

Sanjit Kumar Roy

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Education

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| • Ph.D. in Computer Science & Engineering , IIT Guwahati, India. | Jul 2013 - Sep 2022 |
| Thesis: <i>Task and Message Co-scheduling Strategies in Real-Time Cyber-Physical Systems.</i> | |
| • Master of Technology (M.Tech.) in Information Technology , NIT Durgapur, India | Aug 2011 - May 2013 |
| Thesis: <i>Application of Distributed Key Generation in Secured Sealed-Bid Auction Mechanism.</i> | |
| • Bachelor of Technology (B.Tech.) in Information Technology , WBUT (now MAKAUT), India | Aug 2004 - May 2008 |

Research Interest

While I am always open to exploring new research areas, my current interests lie in **Embedded Systems Design, Real-Time Scheduling, Cyber-Physical Systems, and Optimization**.

Research Experience

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| • Postdoctoral Fellow at <i>Dept. of Information Technology, Uppsala University, Sweden</i> | Aug. 2023 - To Date |
| Supervisor: Prof. Wang Yi | |

Applications in real-time systems are often modeled as Multi-Rate Directed Acyclic Graphs (MR-DAGs) to effectively represent the relationships and dependencies between various tasks operating at different rates. Each node in an MR-DAG represents a specific task, while edges represent inter-task dependencies. One of the major advantages of the MR-DAG model is that tasks can execute concurrently, even when dependencies exist among them. However, this concurrency introduces several challenges, including:

- How to schedule an MR-DAG efficiently?
- How to preserve the processing order of inputs corresponding to external events when dependent tasks execute concurrently?
- What is the *Worst-Case Response Time* (WCRT)?

At present, I am working to address these challenges

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|--|-----------------------|
| • Doctor of Philosophy (Ph.D.) at <i>Dept. of CSE, IIT Guwahati, India</i> | Jul. 2013 - Sep. 2022 |
| Thesis Title: Task and Message Co-scheduling Strategies in Real-time Cyber-Physical Systems | |
| Supervisor: Prof. Arnab Sarkar | |

The principal aim of the Ph.D. dissertation has been to investigate a few important theoretical and practical aspects of task-message co-scheduling strategies in safety-critical Cyber-Physical Systems (CPSs), keeping in view the challenges/hurdles related to timing requirements, resource constraints, energy minimization, etc. In particular, the objectives of the work are as follows:

- Development of co-scheduling strategies for a set of independent periodic tasks executing on a bus-based homogeneous multi-processor system, with the objective of maximizing system level Quality of Service (QoS).
- Design and implementation of QoS adaptive scheduling mechanisms for real-time systems modeled as Precedence-constrained Task Graphs (PTGs), on fully-connected heterogeneous multiprocessor systems.
- Development of optimal and heuristic co-scheduling strategies for PTGs executing on a shared-bus based heterogeneous distributed platform.
- Design of an energy-aware processor-bus co-scheduling strategy for multiple independent PTGs executing on a bus based heterogeneous platform.

Publications

Journal Papers

1. **Sanjit Kumar Roy**, Rajesh Devaraj and Arnab Sarkar. “SAFLA: Scheduling Multiple Real-time Periodic Task Graphs on Heterogeneous Systems.” *IEEE Transactions on Computers (IEEE TC)*, Volume 72, Pages 1067-1080, 2022. [\[DOI\]](#)

2. **Sanjit Kumar Roy**, Rajesh Devaraj, Arnab Sarkar and Debabrata Senapati. “SLAQA: Quality-level Aware Scheduling of Task Graphs on Heterogeneous Distributed Systems.” *ACM Transactions on Embedded Computing Systems (ACM TECS)*, Volume 20, Pages 1-31, 2021. [\[DOI\]](#)
3. **Sanjit Kumar Roy**, Rajesh Devaraj and Arnab Sarkar. “Contention Cognizant Scheduling of Task Graphs on Shared Bus based Heterogeneous Platforms.” *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (IEEE TCAD)*, Volume 41, Pages 281-293, 2021. [\[DOI\]](#)
4. **Sanjit Kumar Roy**, Rajesh Devaraj, Arnab Sarkar, Sayani Sinha and Kankana Maji. “Contention-aware optimal scheduling of real-time precedence-constrained task graphs on heterogeneous distributed systems.” *Elsevier Journal of Systems Architecture (JSA)*, Volume 105, 2020. [\[DOI\]](#)

