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 of 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

- **UCLearn:** **U**niversal **C**ontroller via **Learn**ing Prophecies
- **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**mplate for generalized parity games
- **SImPA:** **S**ufficient **Im**plementable **P**ermissive **A**ssumption for synthesis

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*

Mentored Master's Students

- Oz Gitelson (Yale University, USA)
- Ali Mirzaeisaghezchi (Sharif University of Technology, Iran)
- Kilian Schweppe (Universität Lübeck, Germany)

Other Professional Activities

- **PC Member:** HSCC RE 2024-2025
- **Journal Reviewer:** Formal Methods in System Design (2025), Formal Aspects of Computing (2024)
- **Conference Reviewer/Sub-reviewer:** AAAI 2026, TACAS 2024-2026, CAV 2025, IJCAI 2025, AAMAS 2025, ICALP 2025, VMCAI 2024, ICSE 2023, ISoLA 2022 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

- **Eunsuk Kang**
  Associate Professor of Computer Science in the Software and Societal Systems Department
  at Carnegie Mellon University, Pittsburgh, USA
  email: eskang@cmu.edu

- **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, "Universal safety controllers with learned prophecies", in *40th AAAI Conference on Artificial Intelligence, AAAI 2026,*.

[4] @. A. Anand, S. P. Nayak, R. Raha, I. Saglam, and A.-K. Schmuck, "Quantitative strategy templates", in *23rd International Symposium on Automated Technology for Verification and Analysis, ATVA 2025*.

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

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

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

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

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

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

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

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

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

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

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

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