Ashish Poonia, M.Sc.

Senior Research Fellow
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Research Interests

Broadly, my research focuses on modeling ecological and epidemiological systems using deterministic and stochastic dynamical systems, optimal control, and network theory. Currently, I am investigating how treatment coverage, adherence, switching, and resource allocation strategies influence HIV transmission dynamics, with particular emphasis on the emergence of drug resistance. As a young researcher, I aim to further strengthen my analytical skills and develop innovative modeling frameworks to inform data-driven strategies for managing medical, ecological, and environmental challenges.

Education

2020 – current **Ph.D., Indian Institute of Technology, Guwahati, Assam, India.**
Thesis title: *Mathematical modelling for the community transmission of HIV: Impact of the treatment and its adherence*

2014 – 2019 **Integrated M.Sc., Central University of Rajasthan, Rajasthan, India.**
Major Subject: *Mathematics*.

Research Publications

Peer Reviewed Articles

1. A. Poonia and S. P. Chakrabarty, "Dynamics of a multi-strain HIV/AIDS epidemic model with treatment and its adherence," *The European Physical Journal Plus*, vol. 139, no. 8, p. 769, 2024. DOI: https://doi.org/10.1140/epjp/s13360-024-05566-5.
2. S. Satija, A. Saha, A. Poonia, and S. P. Chakrabarty, "Deterministic and stochastic models for Chronic Myelogenous Leukemia cellular populations in presence of immune response," *The Journal of Innovation Sciences and Sustainable Technologies*, vol. 3, no. 2, pp. 79–98, 2023. URL: https://jisst.com/article?item_id=2021001051.
3. A. Poonia and S. P. Chakrabarty, "Two strains and drug adherence: An HIV model in the paradigm of community transmission," *Nonlinear Dynamics*, vol. 108, no. 3, pp. 2767–2792, 2022. DOI: https://doi.org/10.1007/s11071-022-07323-8.
4. J. P. Tripathi, P. S. Mandal, A. Poonia, and V. P. Bajiya, "A widespread interaction between generalist and specialist enemies: The role of intraguild predation and Allee effect," *Applied Mathematical Modelling*, vol. 89, pp. 105–135, 2021. DOI: https://doi.org/10.1016/j.apm.2020.06.074.

Preprints

1. A. Poonia and S. P. Chakrabarty, *Strategic control of drug-resistant hiv: Multi-strain modeling with diagnosis, adherence, and treatment switching*, 2025. URL: https://arxiv.org/pdf/2507.10625.
2. A. Kumar and A. Poonia, *Dynamical analysis and optimal harvesting policy of a prey-predator model with holling type-iii functional response*, 2023. DOI: https://doi.org/10.21203/rs.3.rs-2710709/v1.

Projects

2019 Intraguild predation with generalist predator and Allee effect in shared prey population **(Master's Thesis)**
Advisor: Dr. Jai Prakash Tripathi, *Assistent Professor, Central University of Rajasthan*

Skills

Coding	MATLAB, Python, Mathematica.
Utilities	LaTeX, MS Office.
Languages	Reading, writing and speaking competencies for English and Hindi.
Misc.	Academic research, teaching, LaTeX typesetting and publishing, photography.

Professional Presentations

2024 **HIV Community Transmission under Treatment: A Two-strain Modelling Approach.**
The International Conference on Scientific Computation and Differential Equations (SciCADE) 2024, National University of Singapore (NUS), Singapore.

2023 **HIV Community Transmission: A Multi-strain Modelling Approach**.
10^{th} *International Congress on Industrial and Applied Mathematics (ICIAM-2023),* Waseda University, Tokyo, Japan.

Community Transmission of Multiple Strains under Treatment: A Mathematical Modelling Approach.
89^{th} *Annual Conference of Indian Mathematical Society: an International Meet (IMS-2023),* Department of Mathematics, BITS-Pilani, Hyderabad Campus, Telangana, India.

2022 **Two Strain Dynamics of HIV Community Transmission: Competition vs Cooperation.**
International Conference on Advances in Biomathematics (ICABM-2022), Indian Society of Mathematical Modelling & Computer Simulation (ISMMACS), Amity University Uttar Pradesh, Lucknow Campus, India.

2021 **Dynamics of a Widespread Food Web System Consisting Intraguild Predation with Allee Effect.**
Online National Conference on Recent Trends in Mathematical Modeling and Its Applications (NCRTM-MA-2021), Department of Mathematics, ICFAI Science School, ICFAI University, Tripura, India.

