

Indranil Saha, Ph.D.

CONTACT

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CURRENT POSITION

Associate Professor
Department of Computer Science and Engineering
Indian Institute of Technology Kanpur
January 2020 – Present

EDUCATION

Ph.D. in Computer Science, University of California Los Angeles
June 2013
M.Tech. in Computer Science, Indian Statistical Institute, Kolkata
August 2005
B.Tech. in Electronics and Communication Engineering, Kalyani Govt. Engg. College
June 2003

RESEARCH INTERESTS

Embedded and Cyber-Physical Systems
Robotics and Automation
Artificial Intelligence and Machine Learning
Software Engineering and Formal Methods

RESEARCH EXPERIENCE

Assistant Professor at the Department of Computer Science and Engineering, IIT Kanpur
July 2015 – December 2019
Postdoctoral Researcher at University of California Berkeley and University of Pennsylvania
July 2013 – June 2015
• Advisors: Prof. Sanjit A. Seshia and Prof. George J. Pappas
• Member of ExCAPE project (<https://excape.cis.upenn.edu/>)
• Member of TerraSwarm project (<https://www.terraswarm.org/>)
Research Assistant at the Computer Science Department of University of California Los Angeles
September 2008 – June 2013
Research Associate at Computer Science laboratory of SRI International, Menlo Park, CA, USA
June 2010 – September 2010, June 2011– September 2011, July 2012 – September 2012
Technical Consultant at Toyota Technical Center, North America
October 2010 – June 2012
Visiting Researcher at Max Planck Institute for Software Systems (MPI-SWS)
November 2010 – December 2010, April 2011 – June 2011, November 2011 – December 2011,
May 2012 – June 2012, October 2012 – December 2012
Research Scientist at Honeywell, Bangalore, India
August 2005 – August 2008

TEACHING
EXPERIENCE

Department of Computer Science and Engineering, IIT Kanpur

Course Instructor for Undergraduate Courses:

January – April 2018: *CS101: Introduction to Computing*

January – April 2017: *CS220: Computer Organization*

January – April 2022, 2023, 2024: *CS220: Software Development and Operations*

Course Instructor for Undergraduate Courses:

July – November 2016, 2018, 2020 – 2024: *CS637: Embedded and Cyber-Physical Systems*

January – April 2016, 2019, 2020: *CS638: Formal Methods for Robotics and Automation*

July – November 2017, 2019: *CS652: Computer Aided Verification*

January – April 2021: *CS59: Autonomous Cyber-Physical Systems*

Computer Science Department, University of California Los Angeles

January 2010 – June 2010

Teaching Assistant for *CS 130: Software Engineering*

- In Winter 2010 with Prof. Paul Eggert
- In Spring 2010 with Prof. Rupak Majumdar

Honeywell Research Lab, Bangalore

August 2005 – December 2005

Seminar series speaker for *Distributed Computing*

AWARDS AND
RECOGNITIONS

Best Repeatability Evaluation Award in HSCC 2023 for the paper entitled “Safe Self Triggered Control Based on Precomputed Reachability Sequences”

Best Paper Nomination in HSCC 2022 for the paper entitled “Using Intersection of Unions to Minimize Multi-directional Linearization Error in Reachability Analysis”

IIT Kanpur **P. K. Kelkar Faculty Fellowship** 2020-2023

DST SERB Early Career Research Award 2016

UCLA **Dissertation Year Fellowship** 2012-2013

ACM SIGBED **Frank Anger Memorial Award** 2012

UCLA nomination for **Microsoft Research Fellowship** 2011-2012

Best Paper Nomination in EMSOFT 2012 for the paper entitled “Synthesis of Minimal Error Control Software”

Best Paper Award in EMSOFT 2010 for the paper entitled “Automatic Verification of Control System Implementations”

Team Innovation Award from Honeywell Technology Solutions, Bangalore, India for the innovation project titled “A Pay-off Matrix Model for Collaborative Monitoring” in 2008

Exponent-Call For Proposal Award from Honeywell Technology Solutions, Bangalore, India in recognition and appreciation of collaboratively defining the winning proposal titled “Energy Efficient Algorithms for Distributed Wireless Networks” in 2007

Individual Excellence Award from Honeywell Technology Solutions, Bangalore, India for outstanding performance, dedicated efforts, excellent contributions and attitude during the completion of the 1st phase of the project “Translator from C to Simulink models” in 2007

COMSWARE 2007 top 8 paper

Finalist for **Sunity Kumar Pal Best Dissertation Award** in the graduating batch of Master of Technology in Computer Science at ISI Kolkata in 2005

National Scholarship in recognition of the high position secured in the list of meritorious candidates qualifying for awards in the Higher Secondary Examination in 1999

National Scholarship in recognition of the high position secured in the list of meritorious candidates qualifying for awards in the Secondary Examination in 1997

RESEARCH
FUNDINGS

Design of Feedback Controllers for Safe Operations of Autonomous Systems (PI)

Sponsor: SERB MATRICS

Funding: INR 6,60,000

Duration: 3 year (February 2020 - February 2023)

Precise and protective agriculture with a cloud-based multi-UAV system (Faculty Advisor)

Sponsor: DST, Lockheed Martin and Tata Trusts

Funding: INR 11,00,000

Duration: 1 year (August 2019 – July 2020)

Developing Safe and Secure Autonomous Cyber-Physical Systems (PI)

Sponsor: MHRD SPARC

Funding: INR 71,76,000

Duration: 2 years

Cloud-Assisted Receding Horizon Planning for Large Scale Multi-Robot Applications (PI)

Sponsor: Google Cloud Platform Research Award

Funding: USD 6000

Duration: 6 months

Max-Planck Partner Group with Max-Planck Institute for Software Systems (PI)

Sponsor: Max-Planck Society

Funding: EUR 100000

Duration: 5 years

Automated Synthesis of Motion Plans for Large-Scale Multi-Robot Systems from Complex Specifications (PI)

