid Offline-Online Approach to Adaptive Downlink Resource Allocation over LTE. IEEE/CAA Journal of Automatica Sinica, Vol. 6, no. 3, pp. 766-777, 2019.
7. R. Devaraj, **A. Sarkar**, S. Biswas. Supervisory Control Approach and its Symbolic Computation for Power-aware RT Scheduling. IEEE Transactions on Industrial Informatics (IEEE TII), Vol. 15, no. 2, pp. 787-799, 2019.
8. P.P. Nair, **A. Sarkar**, S. Biswas. Design of Light Weight Exact DES Diagnosers using Measurement Limitation: Case Study of EFI system. Accepted in: International Journal of Systems Science, Taylor & Francis, May, 2018.
9. S. Moulik, **A. Sarkar**, H. Kapoor. Energy Aware Frame Based Fair Scheduling. Accepted in: Sustainable Computing, Informatics and Systems (SUSCOM), Elsevier, March, 2018.
10. S. Saha, **A. Sarkar**, A. Chakrabarti, R. Ghosh. Co-scheduling Persistent Periodic and Dynamic Aperiodic Real-Time Tasks on Reconfigurable Platforms. IEEE Transactions on Multi-Scale Computing Systems (IEEE TMSCS), Vol. 4, no. 1, pp. 41-54, 2018.
11. V. Kochar, **A. Sarkar**. Real-time Scheduling on Dynamic Resources in a Fog Computing Environment (Conference extended journal version). Journal of Low Power Electronics (JOLPE), Vol. 13, no. 4, pp. 616-626, 2017.
12. S. Kumar, **A. Sarkar**, A. Sur. A Resource Allocation Framework for Adaptive Video Streaming Over LTE. Journal of Network and Computer Applications (JNCA), Elsevier, vol. 97, pp. 126-139, 2017.
13. S. Saha, **A. Sarkar**, A. Chakrabarti. Spatio-Temporal Scheduling of Preemptive Real-Time Tasks on Partially Reconfigurable Systems. ACM Transactions on Design Automation of Electronic Systems (ACM TODAES), Vol. 22, no. 4, pp. 71:1-71:25, 2017.
14. R. Devaraj, **A. Sarkar**, S. Biswas, Comments on "Supervisory control for real-time scheduling of periodic and sporadic tasks with resource constraints" [Automatica 45 (2009) 2597-2604], Automatica, Elsevier, Vol. 82, pp. 332-334, 2017.

15. R. Devaraj, **A. Sarkar**, S. Biswas. Fault-Tolerant Preemptive Aperiodic RT Scheduling by Supervisory Control of TDES on Multiprocessors. *ACM Transactions on Embedded Computing Systems (ACM TECS)*, Vol. 16, no. 3, pp. 87:1-87:25, 2017.
16. P. P. Nair, **A. Sarkar**, N. M. Harsha, M. Gandhi, P. P. Chakrabarti, S. Ghose. ERfair Scheduler with Processor Suspension for Real-Time Multiprocessor Embedded Systems. *ACM Transactions on Design Automation of Electronic Systems (ACM TODAES)*, Vol. 22, no. 1, pp. 19:1-19:25, 2016.
17. S. Kumar, **A. Sarkar**, S. Sriram, A. Sur. A Three Level LTE Downlink Scheduling Framework for RT VBR Traffic. *Computer Networks, Elsevier*, vol. 91, pp. 654-674, 2015.
18. R. Devaraj, **A. Sarkar**, S. Biswas. A Design Fix to Supervisory Control for Fault-tolerant Scheduling of Real-time Multiprocessor Systems with Aperiodic Tasks. *International Journal of Control*, Taylor & Francis, vol. 88, no. 11, pp. 2211-2216, 2015.
19. S. Saha, **A. Sarkar**, A. Chakrabarti. Scheduling Dynamic Hard Real-Time Task Sets on Fully and Partially Reconfigurable Platforms. *IEEE Embedded Systems Letters*, vol. 7, no. 1, pp. 23-26, 2015.
20. **A. Sarkar**, S. Ghose, P.P. Chakrabarti. Sticky-ERfair: A Task-Processor Affinity Aware Proportional Fair Scheduler. *Real Time Systems Journal*, vol. 47, no. 4, Springer, pp. 356-377, 2011.
21. **A. Sarkar**, S. Ghose, P.P. Chakrabarti. A Corrigendum to: "Sticky-ERfair: a task-processor affinity aware proportional fair scheduler". *Real Time Systems Journal*, vol. 47, no. 4, Springer, pp. 382-385, 2011.
22. **A. Sarkar**, A. Shanker, S. Ghose, P.P. Chakrabarti. A Low Overhead Partition-Oriented ERfair Scheduler for Hard Real-Time Embedded Systems. *IEEE Embedded Systems Letters*, vol. 3, no. 1, pp. 5-8, 2011.
23. **A. Sarkar**, P.P. Chakrabarti, S. Ghose. Partition Oriented Frame-Based Fair Scheduler. *Journal of Parallel and Distributed Computing (JPDC)*, vol. 70, no. 7, Elsevier, pp. 707-718, 2010.
24. **A. Sarkar**, P.P. Chakrabarti, R. Kumar. Frame-Based Proportional Round-Robin. *IEEE Transactions on Computers*, vol. 55, no. 9, pp. 1121-1129, Sep, 2006.

