Md Sayeed Anwar

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Research Experience

July, 2021 – Present — **Senior Research Fellow**, Physics and Applied Mathematics Unit, Indian Statistical Institute, Kolkata

July, 2019 – July, 2021 — **Junior Research Fellow**, Physics and Applied Mathematics Unit, Indian Statistical Institute, Kolkata

May-July, 2024 — **Visiting Researcher**, Department of Mathematics and Namur Institute for Complex Systems, University of Namur (Belgium), under the supervision of Prof. Timoteo Carletti.

Academic Qualification

2021 – 2025 — **Ph.D., in Applied Mathematics**, from Indian Statistical Institute, Kolkata, India (degree awarded from University of Calcutta, India)
Supervisor: Prof. Dibakar Ghosh
Thesis title: *Synchronization patterns and their stability analysis in complex systems with pairwise and non-pairwise interactions*

2016 – 2018 — **Master of Science (M.Sc.), Applied Mathematics**, University of Calcutta.

2013 – 2016 — **Bachelor of Science (B.Sc.), Mathematics**, Scottish Church College, University of Calcutta.

Research Interest

My research has primarily focused on **complex networks and nonlinear dynamical systems**, with a particular emphasis on collective phenomena. I have explored different collective dynamics (mostly synchronization) in both non-spatially **coupled oscillators** and spatially embedded systems, such as **swarmalators**, across various network structures, including **time-varying, multilayer, adaptive and higher-order networks**. My recent research interest also focuses on evolutionary dynamics, metapopulation survivability, and critical transitions.

Research Publications

Journal Articles

1. Sar, G. K., **Anwar, Md Sayeed**, Moriamé, M., Ghosh, D., & Carletti, T. (2025). Strategy to control synchronized dynamics in swarmalator systems. **Physical Review E**, *111*(3), 034212.
doi:https://doi.org/10.1103/PhysRevE.111.034212

2. **Anwar, Md Sayeed**, Frolov, N., Hramov, A. E., & Ghosh, D. (2024). Self-organized bistability on globally coupled higher-order networks. **Physical Review E**, *109*(1), 014225.
doi:https://doi.org/10.1103/PhysRevE.109.014225

3. **Anwar, Md Sayeed**, Ghosh, D., & Carletti, T. (2024). Global synchronization on time-varying higher-order structures. **Journal of Physics: Complexity**, *5*(1), 015020. doi:10.1088/2632-072X/ad3262

4. **Anwar, Md Sayeed**, Ghosh, D., & O'Keeffe, K. (2024). Forced one-dimensional swarmalator model. **Physical Review E**, *110*(5), 054205. doi:https://doi.org/10.1103/PhysRevE.110.054205

5. **Anwar, Md Sayeed**, Jenifer, S. N., Muruganandam, P., Ghosh, D., & Carletti, T. (2024). Synchronization in adaptive higher-order networks. **Physical Review E**, *110*(6), 064305. doi:https://doi.org/10.1103/PhysRevE.110.064305

6. **Anwar, Md Sayeed**, Sar, G. K., Perc, M., & Ghosh, D. (2024). Collective dynamics of swarmalators with higher-order interactions. **Communications Physics**, *7*(1), 59. doi:https://doi.org/10.1038/s42005-024-01556-2

7. Nag Chowdhury, S., **Anwar, Md Sayeed**, & Ghosh, D. (2024). Cluster formation due to repulsive spanning trees in attractively coupled networks. **Physical Review E**, *109*(4), 044314. doi:https://doi.org/10.1103/PhysRevE.109.044314

8. O'Keeffe, K., Sar, G. K., **Anwar, Md Sayeed**, Lizárraga, J. U., de Aguiar, M. A., & Ghosh, D. (2024). A solvable two-dimensional swarmalator model. **Royal Society Proceedings A**, *480*(2301), 20240448. doi:https://doi.org/10.1098/rspa.2024.0448

9. Pal, P. K., **Anwar, Md Sayeed**, Perc, M., & Ghosh, D. (2024). Global synchronization in generalized multilayer higher-order networks. **Physical Review Research**, *6*(3), 033003. doi:https://doi.org/10.1103/PhysRevResearch.6.033003

10. **Anwar, Md Sayeed**, & Ghosh, D. (2023a). Neuronal synchronization in time-varying higher-order networks. **Chaos**, *33*(7). doi:https://doi.org/10.1063/5.0152942

11. **Anwar, Md Sayeed**, & Ghosh, D. (2023b). Synchronization in temporal simplicial complexes. **SIAM Journal on Applied Dynamical Systems**, *22*(3), 2054–2081. doi:https://doi.org/10.1137/22M1525909

12. **Anwar, Md Sayeed**, Rakshit, S., Kurths, J., & Ghosh, D. (2023). Synchronization induced by layer mismatch in multiplex networks. **Entropy**, *25*(7), 1083.

