Dr. Soumyadip Bandyopadhyay

Contact Information

Scientist
ABB Corporate Research,
Country: India

mobile: +91 8900270263
Official e-mail: soumyadip.bandyopadhyay@in.abb.com
Personal e-mail: soumyadipcse@gmail.com

Current address

Dr. Soumyadip Bandyopadhyay
D 66 BITS Pilani K K Birla Goa Campus
NH 17B Byepass Road, Zuarinagar
Goa-403726
Country: India

Education

Indian Institute of Technology, Kharagpur, West Bengal, India **2009–2017**

Degree: *Ph.D.*

- Computer Science and Engineering
- Formal Verification Research Group
- Professor Chittaranjan Mandal and Professor Dipankar Sarkar[1]
- Thesis Title: **Path Based Equivalence Checking of Petri Net Representation of Programs for Translation Validation**

West Bengal University of Technology, Kolkata, , West Bengal, India **2004-2008**

Degree: *B.Tech*

- Computer Science and Engineering
- C.G.P.A: **8.43** in scale of **10.0**

Work Experience

- Research Scientist, ABB Corporate Research (July 2023 to Till date)
- Senior Formal Verification Engineer, NVIDIA, (May 2022 to June 2023)
- Assistant Professor, Dept of CSIS, BITS Pilani K K Birla Goa Campus (December 2018 to May 2022)
- Post Doctoral Fellow, System Analysis and Modeling Group, Hasso Plattner Institute, Potsdam, Germany (August 2017 to October 2018)
- Assistant Professor, Dept of CSIS, BITS Pilani K K Birla Goa Campus (December 2016 to July 2017)

Research interest

- Formal methods
- Program Equivalence
- Software Verification
- Generative AI
- PLC verification
- Data path verification
- High Level Synthesis
- Model driven engineering

Honours and Awards

- Best paper ICSOFT 2021
- Selected in 7^{th} HLF as top 50 young researcher in computer science
- Post Doctoral fellowship from System Analysis and Modeling Group, Hasso Plattner Institute, Germany, 2017
- Tata Consultancy Service Innovation Lab Research Fellowship, 2012
- Academic of science Czech Republic Scholarship, 2007

Professional activities

- Reviewer at CAV-2014, EMSOFT-2015, DAC 2020, ACM TOSEAM, Acta Informatica,
- PC member ICSOFT 2018,2019, 2020, 2021, 2022, 2023, VLSI D 2023, INDICON, 2023, MPM4CPS 2021, 2022, 2023, ISEC 2018, 2019, 2020, 2021, 2022
- Senior IEEE Member, ACM Member,INSTICC Member
- PERR 2022 (Co-chair) co-located with FLOC 2022

Journals Publications

- **Soumyadip Badyopadhyay**, Dipankar Sarkar, Chittaranjan Mandal, Holger Giese, "Translation Validation of Coloured Petri Net Models of Programs on Integers", **Acta Informatica**

[1] 1Dept. of Computer Science and Engineering

- **Soumyadip Badyopadhyay**, Dipankar Sarkar, Chittaranjan Mandal, "Equivalence checking of Petri net models of programs using static and dynamic cut-points", **Acta Informatica**
- **Soumyadip Bandyopadhyay**, Dipankar Sarkar, Kunal Banerjee, Chittaranjan A. Mandal, Krishnam Raju, "A Path Construction Algorithm for Translation Validation using PRES+ Models", **Parallel processing letters**