Sponsor: DRDO JCBCAT

Funding: INR 1,12,42,600

Duration: 3 years

Formal Verification of Autopilot Software for UAV (PI)

Sponsor: Indo-French Centre for the Promotion of Advanced Research (DST-Inria-CNRS Targeted Programme)

Funding: INR 37,00,803

Duration: 3 years

Cloud-Assisted Receding Horizon Planning for Large Scale Multi-Robot Applications (PI)

Sponsor: Microsoft Azure Research Award Grant

Funding: USD 20,000

Duration: 1 year

FMSAFE: A Networked Centre for Formal Methods in Validation and Certification Procedures for Safety- Critical ICT Systems (Co-PI)

Sponsor: MHRD IMPRINT Program and Indian Railways

Funding: INR 1,15,70,000

Duration: 3 years

A Framework for Synthesizing Robust Motion Primitives for UAVs (PI)

Sponsor: DST SERB Early Career Research Award

Funding: INR 52,47,000

Duration: 3 years

An End-to-End Software Development Framework for Robot Swarm Applications (PI)

Sponsor: DAAD Research Stay Grant

Funding: EUR 4,525

Duration: 2 months

Formal Methods Assisted Software Development Frameworks for Complex Robotic Applications
(PI)
Sponsor: IIT Kanpur Initiation Grant
Funding: INR 25,00,000
Duration: 2 years

PUBLICATIONS

- BOOK Balaram Saha and Indranil Saha. **Analog Electronic Circuits**. New Age International, June 2016. ISBN: 978-8122440386.
- JOURNAL Samvid Mistry, Indranil Saha and Swarnendu Biswas. **An MILP Encoding for Efficient Verification of Quantized Deep Neural Networks**. *IEEE Trans. Comput. Aided Des. Integr. Circuits Syst.* (2022)
(The paper will be presented in the International Conference on Embedded Software (EMSOFT 2022), ACM/IEEE, hybrid-Sanghaai, October 10-12, 2022)
- Nikhil Kumar Singh and Indranil Saha. **Specification Guided Automated Synthesis of Feedback Controllers**. *ACM Trans. Embed. Comput. Syst.* 20(5s): 80:1-80:26 (2021)
(The paper has been presented in the International Conference on Embedded Software (EMSOFT 2021), ACM/IEEE, virtual conference, October 8-15, 2021)
- Nikhil Kumar Singh and Indranil Saha. **Specification Guided Automatic Debugging of CPS Models**. *IEEE Trans. Comput. Aided Des. Integr. Circuits Syst.* 39(11): 4142-4153 (2020)
(The paper has been presented in the International Conference on Embedded Software (EMSOFT 2020), ACM/IEEE, virtual conference, September 20-25, 2020)
- Ivan Gavran, Rupak majumdar, Indranil Saha. **ANTLAB: A Multi-Robot Task Server**. *ACM Trans. Embedded Comput. Syst.* 16(5): 190:1-190:19 (2017)
(The paper has been presented in the International Conference on Embedded Software (EMSOFT 2017), ACM/IEEE, Seoul, South Korea, October 15-20, 2017)
- Suman Roy, Janardan Misra and Indranil Saha. **A Simplification of a Real-Time Verification Problem**. *Software Testing, Verification and Reliability* 26(8): 548-571 (2016)
- Indranil Saha, Suman Roy and S. Ramesh. **Formal Verification of Fault-Tolerant Startup Algorithms for Time-Triggered Architectures: A Survey**. *The Proceedings of the IEEE*, special issue on *Industrial Cyber-Physical Systems* (2016)
- Janardan Misra and Indranil Saha. **Artificial Neural Networks in Hardware: A Survey of Two Decades of Progress**. *Neurocomputing* 74(1-3): 239-255 (2010)
- Indranil Saha, Lokesh K. Sambasivan, Ranjeet K. Patro, Subhas K. Ghosh. **Distributed Fault Tolerant Topology Control in Wireless Multi-hop Networks**. *Wireless Networks* 16(6): 1511-1524 (2010)
- Indranil Saha, Bhargab B. Bhattacharya, Sheng Zhang, and Sharad C. Seth. **Planar Straight-Line Embedding of Double-Tree Scan Architecture on a Rectangular Grid**. *Fundamenta Informaticae* 89(2-3): 331-344 (2008)
- CONFERENCE AND WORKSHOP Ratijit Mitra and Indranil Saha. **Online On-Demand Multi-Robot Coverage Path Planning**. In *Proceedings of International Conference on Robotics and Automation (ICRA 2024)*. IEEE, Yokohama, Japan, May 13 - 17, 2024.
- Rohit Singh and Indranil Saha. **An Online Planning Framework for Multi-Robot Systems with LTL Specification**. In *Proceedings of the 15th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS 2024)*. IEEE, Hong Kong, China, May 13 - 16, 2024.
- Nikhil Kumar Singh and Indranil Saha. **Frugal Actor-Critic: Sample Efficient Off-Policy Deep Reinforcement Learning Using Unique Experiences**. In *Proceedings of the 23rd*