13. Mirzaei, S., **Anwar, Md Sayeed**, Parastesh, F., Jafari, S., & Ghosh, D. (2023). Synchronization in repulsively coupled oscillators. **Physical Review E**, *107*(1), 014201. doi:https://doi.org/10.1103/PhysRevE.107.014201

14. Pal, P. K., **Anwar, Md Sayeed**, & Ghosh, D. (2023). Desynchrony induced by higher-order interactions in triplex metapopulations. **Physical Review E**, *108*(5), 054208. doi:https://doi.org/10.1103/PhysRevE.108.054208

15. **Anwar, Md Sayeed**, & Ghosh, D. (2022a). Intralayer and interlayer synchronization in multiplex network with higher-order interactions. **Chaos**, *32*(3), 033125. doi:https://doi.org/10.1063/5.0074641

16. **Anwar, Md Sayeed**, & Ghosh, D. (2022b). Stability of synchronization in simplicial complexes with multiple interaction layers. **Physical Review E**, *106*(3), 034314. doi:https://doi.org/10.1103/PhysRevE.106.034314

17. **Anwar, Md Sayeed**, Rakshit, S., Ghosh, D., & Bollt, E. M. (2022). Stability analysis of intralayer synchronization in time-varying multilayer networks with generic coupling functions. **Physical Review E**, *105*(2), 024303. doi:https://doi.org/10.1103/PhysRevE.105.024303

18. **Anwar, Md Sayeed**, Kundu, S., & Ghosh, D. (2021). Enhancing synchrony in asymmetrically weighted multiplex networks. **Chaos, Solitons & Fractals**, *142*, 110476. doi:https://doi.org/10.1016/j.chaos.2020.110476

Accepted for publication

1. **Anwar, Md Sayeed**, Ghosh, D., & O'Keeffe, K. (2025). *On forced swarmalators that move in higher-dimensional spaces*. **Accepted for publication in Physical Review E**.
2. **Anwar, Md Sayeed**, Sar, G. K., Carletti, T., & Ghosh, D. (2025). *A two-dimensional swarmalator model with higher-order interactions*. **Accepted for publication in SIAM Journal on Applied Mathematics**.

Preprints

1. Ghosh, R., **Anwar, Md Sayeed**, Ghosh, D., Kurths, J., & Shrimali, M. D. (2025). *Transitions to synchronization in adaptive multilayer networks with higher-order interactions*. arXiv preprint arXiv:2501.12301.

Attended Conferences

- 2021 — Conference on Nonlinear Systems & Dynamics 2021,17th to 22nd December 2021, Sastra University, India
- 2022 — Conference on Nonlinear Systems and Dynamics 15 to 18 December 2022, Indian Institutes of Science Education and Research Pune, India
- 2023 — Perspectives in Nonlinear Dynamics 2023, August 1-4, 2023, Indian Institute of Technology Madras, India
- 2024 — Conference on Complex Dynamical Systems and Applications (CDSA 2024) · 25-27 January, 2024, Indian Statistical Institute, Kolkata, India
- 2025 — International School and Conference on Network Science (NetsciX 2025) · 14-17 January, 2025, Indian Institute of Technology Indore (India)

Professional service

Refereed for journals — Physical Review E, Physical Review Research, Chaos, Chaos Solitons & Fractals, Scientific Reports, Communication Physics, Nonlinear Dynamics, International Journal of Bifurcation and Chaos, Pramana.

Awards and Fellowships

- 2018, 2019 — Qualified CSIR UGC NET (JRF), Council of Scientific and Industrial Research (CSIR), Govt. of India.
- 2018, 2019 — Qualified GATE (Graduate Aptitude Test in Engineering), Mathematics.
- 2024 — Availed International Travel Grant awarded by Indian Statistical Institute to visit the University of Namur.
- 2021-2024 — Availed National Travel Grant awarded by the Indian Statistical Institute to attend conferences in India.
- 2019 — Awarded Junior Research Fellowship, Indian Statistical Institute.

Skills

Languages	Strong reading, writing and speaking competencies for English, Bengali, Hindi.
Coding	C, Fortran, Python, Matlab, Julia, Latex
Operating System	Windows, Linux

Personal Information

Gender: Male

Nationality: Indian

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Date of Birth: 28/03/1996

References

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