Prince Mathew

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Career Profile

I am a research fellow at the School of Mathematics and Computer Science, Indian Institute of Technology Goa. My research interests lie at the intersection of automata theory and formal verification. During my PhD, I have focused on the equivalence and learning of one-counter systems.

Publications

- **Learning Deterministic One-Counter Automata in Polynomial Time** [arXiv Link] — *Mar 7, 2025*
  Co-authors: Dr. Vincent Penelle, Dr. Sreejith A.V. — *LICS 2025 (to appear)*
- **Learning Real-time One-Counter Automata Using Polynomially Many Queries** [Link] — *May 1, 2025*
  Co-authors: Dr. Vincent Penelle, Dr. Sreejith A.V. — *TACAS 2025*
- **Equivalence of Deterministic Weighted Real-time One-Counter Automata** [Link] — *Feb 3, 2025*
  Co-authors: Dr. Vincent Penelle, Dr. Prakash Saivasan, Dr. Sreejith A.V. — *ICLA 2025*
- **Weighted One-Deterministic-Counter Automata** [Link] — *December 12, 2023*
  Co-authors: Dr. Vincent Penelle, Dr. Prakash Saivasan, Dr. Sreejith A.V. — *FSTTCS 2023*
- **CAP: A Cellular Automata Based Fuzzy Classifier** [Link] — *February 26, 2022*
  Co-authors: Dr. Abdul Nizar M — *Materials Today Proceedings*
- **Optical Music Recognition Using Image Processing and Machine Learning** [Link] — *August 11, 2018*
  Co-authors: Rahul Vijayakumar, Aju Tom Kuriakose, Jesmy Sunny, Dr. Ramani Bai V — *IJCSE 2018*
- **Survey on Fuzzy Logic & Fuzzy Classifiers Based on Continuous Cellular Automata** — *August 20, 2016*
  Co-authors: Dr. Abdul Nizar M — *NCTT 2016*

Experience

- **Indian Institute of Technology Goa** — *January 2025 to present*
  Junior Research Fellow — *January 2024 to July 2024*, *February 2018 to December 2018*
- **Tata Elxsi, Trivandrum** — *January 2017 to January 2018*
  Senior Engineer
- **Central Polytechnic College, Trivandrum** — *June 2016 to October 2016*
  Guest Lecturer

Important Talks

- Learning Deterministic One-Counter Automata in Polynomial Time, LICS 2025 — *June 24, 2025*
- Learning Real-Time One-Counter Automata Using Polynomially Many Queries, TACAS 2025 [Talk] — *May 6, 2025*
- Weighted One-Deterministic-Counter Automata (Lightning Talk), ACM ARCS 2025 — *Feb 27, 2025*
- Equivalence of Deterministic Weighted Real-time One-Counter Automata, ICLA 2025 — *Feb 3, 2025*

- Learning Real-Time One-Counter Automata Using Polynomially Many Queries, RHPL 2024 **[Talk]** — *Dec 18, 2024*
- Learning one-counter automata using SAT solver, Highlights 2024 **[Talk]** — *Sep 19, 2024*
- Weighted one deterministic-counter automata, FSTTCS 2023 **[Talk]** — *July 2023*
- One deterministic-counter automata, Highlights 2023 **[Talk]** — *July 2023*
- Weighted one-deterministic-counter automata, FM Update Meeting 2023 **[Talk]** — *June 2023*

Other Talks

- Learning Deterministic One-Counter Automata in Polynomial Time, IIT Bombay — *July 18, 2025*
- Learning Real-Time One-Counter Automata Using Polynomially Many Queries, TIFR Mumbai — *April 4, 2025*
- Learning One-Counter Automata Using SAT Solver, Université Libre de Bruxelles, Belgium — *September 10, 2024*
- Learning One-Counter Automata Using SAT Solver, Université de Mons, Belgium — *September 9, 2024*
- Learning One-Counter Automata Using SAT Solver, RWTH Aachen University, Germany — *September 6, 2024*
- CAP: A cellular automata-based fuzzy classifier, AIES 2021 — *December 2021*
- Optical music recognition using image processing and machine learning, IJCSE 2018 — *August 2018*

Awards and Recognitions

- Received grant from Google for our work on learning one-counter automata — *May 2025*
- Received ACM/IARCS travel grant for attending LICS 2025 — *May 2025*
- Selected for scholarship for the Logic Mentoring Workshop at LICS 2025 — *April 2025*
- Successfully defended my Ph.D. dissertation titled "Learning and Equivalence of one-counter systems" — *April, 2025*
- Awarded with the ETAPS 2025 scholarship for participating in TACAS 2025 — *April 2025*
- Awarded with the ACM/IARCS travel grant for attending TACAS 2025 — *April 2025*
- Received travel grant from ACM India for attending ARCS 2025 — *March 2025*
- Received invitation from ACM India to present our work at ARCS 2025 — *December 2024*
- Received grants from RWTH Aachen University, Germany and University of Antwerp, Belgium for research visits — *September 2024*