- International Conference on Autonomous Agents and Multi-Agent Systems (AAMAS 2024)*. IFAAMAS, Auckland, New Zealand, May 6 - May 10, 2024.
- Aakash and Indranil Saha. **Optimal Makespan in a Minute Timespan! A Scalable Multi-Robot Goal Assignment Algorithm for Minimizing Mission Time**. In *Proceedings of the 38th AAAI Conference on Artificial Intelligence (AAAI 2024)*. AAAI, Vancouver, Canada, February 20 - February 27, 2024.
- Thao Dang, Alexandre Donze, Inzemamul Haque, Nikolaos Kekatos, Indranil Saha. **Counter-Example Guided Imitation Learning of Feedback Controllers from Temporal Logic Specifications**. Accepted in *62nd IEEE Conference on Decision and Control (CDC 2023)*. IEEE, Singapore, December 13-15, 2023.
- Tanmoy Kundu and Indranil Saha. **Approximation Algorithms for Charging Station Placement for Mobile Robots**. Accepted in *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2023)*. IEEE, Detroit, Michigan, USA, October 1 - October 5, 2023.
- Arvind Adimoolam, Indranil Saha and Thao Dang. **Safe Self-Triggered Control Based on Precomputed Reachability Sequences**. In *Proceedings of the ACM International Conference on Hybrid Systems: Computation and Control (HSCC 2023)*. ACM, San Antonio, Texas, USA, May 9 - May 12, 2023.
- Nikhil Kumar Singh and Indranil Saha. **STL-Based Synthesis of Feedback Controllers Using Reinforcement Learning**. In *Proceedings of the 37th AAAI Conference on Artificial Intelligence (AAAI 2023)*. AAAI, Washington DC, USA, February 7 - February 14, 2023.
- Dhaval Gujarathi and Indranil Saha. **MT*: Multi-Robot Path Planning for Temporal Logic Specifications**. In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2022)*. IEEE, Kyoto, Japan, October 23 - October 27, 2022.
- Amit Dhyani and Indranil Saha. **Temporal Logic Path Planning under Localization Uncertainty**. In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2022)*. IEEE, Kyoto, Japan, October 23 - October 27, 2022.
- Ratijit Mitra and Indranil Saha. **Scalable Online Coverage Path Planning for Multi-Robot Systems**. In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2022)*. IEEE, Kyoto, Japan, October 23 - October 27, 2022.
- Samvid Mistry, Indranil Saha and Swarnendu Biswas. **An MILP Encoding for Efficient Verification of Quantized Deep Neural Networks**. In *the ACM SIGBED International Conference on Embedded Software (EMSOFT 2022)*. ACM, Hybrid Conference, October 10 - October 12, 2022.
- Aakash and Indranil Saha. **It Costs to Get Costs! A Heuristic-Based Scalable Goal Assignment Algorithm for Multi-Robot Systems**. In *Proceedings of the 32nd International Conference on Automated Planning and Scheduling (ICAPS 2022)*. AAAI, Virtual Conference, June 13 - June 24, 2022.
- Arvind Adimoolam and Indranil Saha. **Using Intersection of Unions to Minimize Multi-directional Linearization Error in Reachability Analysis**. In *Proceedings of the ACM International Conference on Hybrid Systems: Computation and Control (HSCC 2022)*. ACM, Virtual Conference, May 4 - May 6, 2022.
- Priya Purohit and Indranil Saha. **DT*: Temporal Logic Path Planning in a Dynamic Environment**. In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2021)*. IEEE, Virtual Conference, September 27 - October 1, 2021.
- Tanmoy Kundu and Indranil Saha. **Mobile Recharger Path Planning and Recharge Scheduling in a Multi-Robot Environment**. In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2021)*. IEEE, Virtual Conference, September 27 - October 1, 2021.

- Nikhil Kumar Singh and Indranil Saha. **Specification Guided Automated Synthesis of Feedback Controllers.** In *ACMSIGBED International Conference on Embedded Software (EMSOFT 2021)*, ACM/IEEE, virtual conference, October 8-15, 2021.
- Sankar Narayan Das, Swaprava Nath and Indranil Saha. **OMCoRP: An Online Mechanism for Competitive Robot Prioritization.** In *Proceedings of International Conference on Automated Planning and Scheduling (ICAPS 2021)*, AAAI, Virtual Conference, August 2-13, 2021.
- Tanmoy Kundu and Indranil Saha. **SMT-Based Optimal Deployment of Mobile Rechargers.** In *Proceedings of International Conference on Robotics and Automation (ICRA 2021)*, IEEE, Virtual Conference, May 30- June 5, 2021.
- Nikhil Kumar Singh and Indranil Saha. **Specification Guided Automatic Debugging of CPS Models.** In *ACM SIGBED International Conference on Embedded Software (EMSOFT 2020)*, ACM/IEEE, virtual conference, September 20-25, 2020.
- Danish Khalidi, Dhaval Gujarathi and Indranil Saha. **T*: A Heuristic Search Based Motion Planning Algorithm for Temporal Logic Specifications** In *Proceedings of International Conference on Robotics and Automation (ICRA 2020)*, IEEE, Paris, France, May 31- June 4, 2020.
- Pratyush Varshney, Gajendra nagar, and Indranil Saha. **DeepControl: Energy-Efficient Control of a Quadrotor using a Deep Neural Network.** In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2019)*. IEEE, Macau, China, November 4-8, 2019.
- Tanmoy Kundu and Indranil Saha. **Energy-Aware Temporal Logic Motion Planning for Mobile Robots.** In *Proceedings of International Conference on Robotics and Automation (ICRA 2019)*, IEEE, Montreal, Canada, May 20-24, 2019.
- Houssam Abbas, Indranil Saha, Yasser Shoukry, Rüdiger Ehlers, Georgios Fainekos, Rajesh Gupta, Rupak Majumdar, Dogan Ulus. **Embedded software for robotics: challenges and future directions: special session.** In *Proceedings of the International Conference on Embedded Software (EMSOFT 2018)*, IEEE, Torino, Italy, September 30 - October 5, 2018.
- Tanmoy Kundu and Indranil Saha. **Charging Station Placement for Indoor Robotic Applications.** In *Proceedings of International Conference on Robotics and Automation (ICRA 2018)*, IEEE, Brisbane, Australia, May 21-25, 2018
- Sankar Narayan Das and Indranil Saha. **Receding Horizon Multi-Robot Coverage.** In *Proceedings of the 9th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPSS 2017)*, ACM/IEEE, Porto, Portugal, April 11-13, 2018
- Yasser Shoukry, PierLuigi Nuzzo, Ayca Balkan, Indranil Saha, Alberto L. Sangiovanni-Vincentelli, Sanjit A. Seshia, George J. Pappas and Paulo Tabuada. **Linear Temporal Logic Motion Planning for Teams of Underactuated Robots Using Satisfiability Modulo Convex Programming.** In *Proceeding of the 56th IEEE Conference on Decision and Control (CDC 2016)*, IEEE, Melbourne, Australia, December 12-15, 2017.
- Ivan Gavran, Rupak majumdar, Indranil Saha. **ANTLAB: A Multi-Robot Task Server.** In *the ACM SIGBED International Conference on Embedded Software (EMSOFT 2017)*, ACM/IEEE, Seoul, South Korea, October 15-20, 2017.
- Ankush Desai, Indranil Saha, Jianqiao Yang, Shaz Qadeer, Sanjit A. Seshia. **DRONA: A Framework for Safe Distributed Mobile Robotics.** In *Proceedings of the 8th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPSS 2017)*, ACM/IEEE, Pittsburgh, USA, April 18-21, 2017
- Yasser Shoukry, PierLuigi Nuzzo, Indranil Saha, Alberto L. Sangiovanni-Vincentelli, Sanjit A. Seshia, George J. Pappas and Paulo Tabuada. **Scalable Motion Planning Using Lazy SMT-Based Solving.** In *Proceeding of the 55th IEEE Conference on Decision and Control (CDC 2016)*, IEEE, Las Vegas, USA, December 12-14, 2016

