Moitrish Majumdar

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RESEARCH INTERESTS

Mathematical biology, antibiotic resistance, population modeling, machine learning, complex systems

EDUCATION

University of California, Merced **Aug '23 - Aug '28 (Expected)**
Applied Mathematics (Ph.D.): Advised by Dr. Suzanne Sindi and Dr. Tomas Rube

Birla Institute of Technology and Science (BITS), Pilani, India **Aug '17 - Aug '22**
Dual major program in Mathematics (MSc.) & Computer Science (B.E.)
Thesis: Network model of a bacterial population (as visiting student at **Dartmouth College**)

PUBLICATIONS

Yan, J., **Majumdar, M.**, Ruffo, S., Sato, Y., Beck, C., Klages, R. (2024). **"Transition to anomalous dynamics in a simple random map."** *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 34(2)., [Link]

RESEARCH EXPERIENCE

Sparse signal reconstruction via constrained optimization to study protein-antibody interactions
Supervisors: Dr. Tomas Rube, Dr. Suzanne Sindi
University of California, Merced (Applied Mathematics Department)
Jan '24 - Present

- Designing an efficient algorithm to extract sparse data from an under-determined system.
- Determining protein-antibody interactions from experiments involving multiple pooled antibodies.
- Accounting for experimental noise in the signal reconstruction.

Network model of a bacterial population with inter-phenotypic switching
[Code][Report][Thesis]
Supervisors: Dr. Alice C. Schwarze, Dr. Ethan Levien
Dartmouth College (Mathematics Department) Hanover, NH, USA
Jan '22 - June '22

- Studied the growth rate of a bacterial population with inter-phenotypic switching.
- Developed a network model and derived novel analytical approaches to compute the growth rate.
- Computed the change in growth rate when edges were deleted in the network model (restricted switching).

Anomalous dynamics generated by a random map
[Code] [Talk][Journal Article]
Supervisors: Dr. Yuzuru Sato, Dr. Rainer Klages
London Mathematical Laboratory/ Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy
July '21 - Dec '21

- Studied the dynamics of a random linear map used to model Brownian motion.

- Designed and ran numerical simulations to determine auto-correlation functions and iterated sums.
- Used numerical simulations to establish weak ergodicity breaking and intermittency displayed by the map.

Stochastic dynamics of epidemic models *Department of Mathematics, BITS Pilani*
[Code] *Goa, India*
Supervisor: Dr. Anupama Sharma **July '20 - May '21**

- Studied extended stochastic versions of epidemic models such as the SIR model.
- Used the Gillespie Algorithm to introduce demographic stochasticity.
- Compared the behaviour of stochastic models with deterministic models with external periodic forcing.

TALKS/PRESENTATIONS

2024 SIAM Conference on the Life Sciences **June '24**
Highlighting LGBTQ+ Mathematicians in the Life Sciences [Program][Poster]

Modeling Resistance Evolution – Theoretical Methodology Symposium **April '23**
Max Planck Institute for Evolutionary Biology
"(Poster) A network model for the growth of a bacterial population in adverse environments" [Program]

London Mathematical Laboratory/ Abdus Salam International Centre for Theoretical Physics: Summer School **July '21**
"Anomalous diffusion in a random dynamical system" [Talk] [Slides]

FELLOWSHIPS AND GRANTS

Travel Grant from the Max Planck Institute of Evolutionary Biology **April '23**
to facilitate attendance at the "Modeling Resistance Evolution - Theoretical Methodology Symposium" in Plön, Germany €1000

Long Term Visiting Students' Program **Aug '22 - May '23**
at the International Centre for Theoretical Sciences (ICTS) approx. ₹300,000
Tata Institute of Fundamental Research (TIFR), Bangalore, India

Stipend from the London Mathematical Laboratory **July '21**
for the Summer School program, jointly conducted with the €500
Abdus Salam International Center for Theoretical Physics (ICTP), Trieste, Italy

TEACHING EXPERIENCE

- **Graduate Teaching Assistant:** Leading discussion sections and grading coursework for Math 021 (Calculus-I) at UC Merced.
- **Undergraduate Learning Assistant:** Designed and graded course assignments and tests, and conducted doubt-clearing classes for undergraduate courses:

SKILLS

Programming/Software: Python, MATLAB, C/C++,Java **Tools:** LaTeX, Linux OS, Git, Bash