Research Visits

- Tata Institute of Fundamental Research (TIFR), Mumbai, India — *July 16 to July 22, 2025*
- Tata Institute of Fundamental Research (TIFR), Mumbai, India — *March 24 to April 4, 2025*
- University of Antwerp, Belgium — *Sep 9 to 13, 2024*
- RWTH Aachen University, Germany — *Sep 4 to 6, 2024*
- The Institute of Mathematical Sciences, HBNI, India — *June 1 to 30, 2022*

Teaching Assistance

- Introduction to Computing — *Spring 2020 – 21, Autumn 2023 – 24*
- Randomised Algorithms — *Spring 2022 – 23*
- Software Tools — *Spring 2022 – 23*
- Data Structures and Algorithms — *Autumn 2022 – 23, Sumer 2022, Autumn 2021 – 22, Autumn 2020 – 21*
- Automata Theory — *Spring 2020 – 21, Spring 2018 – 19*
- Logic in Computer Science — *Autumn 2019 – 20*
- Advanced Algorithms — *Spring 2018 – 19*

Education

- **Indian Institute of Technology Goa** — *January 2019 to December 2024*
  Ph.D. in Theoretical Computer Science — CPI: 8.45
  – **Chennai Mathematical Institute, Tamil Nadu** — *January 2020 to April 2020*
  Ph.D. Coursework
- **College of Engineering Trivandrum, Kerala** — *August 2014 to April 2016*
  M.Tech in Computer Science and Engineering — CGPA: 9.11
- **Saintgits Engineering College, Kerala** — *July 2010 to April 2014*
  B.Tech in Computer Science and Engineering — CGPA: 7.62
- **Don Bosco Higher Secondary School, Kottayam, Kerala** — *2008 to 2010*
  Class 12 — Aggregate: **86.36** %
- **Don Bosco Higher Secondary School, Kottayam, Kerala** — *2007 to 2008*
  Class 10 — CGPA: **10/10**

Other Activities

- Reviewed NPTEL transcripts for the course "Theory of Computation" by Prof. Somenath Biswas
- Sub-reviewer for the International Conference on Concurrency Theory (CONCUR), 2023
- Volunteered and contributed towards the successful organisation of FSTTCS 2021 and FSTTCS 2022
- Volunteered in organising FM Update Meeting 2023
- Successfully cleared the UGC NET examination and have met the eligibility criteria for lectureship
- Member of the evaluation team for the national level technical project exhibition - SRISHTI 2025
- Passed BEC vantage conducted by University of Cambridge
- Passed grade 5 vocals with merit conducted by Trinity College London
- Passed grade 3 piano with merit conducted by Trinity College London
- Earned the "Rashtrapathi Scout" award

Projects

- **MinOCA** *Jan 2024 to December 2024*

  A tool for active learning of one-counter automata using polynomially many queries

  - Tools & technologies used: Python
  - This tool is associated with our paper "Learning Real-Time One-Counter Automata Using Polynomially Many Queries" that appeared in TACAS 2025.
    Code: **zenodo.org/records/14604419**

- **MoES - River Width Extraction Project** *February 2018 to December 2018*

  Web application for MoES for calculating river water discharge from satellite images.

  - Tools & technologies used: Python, Django
  - This work was done as a part of a joint project with Dr. Sreejith A.V (IIT Goa) and Dr. Gaurav Kumar (IISER Bhopal).

- **Skill Center - Tata Elxsi** *January 2017 - February 2018*

  Web application to manage employee profiles of Tata Elxsi.

  - Tools & technologies used: C#, MVC, .NET
  - The application manages skills, project allocation, training, funnel management, performance evaluations, and resume creation. It helps assign projects based on employee skills, plan and track training, search for employees, assess performance, and create resumes.

- **Fuzzy Classifier using Continuous Cellular Automata [Report][Code]** *June 2015 - September 2016*

  Continuous cellular automata-based fuzzy classifier in Java using Weka.

  - Tools & technologies used: Java, Weka
  - Project done as part of Masters degree thesis.

- **Open Image Transcriptor [Report][Code]** *June 2013 - June 2014*

  Image processing tool to recognise musical notes from sheet music and convert it into a MIDI file.

  - Tools & technologies used: Java, Python
  - Project done as part of Undergraduate project.