- Indranil Saha, Rattanachai Ramaitithima, Vijay Kumar, George J. Pappas and Sanjit A. Seshia. **Implan: Scalable Incremental Motion Planning for Multi-Robot Systems.** In *Proceedings of the ACM/IEEE 7th International Conference on Cyber-Physical Systems (ICCPS 2016)*, ACM/IEEE, Vienna, Austria, April 11-14, 2016
- Indranil Saha and Rupak Majumdar and Sanjoy Baruah. **Dynamic Scheduling for Networked Control Systems.** In *Proceedings of the International Conference on Hybrid Systems: Computation and Control (HSCC 2015)*, ACM, Seattle, USA, April 14-16, 2015
- Indranil Saha, Rattanachai Ramaitithima, Vijay Kumar, George J. Pappas and Sanjit A. Seshia. **Automated Composition of Motion Primitives for Multi-Robot Systems from Safe LTL Specifications** In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2014)* IEEE/RSJ, Chicago, USA, September 14-18, 2014.
- Rupak Majumdar, Indranil Saha, Koichi Ueda and Hakan Yazarel. **Compositional equivalence checking for Simulink models and C code** In *Proceedings of the 52nd IEEE Conference on Decision and Control (CDC 2013)*, IEEE, Florence, Italy, December 10-13, 2013
- Eva Darulova, Viktor Kuncak, Rupak Majumdar and Indranil Saha. **Synthesis of fixed-point programs.** In *Proceedings of the International Conference on Embedded Software (EMSOFT 2013)*, ACM, Montreal, Canada, September 29-October 4, 2013
- Indranil Saha and Rupak Majumdar. **Trigger Memoization in Self-Triggered Control.** In *Proceedings of the International Conference on Embedded Software (EMSOFT 2012)*, ACM, Tampere, Finland, October 9-14, 2012
- Rupak Majumdar, Indranil Saha, Majid Zamani. **Synthesis of Minimal Error Control Software.** In *Proceedings of the International Conference on Embedded Software (EMSOFT 2012)*, ACM, Tampere, Finland, October 9-14, 2012 (Best Paper Nomination)
- Sam Owre, Indranil Saha and Natarajan Shankar. **Automatic Dimensional Analysis of Cyber-Physical Systems.** In *Proceedings of Formal Methods Europe (FM 2012)*, LNCS, Paris, France, August 27-31, 2012
- Rupak Majumdar, Indranil Saha, K. C. Shashidhar and Zilong Wang. **CLSE: Closed-Loop Symbolic Execution.** In *Proceedings of the 4th NASA Formal Methods Symposium (NFM 2012)*, LNCS, Norfolk, Virginia, USA, April 3-5, 2012
- Indranil Saha and Natarajan Shankar. **ModelRob: A Simulink Library for Model-Based Development of Robot Manipulators.** In *Proceedings of the International Conference on Robotics and Automation (ICRA 2012)*, IEEE, St. Paul, Minnesota, USA, May 14-18, 2012
- Rupak Majumdar, Indranil Saha, Majid Zamani. **Performance-Aware Scheduler Synthesis for Control Systems.** In *Proceedings of the International Conference on Embedded Software (EMSOFT 2011)*, ACM, Taipei, Taiwan, October 9-14, 2011
- Adolfo Anta, Rupak Majumdar, Indranil Saha, Paulo Tabuada. **Automatic Verification of Control System Implementations.** In *Proceedings of the International Conference on Embedded Software (EMSOFT 2010)*, ACM, Scottsdale, USA, October 24-29, 2010 (Best Paper Award)
- Rupak Majumdar, Indranil Saha, Zilong Wang. **Systematic Testing for Control Applications.** In *Proceedings of the 8th ACM/IEEE International Conference on Formal Methods and Models for Codesign (MemoCODE 2010)*. IEEE Computer Society, Grenoble, France, July 26-28, 2010 (Invited Paper)
- Rupak Majumdar, Indranil Saha. **Symbolic Robustness Analysis.** In *Proceedings of the 30th IEEE Real-Time Systems Symposium (RTSS 2009)*, IEEE Computer Society, Washington DC, USA, December 1-4, 2009
- Indranil Saha, Debapriyay Mukhopadhyay. **Quantitative Analysis of a Probabilistic Non-Repudiation Protocol through Model Checking.** In *Proceedings of the 5th International Conference on Information Systems Security (ICISS 2009)*, LNCS 5905, Springer, pp. 292-300, Kolkata, India, December 14-18, 2009