Conference Publications (Published / Accepted)

1. S. Moulik, R. Chaudhary, Z. Das, **A. Sarkar**. EA-HRT: An Energy-Aware scheduler for Heterogeneous Real-Time systems. Accepted in: 25th Asia and South Pacific Design Automation Conference (ASP-DAC 2020), 2020.
2. S.K. Roy, R. Devaraj, **A. Sarkar**, S. Sinha, K. Maji. Optimal Scheduling of Precedence-constrained Task Graphs on Heterogeneous Distributed Systems with Shared Buses. Accepted in: 22nd IEEE International Symposium on Real-time Distributed Computing, 2019.
3. S.K. Roy, R. Devaraj, **A. Sarkar**. Optimal Scheduling of PTGs with Multiple Service Levels on Heterogeneous Distributed Systems. Accepted in: American Control Conference (ACC '19), 2019.
4. S. Moulik, R. Devaraj, **A. Sarkar**. HEART: A Heterogeneous Energy-Aware Real-Time scheduler. Accepted in: 32nd Int. Conf. on VLSI Design (VLSID '19), Jan, 2019.
5. S. Moulik, R. Devaraj, **A. Sarkar**. COST: A Cluster-Oriented Scheduling Technique for Heterogeneous Multi-cores. Accepted in: IEEE International Conference on Systems, Man, and Cybernetics (IEEE SMC), 2018.
6. S. Kumar, P. Vishnoi, **A. Sarkar**, A. Sur. QoE Aware Resource Allocation for Multi-View Video Flows in LTE. Accepted in: 20th IEEE International Conference on High Performance Computing and Communications (HPCC), 2018.
7. S. Moulik, R. Devaraj, **A. Sarkar**. HETERO-SCHED: A Low-overhead Heterogeneous Multi-core Scheduler for Real-time Periodic Tasks. Accepted in: 20th IEEE International Conference on High Performance Computing and Communications (HPCC), 2018.
8. B. Deepakraj, S. Kumar, S. Padhi, **A. Sarkar**, A. Mondal, K. Ramamritham. Brownout Based Blackout Avoidance Strategies in Smart Grids. Accepted in: ACM e-Energy, 2018.