Professional Developments

2024 **Comprehensive Data Science for Beginners.**
Online Course Organised by iHUB Divyasampark (Joint initiative of Government of India, Department of Science & Technology and IIT Roorkee) in association with Ritvij Bharat Pvt. Ltd.

2023 **Modelling of Complex Systems using Mathematics.**
Faculty Development Programme, Division of Mathematics, School of Advanced Sciences (SAS), Vellore Institute of Technology, Chennai, India.

High-End Workshop (KARYASHALA) on Bifurcations and Chaos: Computations and Applications.
Department of Mathematics, Indian Institute of Technology Indore, Indore, India.

Scientific Computing with Python and its Applications.
Online Course Organised by Electronics & ICT Academy at Indian Institute of Technology Guwahati in association with Ritvij Bharat Pvt. Ltd.

Professional Developments (continued)

2022 **Mathematical Modelling of Biosystems with Special Focus on Epidemiology.**
International Faculty Development Programme, Mizoram University, Mizoram, India.

Advanced LaTeX.
Faculty Development Programme, Division of Mathematics, School of Advanced Sciences (SAS), Vellore Institute of Technology, Chennai, India.

2021 **Pandemic and Socio-Economic Determinants: The Uses, Mathematics and Computations behind the Modeling to Inform Decision Makers.**
Virtual International Workshop (VIW), National Institute of Technology, Uttarakhand, India.

2020 **Workshop on Bio-Mathematics (WoBM-2020).**
Indian Institute of Technology Patna, Patna, India.

Faculty Development Programme on Biomathematics.
Department of Mathematics, P.G.D.A.V. College, University of Delhi & Mahatma Hansraj Faculty Development Center, Hansraj College, University of Delhi, Delhi, India.

2019 **Celestial Mechanics & Dynamical Astronomy (CMDA-2019).**
Department of Mathematics, Central University of Rajasthan, Rajasthan, India.

2016 **Short Term Training Course in Wildlife Biology: Tools and Techniques.**
Ecology and Rural Development Society & Wildlife Wing of Jodhpur Division, Rajasthan State Forest Department, Rajasthan, India.

Relevant Courses

Calculus, Differential Equation, Real Analysis, Complex Analysis, Linear Algebra, Abstract Algebra, Numerical Analysis, Functional Analysis, Mathematical Tools & Software, Modelling & Simulation, Dynamical Systems, Statistical Methods, Probability Theory, Advanced Probability, Statistical Foundation for Data Science, Programming in C, Scientific Computing with Python and its Applications, Comprehensive Data Science for Beginners.

Achievements/Awards

2022 – 2024 Council of Scientific & Industrial Research (CSIR) Senior Research Fellowship (SRF).

2020–2021 Council of Scientific & Industrial Research (CSIR) Junior Research Fellowship (JRF).

June, 2019 Qualified the Joint CSIR-UGC National Eligibility Test (NET) for award of Junior Research Fellowship in Mathematical Sciences (AIR-155).

Dec, 2018 Qualified the Joint CSIR-UGC National Eligibility Test (NET) for award of Lectureship in Mathematical Sciences (AIR-82).

Teaching Assistance

2024, 2025 **Linear Algebra**, Coursera, Indian Institute of Technology Guwahati (as a part of Bachelor of Science (Honours) in Data Science & Artificial Intelligence).

2023 **Algorithmic and High Frequency Trading**, Department of Mathematics, Indian Institute of Technology Guwahati.

2020, 2022, 2023 **Mathematics-I (MA101)**, Department of Mathematics, Indian Institute of Technology Guwahati.

2022 **Mathematics-II (MA102)**, Department of Mathematics, Indian Institute of Technology Guwahati.

2021 **Mathematics-III (MA201)**, Department of Mathematics, Indian Institute of Technology Guwahati.

Teaching Assistance (continued)

2020 — **Mathematical Portfolio Theory**, National Programme on Technology Enhanced Learning (NPTEL), Indian Institute of Technology Guwahati.

Leadership Positions

2021 – 2022 — **HMC Member,** Sports Coordinator.
Disang Hostel, Indian Institute of Technology Guwahati.

2023 – 2024 — **PhD Placement Coordinator**.
Department of Mathematics, Indian Institute of Technology Guwahati.

Reviewer

2023 – current — International Journal of Modelling and Simulation

2025 – current — Frontiers in Applied Mathematics and Statistics

Memberships

Feb, 2024 – current — Indian Mathematical Society

References

Available on Request