- Janardan Misra, Indranil Saha. **A Reinforcement Model for Collaborative Security and its Formal Analysis.** In *Proceedings of 2009 New Security Paradigm Workshop (NSPW2009)*, ACM, Oxford, UK, September 8-11, 2009
- Indranil Saha, Kuntal Chakraborty, Suman Roy, I. VishnuVardhan, Venkatappaia Kurapati. **An Approach to Reverse Engineering of C program to Simulink Models with Conformance Testing.** In *2nd Indian Software Engineering Conference (ISEC 2009)*, ACM, pp. 137-138, Pune, India, February 22-26, 2009
- Indranil Saha, Debapriyay Mukhopadhyay. **Security against Sybil Attack in Wireless Sensor Network through Location Verification.** In *Proceedings of 10th International Conference on Distributed Computing and Networking (ICDCN 2009)*, LNCS 5408, Springer, pp. 187-192, Hyderabad, India, January 3-6, 2009
- Indranil Saha, Janardan Misra, Suman Roy. **Timeout and Calendar based Finite State Modeling and Verification of Real-Time Systems.** In *Proceedings of the 5th International Symposium on Automated Technology for Verification and Analysis (ATVA 2007)*, LNCS 4762, Springer, pp. 284-299, Tokyo, Japan, October 22 -25, 2007
- Indranil Saha, Suman Roy, Kuntal Chakraborty. **Modeling and Verification of TTCAN Startup Protocol Using Synchronous Calendar.** In *Proceedings of the 5th IEEE International Conference on Software Engineering and Formal Methods (SEFM 2007)*, IEEE Computer Society, pp. 69-79, London, UK, September 11-15, 2007
- Indranil Saha, Debapriyay Mukhopadhyay. **A Distributed Algorithm of Fault Recovery for Stateful Failover.** In *Proceedings the 4th Annual Conference on Theory and Applications of Models of Computation (TAMC07)*, LNCS 4484, Springer, pp. 738-749, Sanghai, China, May 22-25, 2007
- Indranil Saha, Suman Roy. **A Finite State Analysis of Time-triggered CAN (TTCAN) Protocol using Spin.** In *Proceedings of the International Conference on Computing: Theory and Application (ICCTA 2007)*, IEEE Computer Society, pp. 77-81, Kolkata, March 5-7, 2007
- Indranil Saha, Lokesh K. Sambasivan, Ranjeet K. Patro, Subhas K. Ghosh. **Distributed Fault Tolerant Topology Control in Static and Mobile Wireless Ad-hoc Networks.** In *Proceedings of the 2nd International Conference on Communication System Software and Middleware (COMSWARE 2007)*, IEEE Computer Society, Bangalore, India, January 7-12, 2007 (A Top 8 Paper)
- Debapriyay Mukhopadhyay, Indranil Saha. **Location Verification Based Defense against Sybil Attack in Sensor Networks.** In *Proceedings of the 8th International Conference on Distributed Computing and Networking (ICDCN 2006)*, LNCS 4308, Springer, pp. 509-521, Guwahati, India, December 27-30, 2006
- Indranil Saha, Debapriyay Mukhopadhyay, Satyajit Banerjee. **Designing Reliable Architecture for Stateful Fault Tolerance.** In *Proceedings of the 7th International Conference on Parallel and Distributed Computing, Applications and Technologies (PDCAT2006)*, IEEE Computer Society, pp. 545-551, Taipei, Taiwan December 4-7, 2006
- Indranil Saha, Suman Roy. **A Finite State Modeling of AFDX Frame Management using Spin.** In *Proceedings of the 11th International Workshop on Formal Methods for Industrial Critical Systems (FMICS 2006)*, LNCS 4346, Springer, pp. 227-243, Bonn, Germany, August 26-27, 2006
- Indranil Saha, Lokesh K. Sambasivan, Ranjeet K. Patro, Subhas K. Ghosh. **Distributed Fault Tolerant Topology Control in Wireless Ad-hoc Sensor Networks.** In *Proceedings of the 3rd International Conference on Wireless and Optical Communication Networks (WOCN 2006)*, IEEE Computer Society, Bangalore, India, April 11-13, 2006

TALKS

An Online Planning Framework for Heterogeneous Multi-Robot Systems with LTL Specification at

- The 15th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS 2024), Hong Kong, China, May 14-16, 2024.
- The 4th International Workshop on Generative AI and Human-Robot Interaction, IIIT Allahabad, India, February 16-18, 2024

Specification-Driven Synthesis of Feedback Controller Using Reinforcement Learning at

- The 4th Workshop on Computation-Aware Algorithmic Design for Cyber-Physical Systems (A co-located workshop of the CPS-IoT week 2024), Hong Kong, May 13, 2024
- The 37th International Conference on VLSI Design and 23rd International Conference on Embedded Systems (VLSID 2024), Kolkata, January 6-10, 2024

Developing Autonomous Multi-Robot Systems for Complex Motions at

- Accenture Labs (Virtual Talk), April 21, 2021
- Workshop on Robotics and Machine Intelligence 2020 organized by the Center of Intelligent Robotics, IIIT Allahabad, India, January 2, 2020
- Verimag, France, July 2, 2019
- ENSTA ParisTech, June 25, 2019

Rhocop: Receding Horizon Multi-Robot Coverage at

- The Robotics Society (India) and IEEE RAS Winter School on Robotics and Autonomous Systems, April 5, 2019
- Ericson R&D, June 13, 2018
- 9th International Conference on Cyber-Physical Systems (ICCPS), Porto, Portugal, April 12, 2018

Automated Task and Motion Plan Generation for Multi-Robot Systems from Complex Specifications at

- Robotics Club Tech Talk Series, IIT Kanpur, January 25, 2024
- AICTE FDP, Amity University (Virtual Talk), January 11-12, 2021
- TEQIP Workshop on Robotics and Automation, IIT Kanpur, February 23, 2020
- QIP Short Term Course on Robotics, IIT Kanpur, India, January 25, 2020
- ITEC-TEQIP Sponsored International Workshop on Robotics, IIT Kanpur, September 27, 2018
- QIP Short Term Course on Deep Learning and Computational Intelligence in Automation and Control, IIT Kanpur, December 4, 2017
- First Cyber-Physical Systems Symposium, IISc, Bengaluru, July 19, 2017
- DRDO Center of Artificial Intelligence and Robotics (CAIR), Bengaluru, July 18, 2016