9. R. Devaraj, **A. Sarkar**, S. Biswas. Exact Task Completion Time Aware Real-Time Scheduling Based on Supervisory Control Theory of Timed DES. Accepted in: European Control Conference (ECC), 2018.
10. A. Lekharu, S. Kumar, A. Sur, **A. Sarkar**. A QoE Aware LSTM based Bit-Rate Prediction Model for DASH Videos. Accepted in: 10th International Conference on COMMunication Systems and NETWORKS (COMSNETS 2018).
11. S. Moulik, R. Devaraj, **A. Sarkar** and A. Shaw. A Deadline-partition Oriented Heterogeneous Multi-core Scheduler for Periodic Tasks. Accepted in: 18th Int. Conf. on Par. & Distrib. Comput., Appl. and Tech. (IEEE PDCAT '17), Dec, 2017.
12. S. Moulik, **A. Sarkar** and H. Kapoor. DPFair Scheduling with Slowdown and Suspension. Accepted in: 31st Int. Conf. on VLSI Design (VLSID '18), Jan, 2018.
13. A. Lekharu, S. Kumar, A. Sur, **A. Sarkar**. A QoE Aware SVC Based Client-side Video Adaptation Algorithm for Cellular Networks. 9th International Conference on Distributed Computing and Networking (ICDCN '18), pp. 27:1-27:4, Jan, 2018.
14. P.P. Nair, R. Devaraj, A. Sen, **A. Sarkar**, S. Biswas. DES based Modeling and Fault Diagnosis in Safety-critical Semi-Partitioned Real-time Systems. Accepted in: IFAC 2017 World Congress, 2017.
15. R. Devaraj, **A. Sarkar**, S. Biswas. Fault-Tolerant Scheduling of Non-preemptive Periodic Tasks using SCT of Timed DES on Uniprocessor Systems. Accepted in: IFAC 2017 World Congress, 2017.
16. R. Devaraj, **A. Sarkar**, S. Biswas. Real-time scheduling of non-preemptive sporadic tasks on uniprocessor systems using supervisory control of timed DES. American Control Conference (ACC '17), pp. 3212-3217, 2017.
17. S. Kumar, D.P. Goswami, **A. Sarkar**, A. Sur. Buffer Aware Three Level Scheduler for Video Streaming over LTE. 9th International Conference on COMMunication Systems and NETWORKS (COMSNETS '17), pp. 222-228, Jan, 2017.
18. A. Tripathi, **A. Sarkar**, P.P. Chakrabarti. Migration Aware Low Overhead ERfair Scheduler. 30th Int. Conf. on VLSI Design (VLSID '17), pp. 219-224, Jan, 2017.
19. V. Kochar, **A. Sarkar**. Real Time Resource Allocation on a Dynamic 2-level Symbiotic Fog Architecture. Accepted in: 6th Int. Symp. on Embedded computing & system Design (ISED '16).
20. S. Kumar, S. Sriram, **A. Sarkar**, A. Sur. A Three Level Adaptive Video Streaming Framework Over LTE. IEEE International Conference on Systems, Man, and Cybernetics (IEEE SMC), pp. 2442-2447, Dec, 2016.
21. **A. Sarkar**, A. Mondal. Partitioned Proportional Round Robin: A Fast and Accurate QoS Aware Scheduler for Embedded Systems. 29th Int. Conf. on VLSI Design (VLSID '16), pp. 403-408, Jan, 2016.
22. K. Chauhan, Piyoosh. P, **A. Sarkar**, S. Biswas. A Priori Overload Handling in ERfair Scheduled Embedded Systems: Hybrid Automata Approach. IEEE INDICON, Dec, 2014.
23. S. Ray, **A. Sarkar**. A Pseudo-Deadline Based O(1) proportional share scheduler for embedded systems. 18th VLSI Design and Test (VDATE) Symp., pp. 1-2, Aug, 2014.
24. **A. Sarkar**, R. Nanda, S. Ghose, P.P. Chakrabarti. Safe-ERfair - A priori Overload Handling in Fair Scheduled Embedded Systems. 23rd Int. Conf. on VLSI Design (VLSID '10), pp. 128-133, Jan, 2010.
25. **A. Sarkar**, S. Swaroop, S. Ghose, P.P. Chakrabarti. ERfair Scheduler with Processor Shutdown. 16th Int. Conf. on High Performance Computing (HiPC '09), pp. 4-12, Dec, 2009.
26. S. Chatterjee, **A. Sarkar**, P.P. Chakrabarti. A priori Overload Detection and Avoidance in RT Fair Scheduled Systems. 10th High Performance Computing ASIA Conference (HPC ASIA '09), pp. 93-100, Mar, 2009.
27. S. Bhattacharya, P. Verma, S. Malhotra, **A. Sarkar**, S.K. Ghosh. An Automated Framework for Network Security Assessment. Int. Conf. on Advances in Computing, Feb, 2008.