Conference and workshop Publications

- **Soumyadip Bandyopadhyay** and Raoul Jetley,"Pn4PLC: Verification of Software Upgrade for PLC Code", **FSE 2025** (Core rank A^*)
- Md Tauseef Alam, Sorbajit Goswami, Khushi Singh, Raju Halder, Abyayananda Maiti, **Soumyadip Bandyopadhyay**,"SolGen: Secure Smart Contract Code Generation Using Large Language Models Via Masked Prompting", **ISEC 2025**
- Heiko Koziolek, Virendra Ashiwal, **Soumyadip Bandyopadhyay**, Chandrika K R, " Automated Control Logic Test Case Generation using Large Language Models", **ETFA 2024**
- Rakshit Mittal, Dominique Blouin, Anish Bhobe and **Soumyadip Bandyopadhyay**, "Solving the Instance Model-View Update Problem in AADL", **MODELS 2022** (Core rank A)
- Rakshit Mittal, Dominique Blouin, **Soumyadip Bandyopadhyay**, "PNPEq: Verification of Scheduled Conditional Behavior in Embedded Software", **APSEC 2021** (during publication Core rank B)
- Rakshit Mittal, Rochishnu Banerjee, Dominique Blouin, **Soumyadip Bandyopadhyay**, "Towards an Approach for Translation Validation of Thread-level Parallelizing Transformations using Colored Petri Nets", **ICSOFT 2021 (Best Paper)** (during publication Core rank B)
- Rakshit Mittal, Rochisnu Banerjee, Santonu Sarkar, **Soumyadip Bandyopadhyay**," Translation Validation of Loop involving Code Optimizing Transformations using Petri Net based Models of Programs", **Petri Nets workshop 2020**
- Shivam, Nilanjana Goswami, Veeky Baths, **Soumyadip Bandyopadhyay**, "AES: Automated Evaluation Systems for Computer Programing Course", **ICSOFT 2019** (during publication Core rank B)
- **Soumyadip Bandyopadhyay**, Dipankar Sarkar, Chittaranjan Mandal, "SamaTulyataOne: A Path Based Equivalence Checker", **ISEC 2019**
- Santonu Sarkar, Prateek Kandelwal, **Soumyadip Bandyopadhyay**, Holger Giese, "Analysis of GPGPU Programs for Data-race and Barrier Divergence", **ICSOFT 2018** (during publication Core rank B)
- **Soumyadip Bandyopadhyay**, Santonu Sarkar, Dipankar Sarkar and Chittaranjan Mandal; SamaTulyata, "An Efficient Path Based Equivalence Checking Tool", **ATVA 2017** (during publication Core rank A)
- **Soumyadip Bandyopadhyay**, Santonu Sarkar and Kunal Banerjee, "An End-to-End Formal Verifier for Parallel Programs", **ICSOFT 2017** (during publication Core rank B)
- **Soumyadip Bandyopadhyay** and Kunal Banerjee, "PRESGen: A Fully Automatic Equivalence Checker for Validating Optimizing and Parallelizing Transformations", **HPDC workshop 17**
- **Soumyadip Bandyopadhyay**, Dipankar Sarkar and Chittaranjan Mandal, "An efficient path based equivalence checking for Petri net based models of programs", **ISEC-2016**
- **Soumyadip Bandyopadhyay** and Kunal Banerjee, "Implementing an Efficient Path Based Equivalence Checker for Parallel Programs", **HPDC workshop 16**
- Kunal Banerjee, **Soumyadip Bandyopadhyay**, and Santonu Sarkar, "Data-Race Detection: The Missing Piece for an End-to-End Semantic Equivalence Checker for Parallelizing Transformations of Array-Intensive Programs", **PLDI workshop 2016**
- **Soumyadip Bandyopadhyay**, Dipankar Sarkar and Chittaranjan Mandal, "Validating SPARK: High Level Synthesis compiler", **ISVLSI-2015**
- **Soumyadip Bandyopadhyay**, Dipankar Sarkar and Chittaranjan Mandal, "A Path-Based Equivalence Checking Method for Petri net based Models of Programs", **ICSOFT-EA-2015** (during publication Core rank B)
- **Soumyadip Bandyopadhyay**, Dipankar Sarkar, Chittaranjan A. Mandal, "An Efficient Equivalence Checking Method for Petri net based Models of Programs", **ICSE 2015** (Core rank A^*)
- **Soumyadip Bandyopadhyay**, Kunal Banerjee, Dipankar Sarkar, Chittaranjan A. Mandal," Translation Validation for PRES+ Models of Parallel Behaviours via an FSMD Equivalence Checker", **VDAT 2012**

Poster Publications

- **Soumyadip Bandyopadhyay**, "Behavioural verification using Petri net based models of programs", **POPL-2015 (ACM student research competition)**
- **Soumyadip Bandyopadhyay**, Dipankar Sarkar, Chittaranjan A. Mandal, "Translation Validation using Path-Based Equivalence Checking of Petri net based Models of Programs",**WEPL 2015**