Implan: Scalable Incremental Motion Planning for Multi-Robot Systems at 7th International Conference on Cyber-Physical Systems (ICCPS), Vienna, Austria, April 14, 2016**Dynamic Scheduling for Networked Control Systems** at 18th International Conference on Hybrid Systems: Computation and Control (HSCC 2015), Seattle, USA, April 15, 2015**Automated Software Synthesis for Cyber-Physical Systems** at

- A Short course on Control of Cyber Physical Systems at IIT Kanpur, March 24, 2017
- Workshop on Development Aspects of Intelligent Adaptive Systems (DIAS 2017), February 5, 2017
- TEQIP Workshop on Advanced Robotics at IIT Kanpur, March 19, 2016
- Microsoft Research, Redmond, USA, April 23, 2015
- Indian Institute of Technology, Kanpur, India, April 7, 2015
- Indian Institute of Science, Bangalore, India, March 30, 2015
- University of Illinois Chicago, USA, March 13, 2015

Compositional Synthesis of Multi-Robot Motion Plans via SMT Solving at

- Dagstuhl seminar on verification of cyber-physical systems, Dagstuhl, Germany, March 17-21, 2014

- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2014), Chicago, September 15, 2014.

Program Analysis and Synthesis for Control Applications at

- CPSGame Seminar Series, UC Berkeley, USA, Dec 6, 2013
- Galois Inc., Portland, USA, May 3, 2013
- ExCAPE project webinar, April 18, 2013
- Shanghai Tech University, Shanghai, China, March 29, 2013

Trigger Memoization in Self-Triggered Control. at International Conference on Embedded Software (EMSOFT 2012), Tampere, Finland, October 11, 2012

Synthesis of Minimal Error Control Software. at International Conference on Embedded Software (EMSOFT 2012), Tampere, Finland, October 11, 2012

Automatic Dimensional Analysis of Cyber-Physical Systems at Formal Methods Europe (FM 2012), Paris, France, August 29, 2012

ModelRob: A Simulink Library for Model-Based Development of Robot Manipulators at

- International Conference on Robotics and Automation (ICRA 2012), St. Paul, Minnesota, USA, May 16, 2012
- Fortiss, Munich, Germany, June 12, 2012

Performance-Aware Scheduler Synthesis for Control Systems at

- International Conference on Embedded Software (EMSOFT 2012), Taipei, Taiwan, October 12, 2011
- GM India Science Lab, Bangalore, India, November 2, 2011
- Fortiss, Munich, Germany, June 11, 2012

Automatic Verification of Control System Implementations at

- International Conference on Embedded Software (EMSOFT 2011), Scottsdale, USA, October 25, 2010
- Computing, Informatics and Decision Systems Engineering Department, Arizona State University, Tempe, USA, October 29, 2010
- In the Meeting of IFIP Working Group 2.3 at SRI International, Menlo Park, CA, USA, June, 2011.
- GM India Science Lab, Bangalore, India, November 2, 2011

Symbolic Robustness Analysis at 30th IEEE Real-Time Systems Symposium (RTSS 2009), Washington DC, USA, December 4, 2009

Quantitative Analysis of a Probabilistic Non-Repudiation Protocol through Model Checking at 5th International Conference on Information Systems Security (ICISS 2009), Kolkata, India, December 18, 2009

A Reinforcement Model for Collaborative Security and its Formal Analysis at New Security Paradigm Workshop (NSPW2009), Oxford, UK, September 10, 2009

Modeling and Verification of TTCAN Startup Protocol Using Synchronous Calendar at 5th IEEE International Conference on Software Engineering and Formal Methods (SEFM 2007), London, UK, September 13, 2007

A Finite State Analysis of Time-triggered CAN (TTCAN) Protocol using Spin at the International Conference on Computing: Theory and Application (ICCTA 2007), Kolkata, India, March 5, 2007

Distributed Fault Tolerant Topology Control in Static and Mobile Wireless Ad-hoc Networks at 2nd International Conference on Communication System Software and Middleware (COMSWARE 2007), Bangalore, India, January 12, 2007

Location Verification Based Defense against Sybil Attack in Sensor Networks at 8th International Conference on Distributed Computing and Networking (ICDCN 2006), Guwahati, India, December 30, 2006

Distributed Fault Tolerant Topology Control in Wireless Ad-hoc Sensor Networks at 3rd International Conference on Wireless and Optical Communication Networks (WOCN 2006), Bangalore, India, April 11, 2006

PATENTS

Janardan Misra, Indranil Saha. **System and Method for Collaborative Monitoring of Policy Violations.** Patent application filed from Honeywell, Bangalore, India. Patent application number: 12/057855

Indranil Saha, Janardan Misra. **Probabilistic Modeling of Collaborative Monitoring of Policy Violation.** Patent application filed from Honeywell, Bangalore, India. Patent application number: 12/171225

Janardan Misra, Indranil Saha. **An Adaptive Learning Approach for Enterprise Threat Management.** Patent application filed from Honeywell, Bangalore, India. Patent application number: 12/171231

SOFTWARE

Complan. A tool for compositional motion planning for multi-robot systems with complex specifications.
<http://www.seas.upenn.edu/~isaha/complan.shtml>

DimSim. A Tool for Automatic Dimensional Analysis of Simulink Models.
<http://www.seas.upenn.edu/~isaha/dimsim.tgz>

ModelRob. A Simulink Library for Modeling of Robot Manipulators.
<http://www.seas.upenn.edu/~isaha/modelrob.tgz>

STUDENTS

POSTDOCTORAL
RESEARCHERS

Dr. Ramesh Yenda (Ph.D. from IIT Hyderabad, August 2023 – till date)
Dr. Arvind Adimoolam (Ph.D. from Verimag, First Postdoc from Cornell University, July 2020 – till date)
Dr. Inzemamul Haque (Ph.D. from IISc, February 2020 – till date)
Dr. Ayan Chakraborty (Ph.D. from IIT Kanpur, January 2019 – June 2020)
- First Position: Postdoctoral researcher at Leibniz University, Hannover, Germany
Dr. Sankar Das (Ph.D. from IIT Kharagpur, February 2016 – March 2020)
- First Position: Principal Research Associate at Accenture Labs, India

