Satya Prakash Nayak

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Education

Max Planck Institute for Software Systems — Kaiserslautern, Germany
Ph.D. in Computer Science — 2021–Current
Advisor: Anne-Kathrin Schmuck

Chennai Mathematical Institute — Chennai, India
M.Sc. in Computer Science — 2019–2021
CGPA: 9.94/10.00

Chennai Mathematical Institute — Chennai, India
B.Sc. in Mathematics and Computer Science — 2016–2019
CGPA: 8.48/10.00

Area of Research

Formal verification and synthesis of cyber-physical systems
Temporal Logics, Controller Synthesis, Game Theory

Reserach Internships/Visits

Carnegie Mellon University — Pittsburgh, USA
with Eunsuk Kang — May 2025

- Robustness for Software Systems

Max Planck Institute for Software Systems / University of Liverpool — Remote
with Daniel Neider and Martin Zimmermann — July - Dec 2020

- Adaptive Strategies for rLTL Games

Aix-Marseille University — Marseille, France
with Jean-Marc Talbot — May - July 2019

- Minimization of Visibly Pushdown Automata

Reading Projects

Chennai Mathematical Institute — Chennai, India
with Prajakta Nimbhorkar — Aug - Nov 2020

- Metric Embeddings and their Algorithmic Applications

Chennai Mathematical Institute — Chennai, India
with Balaguru Srivathsan — Aug - Nov 2019

- Games on Graphs

Honours

- Recipient the INSPIRE scholarship for my Bachelor's and Master's degrees by the Dept. of Science and Tech, India.
- Was among the top 30 students in India selected to attend the International Mathematics Olympiad Training Camp (IMOTC) 2015 and 2016
- Was among the top 30 students in my state in the Zonal Informatics Olympiad 2015
- Recipient of the Gold Medal in the Regional Mathematics Olympiad 2014

Invited Talks

Assume-Guarantee Distributed Synthesis via Permissive Templates — Pittsburgh, USA
Software Design and Analysis Group at Carnegie Mellon University — May 2025

Towards Seamless Reactivity of Hybrid Control — Lund, Sweden
ELLIIT Focus Period on Security and Fault Tolerance of Cyber-Physical Systems — Apr 2024

Strategy Templates for Graph Games — Brussels, Belgium
Formal Methods and Verification Seminar at Université libre de Bruxelles — Dec 2023

Adaptive Strategies for rLTL Games — Remote
Formal Methods and Verification Seminar at Université libre de Bruxelles — Dec 2020

Skills

- **Programming Languages:** C++, Python, Haskell

Tools Developed

- **rpg-STeLA: r**eactive **p**rogram (infinite-state) **g**ame solver using **S**trategy **Te**mplate-based **L**ocalized **A**cceleration
- **CoSMo: Co**ntracted **S**trategy **M**ask Neg**o**tiation in two-objective parity games
- **PeSTel: Pe**rmissive **S**trategy **Te**mpl**a**te for generalized parity games
- **SImPA: S**ufficient **Im**plementable **P**ermissive **A**ssumption for synthesis

Mentoring of Master's Students

Kilian Schweppe

Teaching Experience

- **Teaching Assistant** at Technical University of Kaiserslautern
  Advanced Automata Theory — *2024*
  Advanced Automata Theory — *2023*
- **Teaching Assistant** at Chennai Mathematical Institute
  Discrete Mathematics — *2021*
  Design and Analysis of Algorithms — *2020*
  Data Mining and Machine Learning — *2019*
- **Guest Teacher** at Rtapalli Vidyapitha
  Calculus — *2017-2018*
  Elementary Number Theory — *2025-Current*

Other Professional Activities

- **PC Member:** HSCC RE 2024-2025
- **Journal Reviewer:** FAC 2024
- **Conference Reviewer:** ISoLA 2022
- **Conference Sub-reviewer:** CAV 2025, IJCAI 2025, AAMAS 2025, TACAS 2024-2025, ICALP 2025, VMCAI 2024, ICSE 2023, NFM 2022

