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Pranshu Gaba

Curriculum Vitae

Research interests

General formal methods, game theory, logic, computer science, discrete mathematics

Specific reactive synthesis, finitary objectives, stochastic games, Markov decision processes

Education

ongoing (synopsis submitted) **PhD in Theoretical Computer Science**
Tata Institute of Fundamental Research, Mumbai, India
Advisor: Shibashis Guha
Thesis: *Window mean-payoff in turn-based stochastic games*

Relevant courses: Logic, automata, and games; Automata, verification, and infinite Games; Descriptive complexity; Computational complexity; Algebra and computation; Algebraic automata theory.

July 2020 **Bachelor of Science (Research) with Mathematics major**
Indian Institute of Science, Bangalore, India

Advisor: L. Sunil Chandran
Thesis: *Vertex connectivity of Eulerian orientations*

Relevant courses: Automata theory and computability; Introduction to scalable systems; Game theory; Graph theory; Combinatorics; Number Theory; Measure theory.

Conference proceedings

[c4] Laurent Doyen, Pranshu Gaba, and Shibashis Guha, "Expectation in Stochastic Games with Prefix-independent Objectives" in *International Conference on Concurrency Theory*, August 2025. doi: 10.4230/LIPIcs.CONCUR.2025.16.

[c3] Pranshu Gaba and Shibashis Guha, "Optimising Expectation with Guarantees for Window Mean Payoff in Markov Decision Processes" in *International Conference on Autonomous Agents and Multiagent Systems*, May 2025. doi: 10.5555/3709347.3743600.

[c2] Pranshu Gaba and Arnab Sur, "Recognising numbers" in *Indian Conference on Logic and its Applications*, April 2025, Awarded best student paper award, pp. 126-137. doi: 10.1007/978-3-031-89610-1_9.

[c1] Laurent Doyen, Pranshu Gaba, and Shibashis Guha, "Stochastic Window Mean-Payoff Games" in *Foundations of Software Science and Computation Structures*, April 2024, pp. 34-54. doi: 10.1007/978-3-031-57228-9.

Journal publications

[j1] Laurent Doyen, Pranshu Gaba, and Shibashis Guha, "Stochastic Window Mean-Payoff Games" in *Logical Methods in Computer Science*, June 2025. doi: 10.46298/lmcs-21(2:19)2025.

Conference talks

- Optimizing expectation with guarantees for window mean-payoff in MDPs
  - Workshop on Automata and Games for Synthesis, co-located with FSTTCS 2025
  - Seminar talk at Masaryk University, Brno (September 2025)
  - Seminar talk at IST Austria (September 2025)
  - Highlights 2025
  - Seminar talk at IIT Bombay (August 2025)
  - Formal Methods Update meeting 2025
- Expectation in Stochastic Games with Prefix-Independent Objectives
  - Seminar talk at MPI-SWS Kaiserslautern (September 2025)
  - CONCUR 2025
  - Workshop on Automata and Games for Synthesis, co-located with FSTTCS 2024
- Stochastic Window Mean-Payoff Games
  - ACM ARCS 2025
  - Seminar talk at ENS Paris-Saclay (April 2024)
  - FoSSaCS 2024
  - STCS Student Symposium 2023
  - Formal Methods Update meeting 2023
- Recognizing numbers
  - ICLA 2025
  - TCS Research Expo 2024
  - STCS Student Symposium 2024

Seminar talks at TIFR

- The Canadian Traveller Problem (February 2025)
- Sperner's lemma and the equidissection of regular polygons (July 2024)
- The connection between circuit complexity and first-order logic (May 2024)
- The complexity of solving simple stochastic games (February 2024)
- Courcelle's theorem (September 2023)
- Total-payoff games on graphs with windows (October 2022)
- Determinacy of two-player games with perfect information (March 2022)
- Vertex connectivity of Eulerian orientations (July 2021)

Outreach talks

- Sperner's lemma and its application to rent division at Chai and Why 2025, Vigyan Vidushi 2024
- Voting mechanisms at Chai and Why 2024
- Hamming codes at Chai and Why 2023
- Fun with graphs at Chai and Why 2022
- Impartial games at Open day 2020, IISc

Professional service

Reviewing MathOR, ATVA 2025, EC 2025, CAV 2025, CSL 2025, STACS 2025, LICS 2024

Volunteering FoSSaCS 2024, FLoC 2022

TA Automata and Computability at TIFR (January - May 2025)

Conferences / workshops attended

2025
- FSTTCS 2025 in BITS Pilani, Goa, India
- IndiCS Seminar on Automated Synthesis 2025, Mysore, India
- ATVA 2025 in IIIT Bangalore, India
- Highlights 2025 in Saarland University, Saarbrücken, Germany
- CONCUR 2025 in University of Aarhus, Denmark
- Formal Methods Update meeting 2025 in DAU, Gandhinagar, India
- ACM ARCS 2025 in PSG College of Technology, Coimbatore, India
- ICLA 2025 in ISI Kolkata, India

2024
- FSTTCS 2024 in IIT Gandhinagar, India
- Winter School on Verification 2024 in IIT Delhi, India
- SAT 2024 in TCS Pune, India
- ISLA 2024 in IIT Goa, India
- ETAPS 2024 in Luxembourg

2023
- FSTTCS 2023 in IIIT Hyderabad, India
- Formal Methods Update meeting 2023 in IIT Goa, India

2022
- FSTTCS 2022 in IIT Madras, Chennai, India
- FLoC 2022 in Technion, Haifa, Israel

Projects experience

Jul 2019 **Summer Intern at CiSTUP**
Indian Institute of Science, Bangalore, India
Worked with Prof. Tarun Rambha
- Learnt about optimization techniques such as branch and bound, and cutting planes.
- Wrote C++ programs to find solutions for cost allocations for the traveling salesman problem and the vehicle routing problem

Jun 2018 **Visiting Research Student**
Tata Institute of Fundamental Research, Mumbai, India
Worked with Prof. Amitava Bhattacharya
- Studied properties relating to the Game of Cops and Robbers on Graphs, such as bounds on the cop number of a graph
- Explored concepts in combinatorics such as counting walks on graphs, Sperner's theorem, and matrix-tree theorem

Jul 2021 **Content Intern**
Brilliant.org, Remote
- Created challenging and thought-provoking math and science problems
- Interacted and engaged in discussions with the Brilliant community consisting of math and science enthusiasts

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