PH.D. STUDENTS

Ahmad Irjoob (CSE, January 2021 – till date, international student)
Aishwarya Gupta (CSE, August 2020 – till date, co-advisor with Piyush Rai)
Shatroopa Saxena (CSE, January 2020 – till date)
Nikhil Kumar Singh (CSE, January 2020 – till date)
Aakash (CSE, August 2019 – till date)
Ratijit Mitra (CSE, January 2017 – present)
Tanmoy Kundu (CSE, January 2016 – May 2022)
- First Position: Postdoctoral researcher at Technion, Haifa, Israel

MS STUDENTS

Rohit Singh (CSE, August 2020 – July 2023)
Amit Dhyani (CSE, August 2019 – March 2022)
Priya Purohit (CSE, August 2018 – July 2021)
Nikhil Kumar Singh (CSE, January 2018 – December 2019)
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Pratyush Varshney (CSE, January 2017 – September 2019)

M.TECH STUDENTS Himanshu Karnataka (CSE, August 2023 – till date, co-advisor with Urbi Chatterjee and Debaddatta Mishra)
 Chabil Kansal (CSE, August 2021 – till date)
 Abhinav Dudeja (CSE, August 2021 – till date)
 Lucky Kant Nayak (AE, August 2022 – April 2024)
 Aman Aryan (CSE, August 2020 – January 2024)
 Aakash Kumar Singh (EE, August 2019 – July 2021)
 Samvid Maheshbhai Mistry (CSE, August 2019 – July 2021, co-advisor with Swarnendu Biswas)
 Niravkumar Hasmukhbhai Panchal (CSE, August 2019 – July 2021, co-advisor with Piyush Rai)
 Sivarajesh Anantharaj (CSE, August 2019 – July 2021)
 Prakhyat Sankeshi (CSE, August 2019 – July 2021)
 Kagitha Gopi (CSE, August 2019 – July 2021)
 I G Prasad (CSE, August 2018 – September 2023)
 Manish Mazumder (CSE, August 2018 – June 2020)
 Dhaval Sukhanand Gujarathi (CSE, August 2017 – June 2019)
 Manan Nileshkumar Modi (CSE, August 2017 – June 2019)
 Ravi Kurail (CSE, August 2016 – June 2018)
 Danish Khalidi (CSE, August 2016 – June 2018)

PH.D STUDENTS Dharambir Poddar (AE, January 2020 - May 2024)

CONVERTED TO

M.TECH

B.TECH STUDENTS Pratyush Gupta (CSE, Fall 2023, Winter 2024)
 Ayush Ranjan (ME, Fall 2022, Winter 2022), Nishi Mehta (CSE, Fall 2022, Winter 2022), Nakul Jindal (CSE, Fall 2022), Niket Jain (CSE, Fall 2022), Gaurav Kumar (CSE, Fall 2022)
 Indrani Nekkili (CSE, Summer 2022)
 Rythm Agrawal (CSE, Winter 2021) Sarthak Dubey (CSE, Winter 2021)
 Faizan Siddiqui (MSE, Fall 2020) Prashant Kumar (CSE, Fall 2020)
 Sahil Dhull (CSE, Winter 2020), Jatin Jindal (CSE, Winter 2020), Naishadh Parmar (EE, Summer 2019, Fall 2019, Winter 2020), Pence Mataria (AE, Summer 2019, Fall 2019, Winter 2020)
 Yasharth Bajpai (EE, Fall 2019), Bhavy Singh (CSE, Summer 2019, Fall 2019)
 Vivek Agarwal (EE, Summer 2019)
 Ujjwal Varshney (MSE, Winter 2019), Gajendra Nagar (AE, Monsoon 2018, Winter 2019)
 Shruti Joshi (EE, Monsoon 2018), Sirshendu Mandal (CSE, Monsoon 2018), Amit Yadav (CSE, Summer 2018, Monsoon 2018), Rituji Beniwal (EE, Summer 2018, Monsoon 2018)
 Mayank Mittal (EE, Winter 2018), Mrinal Kumar Dogra (CSE, Winter 2018), Madhukant (CSE, Summer 2017, Monsoon 2017, Winter 2018), Tushar Gupta (CSE, Summer 2017, Monsoon 2017, Winter 2018)
 Abhimanyu Kulkarni (EE, Monsoon 2017), Jaskirat Singh (CSE, Summer 2017, Monsoon 2017), Manish Kumar Bera (CSE, Summer 2017, Monsoon 2017)
 Abhishek Panda (CSE, Summer 2017), Deepak Gangwar (EE, Summer 2017), Harsh Sinha (EE, Summer 2017)
 Vemula Akhil (CSE, Winter, 2017), Ashish Kolluri (CSE, Winter, 2017), Shirsopratim Chattopadhyay (MSE, Winter 2017)
 Pramod Chunduri (CSE, Monsoon 2016), Vivek Verma (CSE, Monsoon 2016)

PROFESSIONAL SERVICES

ORGANIZATION ESWeek 2018 Special Session on Embedded Software for Robotics
 ETAPS 2018 Workshop on Formal Methods for ML-Based Autonomous Systems

PROGRAM AAAI 2025, FSE 2025
 COMMITTEE RV 2024, EMSOFT 2024, ICCPS 2024, AAAI 2024
 MEMBER RV2023, ATVA 2023, EMSOFT 2023, ICCPS 2023
 RV 2022, EMSOFT 2022, FSE 2022, ICCPS 2022, HSCC 2022
 MEMOCODE 2021 (Co-Chair), ATVA 2021, EMSOFT 2021, HSCC 2021, AAAI 2021
 MEMOCODE 2020 (Co-Chair), ATVA 2020, EMSOFT 2020, HSCC 2020, ICCPS 2020
 ATVA 2019, EMSOFT 2019, ICCPS 2019
 EMSOFT 2018, HSCC 2018
 ATVA 2017, HSCC 2017
 EMSOFT 2014