References

- **Anne-Kathrin Schmuck**
  Faculty member at the Max Planck Institute for Software Systems, Germany
  email: akschmuck@mpi-sws.org
- **Bernd Finkbeiner**
  Faculty member at the CISPA Helmholtz Center for Information Security, Germany
  Professor at Saarland University, Germany
  email: finkbeiner@cispa.de
- **Martin Zimmermann**
  Associate professor at Aalborg University, Denmark
  email: mzi@cs.aau.dk

Journal Publications (@. alphabetical/randomized order of authors)

[1] @. S. P. Nayak, D. Neider, R. Roy, and M. Zimmermann, "Robust computation tree logic", *Innovations in Systems and Software Engineering*, 2024.

[2] S. P. Nayak, L. N. Egidio, M. Della Rossa, A.-K. Schmuck, and R. M. Jungers, "Context-triggered abstraction-based control design", *IEEE Open Journal of Control Systems*, vol. 2, 2023.

Conference Publications (@. alphabetical/randomized order of authors)

[3] @. B. Finkbeiner, N. Metzger, S. P. Nayak, and A.-K. Schmuck, "Synthesis of universal safety controllers", in *Tools and Algorithms for the Construction and Analysis of Systems - 31st International Conference, TACAS 2025*.

[4] @. A. Anand, S. P. Nayak, R. Raha, I. Saglam, and A.-K. Schmuck, "Fair quantitative games", in *Foundations of Software Science and Computation Structures - 28th International Conference, FoSSaCS 2025*.

[5] @. A. Anand, A. Schmuck, and S. P. Nayak, "Strategy templates - robust certified interfaces for interactive systems", in *Automated Technology for Verification and Analysis - 22nd International Symposium, ATVA 2024*.

[6] @. A. Schmuck, P. Heim, R. Dimitrova, and S. P. Nayak, "Localized attractor computations for infinite-state games", in *Computer Aided Verification - 36th International Conference, CAV 2024*.

[7] @. A. Anand, A. Schmuck, and S. P. Nayak, "Contract-based distributed logical controller synthesis", in *Proceedings of the 27th ACM International Conference on Hybrid Systems: Computation and Control, HSCC 2024*.

[8] A. Nejati, S. P. Nayak, and A. Schmuck, "Context-triggered games for reactive synthesis over stochastic systems via control barrier certificates", in *Proceedings of the 27th ACM International Conference on Hybrid Systems: Computation and Control, HSCC 2024*.

[9] @. S. P. Nayak and A. Schmuck, "Most general winning secure equilibria synthesis in graph games", in *Tools and Algorithms for the Construction and Analysis of Systems - 30th International Conference, TACAS 2024*.

[10] @. A. Schmuck, K. S. Thejaswini, I. Saglam, and S. P. Nayak, "Solving two-player games under progress assumptions", in *Verification, Model Checking, and Abstract Interpretation - 25th International Conference, VMCAI 2024*.

[11] @. A. Anand, S. P. Nayak, and A. Schmuck, "Synthesizing permissive winning strategy templates for parity games", in *Computer Aided Verification - 35th International Conference, CAV 2023*.

[12] @. A. Anand, K. Mallik, S. P. Nayak, and A. Schmuck, "Computing adequately permissive assumptions for synthesis", in *Tools and Algorithms for the Construction and Analysis of Systems - 29th International Conference, TACAS 2023*.

[13] @. S. P. Nayak, D. Neider, and M. Zimmermann, "Robustness-by-construction synthesis: Adapting to the environment at runtime", in *Leveraging Applications of Formal Methods, Verification and Validation. Verification Principles - 11th International Symposium, ISoLA 2022*.

[14] @. S. P. Nayak, D. Neider, R. Roy, and M. Zimmermann, "Robust computation tree logic", in *NASA Formal Methods - 14th International Symposium, NFM 2022*.