Book chapter

- Bedir Tekinerdogan, Rakshit Mittal, Rima Al-Ali, Mauro Iaconod, Eva Navarroe, **Soumyadip Bandyopadhyay**, Ken Vanherpen and Ankica Barisic, "A feature-based ontology for cyber physical systems", **Chapter 3, Book Title : Multi-Paradigm Modelling Approaches for Cyber-Physical, Elsevier Press. ISBN No. 9780128191064**
- Holger Giese , Dominique Blouin , Rima Al-Ali , Hana Mkaoua, **Soumyadip Bandyopadhyay**, Mauro Iacono, Moussa Amrani, Stefan Klikovits and Ferhat Erata "An ontology for multiparadigm modelling", **Chapter 4, Book Title: Multi-Paradigm Modelling Approaches for Cyber-Physical, Elsevier Press. ISBN No. 9780128191064**
- Dominique Blouin, Rima Al-Ali, Holger Giese, Stefan Klikovits, **Soumyadip Bandyopadhyay**, Ankica Barisic and Ferhat Erata, "An integrated ontology for multi-paradigm modelling for cyberphysical systems" , **Chapter 5, Book Title: Multi-Paradigm Modelling Approaches for Cyber-Physical, Elsevier Press, ISBN No. 9780128191064**

Sponsored and Consultancy Projects

- "APP based learning for Python program" Funding Agency: 6th Sense and AGH advisor Duration : 2021-2023, Amount: 15.81L
- "Modelling and Verification of Bio-Inspired system", Funding Agency: DST under BIO-CPS incubation, Duration 2020-2025, Amount: 40L
- "AES: Automated Evaluation Systems for Computer Programing Course in Any University" Funding Agency: BITS Pilani, Duration: 2018-2021, Project Amount : 2L
- "SamaTulyata: Automated Evaluation for Computer Programming Course " Funding Agency: TLC BITS Goa, Duration: 2019-2020, Project Amount: 1L
- " Verification of Industrial control systems" Funding Agency: ABB Corporate Research, Amount: 20L

Industrial Projects

- **CodeGenAI:**Explore potential of Generative AI and Large Language Model (LLM) to support engineering:
  - Generation of control logic utilizing ABB control libraries and ABB notations.
  - Generation of test code to improve quality and save efforts in FAT.
  - Streamlined and integrated user interface to let control engineer interact with GenAI.
- **SamaTulyata4PLC:** Proving the modern system to be functionally equivalent to the Heritage systems. Building a tool for equivalence checking between modern systems vs heritage systems. The model constructor is carried out by LLM and then verify correctness of the generated models using formal verification tools.

Teaching at BITS Goa

- Compiler Construction (Spring 2019, 2020, 2022)
- Theory of Computation (Autumn 2019)
- Parallel computing (Spring 2022)
- Data structure and Algorithm (Spring 2022)
- Computer Architecture (Autumn 2020)
- Object oriented programming (Autumn 2020)
- Principal of programming language (Autumn 2021)
- Computer Programming (Spring 2021)

Teaching at NVIDIA and ABB

- Road map of Functional verification for ML Based hardware accilarator
- Software engineering for AI

Tool develop

- **SamaTulyata4PLC** for software migration using LLM
- **ABB Co-pilot** for PLC code generation and unit testing
- **SamaTulyata:** Eclipse based Program equivalence tool using Petri net
- **Autoval:** Automatic evaluation of student's Program using program equivalence
- **Raise-2:** Test case based analysis tool for Computing course
- **CatGrader:** Category based grading for computer programing course.
- **OsarteDM:** Model transformation Tool for Cyber physical system

Programming C, Verilog, Linux Shell scripting, LaTeX, C++.

Formal Tools worked with KLEE, CBMC, JasperGold, Hector, Helena, SAL, Pluto, Par4All, CPN

Language known English and Bengali

Referees

Prof. Dipankar Sarkar
Retired Professor
Dept. of Computer Science and Engineering
IIT Kharagpur
e-mail: *ds@cse.iitkgp.ac.in*

Prof. Sandeep Shukla
Professor
Dept. of Computer Science and Engineering
IIT Kanpur
e-mail: *sandeeps@iitk.ac.in*

Dr. Dominique Blouin
Associate Professor
Telecom paris, France
e-mail: *dominique.blouin@telecom-paris.fr*

Dr. Mattias Ulbrich
Researcher
Karlsruhe Institute of Technology, Germany
e-mail: *ulbrich@kit.edu*