28. **A. Sarkar**, P.P. Chakrabarti, R. Kumar. Frame-Based Fair Multiprocessor Scheduler: A Fast Fair Algorithm for Real-time Embedded Systems. 19th Int. Conf. on VLSI Design (VLSID '06), pp. 677-682, Jan, 2006.
29. **A. Sarkar**, P.P. Chakrabarti, R. Kumar. Boundary-Fair Round-Robin: A Fast Fair Scheduler. 9th VLSI Design and Test (VDAT) Symp., pp. 81-91, Aug, 2005.

Book Chapter

1. S. Kumar, D.P. Goswami, **A. Sarkar**, A. Sur. A Buffer Aware Resource Allocation Framework for Video Streaming over LTE (Chapter No.: 14). Lecture Notes in Computer Science (LNCS), Vol. 10340, Springer, April 2017.

Sponsored R&D projects

1. **Sponsoring Agency:** MHRD and Ministry of Power, Govt. of India
Title A Software Tool for the Planning and Design of Smart Micro Power Grids **under IMPRINT**
Principal Investigator: Arnab Sarkar
Date of Start: March 2017
Date of completion: March 2020
2. **Sponsoring Agency:** MeitY, Govt. of India
Title: Security Aware Resource Allocation in Fog/Edge Computing Environments (Information Security Research and Development Centre (ISRDC)); ISEA Project (Phase-II)
Co-Investigator: Arnab Sarkar
Date of Start: March 2015
Date of completion: March 2020

Teaching Experience

1. **IIT Kharagpur**
 - a. AT60008: Embedded Communication Networks [(Spring, 2020)]
2. **IIT Guwahati**
 - a. CS342: Operating Systems Lab [(Autumn, 2018)]
 - b. CS341: Operating Systems [(Autumn, 2017)]
 - c. CS522: Embedded Systems [(Autumn, 2016), (Autumn, 2017), (Autumn, 2018), (Autumn, 2019)]
 - d. CS346: Compilers [(Spring, 2013), (Spring, 2014), (Spring, 2015), (Spring, 2016), (Spring, 2017), (Spring, 2018), (Spring, 2019)]
 - e. CS110: Computing Lab [(Spring, 2015), (Spring, 2016)]
 - f. CS526: CAD for VLSI [(Autumn, 2013), (Autumn, 2014), (Autumn, 2015)]
 - g. CS210: Data Structures Lab [(Autumn, 2014)]
 - h. CS347: Compilers Lab [(Spring, 2013), (Spring, 2014), (Spring, 2016), (Spring, 2017), (Spring, 2018), (Spring, 2019)]
 - i. CS244: Systems Programming Lab [(Spring, 2014)]
 - j. CS241: Systems Software Lab [(Autumn, 2013)]
3. **NPTEL Online Certification Courses**
 - a. Embedded Systems Design, Verification and Test [(Autumn, 2018)]
 - b. Computer Organization and Architecture [(Spring, 2018)]
 - c. VLSI Design, Verification and Test [(Autumn, 2016)]
4. **IIIT Guwahati (On Deputation from IIT Guwahati)**

- a. Data Structures [(Spring, 2014)]
- b. Information Technology Workshop [(Autumn, 2013)]

Short Term Courses / Workshops

1. GIAN Course on: Mixed-criticality Real-time Systems, 21st to 25th May, 2018, IIT Guwahati.
2. KIC-TEQIP Workshop on "Information and Communication Technology in Healthcare: Challenges and Promises", 25th March, 2015, IIT Guwahati.
3. QIP STC on "Computational Methods for Smart Grids". 9th to 13th March, 2015, IIT Guwahati.
4. KIC-TEQIP STC on "Real-Time Embedded Systems - Design, Verification and Test". Nov-Dec, 2014, IIT Guwahati.