Conference Papers

1. **Sanjit Kumar Roy**, Arnab Sarkar and Rahul Gangopadhyay. “Processor and Bus Co-scheduling Strategies for Real-time Tasks with Multiple Service-levels.” *IEEE 27th International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA)*, Pages 21-30, 2021. [\[DOI\]](#)
2. **Sanjit Kumar Roy**, Rajesh Devaraj, Arnab Sarkar, Sayani Sinha and Kankana Maji. “Optimal scheduling of precedence-constrained task graphs on heterogeneous distributed systems with shared buses.” *IEEE 22nd International Symposium on Real-Time Distributed Computing (ISORC)*, Pages 185-192, 2019. [\[DOI\]](#)
3. **Sanjit Kumar Roy**, Rajesh Devaraj and Arnab Sarkar. “Optimal scheduling of PTGs with multiple service levels on heterogeneous distributed systems.” *American Control Conference (ACC)*, Pages 157-162, 2019. [\[DOI\]](#)
4. Jaydeep Howlader, **Sanjit Kumar Roy**, Ashis Kumar Mal. “Practical Receipt-Free Sealed-Bid Auction in the Coercive Environment”. *16th International Conference on Information Security and Cryptology (ICISC)*, Pages 418-434, 2013. [\[DOI\]](#)

Teaching Interest

Real-Time Systems, Data Structures, Algorithms, Digital Design, Operating Systems, Computer Organization & Architecture, etc.

Teaching Experience

- **Postdoc** at Uppsala University, Sweden Aug. 2023 - To Date
 - Courses taught: Real Time Systems (1DT063 & 1DT004)
- **Assistant Professor** at SRM University AP, Andhra Pradesh, India Dec. 2021 - Jul. 2023
 - Courses taught: Operating Systems (CSE301), Operating Systems Lab (CSE301L), Design and Analysis of Algorithms (CSE201), Design and Analysis of Algorithms Lab (CSE201L), Data Structures (CSE107), Data Structures Lab (CSE107L)
- **Assistant Professor** at UPES, Dehradun, India Sep. 2021 - Dec. 2021
- **Teaching Assistant** at IIT Guwahati, India Jul. 2013 - Dec. 2018
 - Courses: Operating Systems Lab (CS342), CAD for VLSI (CS526), Data Structure Laboratory (CS210), Compilers Lab (CS347), Data Structures Lab (CS513), Computer Systems (CS548), Programming Languages Lab (CS431), Computing Lab (CS110), System Software Lab (CS241)
- **Teaching Assistant** at NIT Durgapur, India Aug. 2011 - May 2013
 - Courses: Operating System Lab, Microprocessor Lab
- **Teaching Assistant** of the NPTEL Online Certification course, “Optimization Techniques for Digital VLSI Design”, funded by the MHRD, Govt. of India, organized at IIT Guwahati, India Feb. - Mar. 2018
- **Teaching Assistant** of the NPTEL Online Certification course, “Embedded Systems-Design Verification And Test”, funded by the MHRD, Govt. of India, organized at IIT Guwahati, India Jul. - Oct. 2018

Language/Tool Skills

C, Python, Java, Ada, Shell Script, CPLEX, Embedded C, Assembly Language, Matlab

Conference Presentation

- ISORC 2019, Valencia, Spain (May, 2019)
- RTCSA 2021, Virtual Conference (August, 2021)

Awards & Scholarships

I was awarded government scholarships for both my **M.Tech** and **Ph.D. studies**, fully funded by the **Ministry of Education (formerly MHRD), Government of India**. I also received **conference travel grants** from the Ministry to attend international conferences, including **IEEE RTCSA** and **IEEE ISORC**.

Professional Activities

- Reviewer
 - Journals: Complex & Intelligent Systems (Springer CAIS)
 - Conferences: COMSNETS 2022, Indicon 2021, VDAT 2016
- Volunteer in FSTTCS, Dec. 2013, IIT Guwahati, India
- Volunteer and active participant in GIAN course, “Mixed-Criticality Real-Time Systems”, funded by the MoE (MHRD), Govt. of India, organized at IIT Guwahati, May 2018

Referees

• Dr. Arnab Sarkar

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Kharagpur - 721302, West Bengal, India
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• Dr. Chandan Karfa

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• Dr. Wang Yi

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