PUBLICITY CHAIR ICCPS 2019

SESSION CHAIR ICRA 2021
 IROS 2019, 2022
 ICCPS 2018, 2024
 HSCC 2017
 EMSOFT 2015, 2018, 2022

PANEL MEMBER Best Paper Award Committee, EMSOFT 2020
 Best Paper Award Committee, EMSOFT 2018
 DST ICPS IoT Proposal Review Panel, IIT Kharagpur, November 2017
 DST ICPS Security Proposal Review Panel, IIT Kanpur, October 2017
 NSF CPS Breakthrough Proposal Review Panel, July 2014

REVIEWER - Embedded Systems Letter
 JOURNAL ACM Transactions on Cyber-Physical Systems (TECS)
 Robotics and Automation Letter (RA-L)
 IEEE Transactions on Dependable and Secure Computing (TDSC)
 ACM Transactions on Embedded Computing Systems (TECS)
 IEEE Transactions on Computers (TC)
 Springer Journal on Discrete Event Dynamic Systems (DISC)
 IEEE Transactions on Robotics (TRO)
 Software and Systems Modeling
 IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)
 IEEE Transactions on Automatic Control (TAC)
 Wireless Communications and Mobile Computing
 IEEE Communications Magazine

REVIEWER - RV 2024, EMSOFT 2024, IROS 2024, ICCPS 2024, AAAI 2024, ICRA 2024
 CONFERENCE IROS 2023, RV 2023, ATVA 2023, EMSOFT 2023, ICRA 2023, ICCPS 2023
 IROS 2022, RV 2022, EMSOFT 2022, FSE 2022, ICRA 2022, HSCC 2022, ICCPS 2022
 ADHS 2021, IROS 2021, ATVA 2021, EMSOFT 2021, ICRA 2021, HSCC 2021, AAAI 2021
 ATVA 2020, EMSOFT 2020, ICRA 2020, ICCPS 2020, HSCC 2020
 IROS 2019, ICCPS 2019, ICRA 2019, ATVA 2019, EMSOFT 2019
 ICRA 2018, HSCC 2018, EMSOFT 2018
 ICRA 2017, ACC 2017, HSCC 2017, CDC 2017, CASE 2017, ATVA 2017
 MemoCODE2016, IROS 2016, CDC 2016
 ACC 2015, ICRA 2015, HSCC 2015, ICCPS 2015
 FMCAD 2014, RTSS 2014, EMSOFT 2014, CDC 2014, IROS 2014, CAV 2014, ACC 2014, ICRA
 2014
 FMCAD 2013, IROS 2013, HSCC 2013, FoSSaCS 2013
 HSCC 2012, RTSS 2012, EMSOFT 2012
 EMSOFT 2011, ATVA 2011, SPIN 2011, HSCC 2011, TACAS 2011, DATE 2011

LPAR 2010, ISCAS 2010
TACAS 2009 FSTTCS 2009, RTSS 2009

EXTERNAL
EXAMINER
Reviewer for PMRF Fellows, June 2024 PhD Thesis Evaluation Committee for Rohit Chowdhury, IISc Bangalore, 2024 PhD Thesis Evaluation Committee for Vandana Kushwaha, IIIT Allahabad, 2024 PhD Thesis Evaluation Committee for Lhilo Kenye, IIIT Allahabad, 2023 PhD Thesis Evaluation Committee for Himanshu Gauttam, IIITM Gwalior, 2023 Reviewer for PMRF Applications, April 2021, March 2022, September 2022
Dissertation Committee Member for Manigh Goyal, UNC Chappel Hill, 2021-2022
M.Tech Theses from IIIT Allahabad, 2019, 2020, 2021
JRF to SRF Assessment at IISc Bangalore, 2020

INSTITUTE SERVICES

INSTITUTE
COMMITTEES
Member of the Sectional Committee for Junior Technician Recruitment (2023)
Member of Women's Cell (2020-2022)
Senate Scholarship and Prize Committee (2019, 2020)
Member of Innovation and Incubation Advisory Committee (2019-2021)
Faculty Advisor, Robotics Club, Science and Technology Council (2018-2019)
Member of Institute Research and Development Committee(2017-2019)
Coordinator for the Viswajeet proposal on the Center of Excellence for Autonomous Systems (2017)

DEPARTMENT
COMMITTEES
Member of Department Space Committee (2021 - 2023)
Member of Outstanding PhD Thesis Award Committee (2020)
Member of Convocation Award Committee (2020)
Member of ACM India Doctoral Dissertation Nomination Committee (2020)
Member of Department External PhD Advising Screening Committee (2018 - 2023)
Member of Department Faculty Search Committee (2018 - 2023)
Member of Department Admission Committee (2015 - till data)
Member of Department Post Graduate Committee (2017-till date)
Member of PhD Reformation Committee (2018)
Member ESC101 Syllabus Revision Committee (2018)
Member of Department's Systems Curriculum Review Committee (2018)
Member of Department's M.Tech Curriculum Review Committee (2018)
Member of Convocation Award Committee (2017)
Member of Comprehensive Examination Process Development Committee (2015)

EXAMINATION
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Aditya Vats (M.Tech. Thesis Defense, ME, 2022)
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 Debajyoti De (M.Tech. Defense, CSE, 2015)

DEPARTMENT	Hosted Mathworks Seminar on Designing Large Complex Embedded Control Systems using Simulink
SEMINAR	Hosted Faculty Candidate Talk by Dr. Shibashis Guha
ORGANIZATION	Hosted INTEL Seminar on AI from the Data Center to Edge

Hosted Faculty Candidate Talk by Dr. Jainendra Shukla
Hosted Mathworks Seminar on Deep Learning
Hosted Faculty Candidate Talk by Dr. Pramod Subramanian
Hosted Faculty Candidate Talk by Dr. Rijurekha Sen

REFERENCES

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