Tutorials

1. Scheduling in Mixed-Criticality Systems – From Theory to Practice. 7th International Symposium on Embedded Computing and System Design (ISED), Dec, 2017.
2. Real-time Task Scheduling in the Reconfigurable Space. 7th International Symposium on Embedded Computing and System Design (ISED), Dec, 2017.
3. Real-time Embedded Systems Analysis – From Theory to Practice. 19th International Symposium on VLSI Design and Test (VDATE), June 26-29, 2015, Ahmedabad.
4. Reliable Real-Time Embedded Systems. IEEE INDICON, Dec, 2014.

Talks

1. Fault-tolerant and Reliable Embedded Systems Design, Strategic Training Programme on, "Next Generation Spacecraft Systems and Technologies", December 19, 2019, URSC ISRO Bangalore.
2. Real-time Safety-critical Systems Design, ICACNI, June 8, 2018, NIT Silchar.
3. Optimal Scheduling of Real-time Tasks using Supervisory Control Theory of Discrete Event Systems. June 08, 2017, ACMU, ISI Kolkata.
4. Performance Validation in Real-Time Cyber-Physical Systems. One-day seminar on "Emerging topics in Computer Science", May 01, 2017, NIT Meghalaya.
5. Dynamic Resource Allocation for Cloud Data Centers. Faculty Development Program on "Cloud Computing with AWS", Dec 06, 2016, IIIT Guwahati. Organized by: E & ICT Academy, IIT Guwahati
6. IoT and its Use-cases in Diverse Domains. Workshop on "IoT: A Gateway to Smart and Intelligent Future", Nov 04, 2016, NIT Meghalaya. Organized by: E & ICT Academy, IIT Guwahati
7. CAD for Digital VLSI: From Concept to Chip. Workshop on "Electronics System Design and Manufacturing", Mar 16, 2015, IIT Guwahati.
8. CAD for Digital VLSI Design Automation. STC on "Recent Trends in Electronics and Computation", Mar 9-13, 2015, IIT Guwahati.
9. Real-Time Scheduling in Distributed Environments. STC on "Recent Trends in Networks and Distributed Computing", Feb 10-14, 2015, IIT Guwahati.
10. Introduction to Real-Time Embedded Systems Design. STC on "Real-Time Embedded Systems - Design, Verification and Test", Nov 27-29, 2014, IIT Guwahati.
11. Routing Algorithms in VLSI Physical Design Automation. Oct, 2014, IIT Patna.
12. Real-time Scheduling on Multiprocessors: Problems and Algorithms. May, 2013, Calcutta University.

Awards

1. MSR India PhD fellowship Award from Microsoft Research India, in 2007.
2. National Doctoral Fellowship (NDF) from AICTE, Ministry of HRD, Govt. of India, in 2006.

3. National Scholarship from Ministry of HRD, Government of India, in 2001.

Other Professional Services

1. Chairman, Technical Board, IIT Guwahati (Mar 2018 – Oct 2019)
2. Warden, Dibang Hostel, IIT Guwahati (Apr 2016 – Oct 2017)
3. External Reviewer to IEEE Transactions on Computers (IEEE TC), IEEE Transactions on Systems, Man and Cybernetics (IEEE TSMC), Journal of Parallel and Distributed Computing (JPDC), Journal of Systems and Software (JSS), IET Computers and Digital Techniques etc.
4. Member TPC: ES & VLSID 2018, 2017, 2016, ISED 2016, VDAT 2016, WALCOM 2019; Publication Chair: VDAT 2016, ISED 2017.