ABHIRUP MOITRA

RESEARCHER, EDUCATOR, & SCIENCE COMMUNICATOR

Profile

I am a **researcher, educator, and science communicator** with expertise in **scientific computing, numerical methods, and complex dynamics.**

Research Interests:

- **Mathematical Analysis,**
- **Statistics (Theoretical and Mathematical),**
- **Complex Dynamics,**
- **Fixed Point Iteration & Iterated Function System (IFS),**
- **Self-similarity & Fractals.**

Aiming to share fundamental and advanced mathematical concepts to inspire research and contribute to science and technology. Committed to passing on knowledge to the next generation.

Education

B.Sc.(Hons.)-Statistics, Amity University, Kolkata

AUGUST 2019 — AUGUST 2022

In a 3-year B.Sc. (Hons.) Statistics program, I focused on Statistics and Mathematics as major subjects, with a minor in Econometrics, mathematical programming, and data visualization.

Academic Projects

Student Trainee , Amity University, Kolkata

APRIL 2020 — JANUARY 2021

Creating Linear Statistical Model And Diagnostic Plot

Applied linear regression to the mpg dataset, employing diagnostic plots for error analysis and model refinement. Contributed to enhanced predictive accuracy and model integrity.

Project Trainee , Amity University, Kolkata

FEBRUARY 2022 — MAY 2022

Simulation of COVID-19 Lateral Test Process Using R simmer

The study uses Discrete Event Simulation to model systems, assessing completion rates in a minute. Process Cycle Efficiency, or the "value-added ratio," measures active versus waiting time, providing crucial insights into process efficiency and system dynamics.

Major Project Trainee , Amity University, Kolkata

FEBRUARY 2022 — MAY 2022

DEVELOPING R SHINY APP WITH DIFFERENTIAL GENE EXPRESSION DATA (REAL-TIME PCR)

This research project allows to creation of a Shiny app to plot gene expression data (Real-Time PCR) from a published manuscript entitled "An Unbiased Systems Genetics Approach to Mapping Genetic Loci Modulating Susceptibility to Severe Streptococcal Sepsis by Abdeltawab, N.F. et al. 2008".

Details

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India
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NATIONALITY

Indian

DATE / PLACE OF BIRTH

14/11/2000
Malda

Links

Portfolio

LinkedIn

GitHub

RPubs

Skills

- R
- Python
- LaTeX
- GeoGebra

Languages

- Bengali
- English
- Hindi

Research Collaboration, Cosmic Charade, Kolkata

AUGUST 2023 — DECEMBER 2023

Analysing **Fractal Complexity: A Comprehensive Examination of Iterated Function Systems in Mathematical and Computational Sciences.**

The study aims to underscore the significance of IFS as a powerful and flexible tool for generating complex, self-replicating structures with applications that extend across various domains of scientific inquiry and artistic expression.

Working Experiences

Founding Member & Executive Contributor, Cosmic Charade, Kolkata

FEBRUARY 2022 — PRESENT

Actively engaged in establishing **Cosmic Charade** as a startup since 2022. Led efforts with the team to formalise and register the organisation under the Government of India. Successfully obtained UDYAM registration (**UDYAM-WB-08-0072647**) to enhance credibility and operational legitimacy. Contributed to strategic growth, content development, and outreach initiatives.

Founding Member & Assistant Organizer, Kolkata R User Group, Kolkata

MARCH 2024 — PRESENT

I'm a core **committee member** of the **Kolkata R User Group,** where I serve as an event coordinator and R programming course instructor. I contribute to the group's mission of advancing scientific computation visualization, and statistical analysis through R programming.

Educator, Mentor & Science Communicator, Kolkata

FEBRUARY 2022 — PRESENT

I design and conduct **workshops, courses, and mentoring sessions** on scientific computing, numerical methods, and complex dynamics, equipping learners with essential analytical skills. Through **scholarly writing and public engagement**, I simplify complex scientific concepts and bridge the gap between research and broader audiences. As a **mentor in computational sciences, fractal geometry, and numerical analysis**, I guide students in developing critical thinking and problem-solving abilities, fostering deeper scientific inquiry.

Content Generator and Blogger, Kolkata

DECEMBER 2022 — JULY 2023

Involved in MATH-GANIT, an initiative by Indian Statistical Institute fellows, I shared problem-solving strategies for mathematics and authored formal blogs on the subject.

Invited Talks & Membership

Open Source Active User, R Foundation For Statistical Computing, Boston

JULY 2020 — PRESENT

Statistical Programmer | Kolkata R User Group (Lifetime Member), Kolkata R UseR Group, Kolkata

MARCH 2024 — PRESENT

Contribute to the community by sharing **teaching methodologies** and **best practices** for **data** visualisation **using R Studio**, fostering knowledge exchange and skill development in statistical programming.

Invited Talks, Abuja R Users Group, Abuja

OCTOBER 2022 — PRESENT

Invited to deliver talks on:

1. ***Non-linear Dynamical Systems (Chaos Theory and the Butterfly Effect) using R*** – Focused on the mathematical principles of chaos and its applications, with R-based simulations.
2. ***Algorithmic Elegance: Fractal Symphonies in R*** – Discussed the computational generation of fractals, showcasing the interplay between mathematics and coding in R

E-Student Member, Royal Statistical Society, London

NOVEMBER 2021 — DECEMBER 2022

I was an e-student member of the Royal Statistical Society (RSS).

Internships

Summer Internship , VIT-AP University, Amaravati, Andhra Pradesh

MAY 2024 — JULY 2024

I conducted a comprehensive literature review focused on holomorphic dynamics, fractal geometry, and their connections to mathematical and computational sciences under the guidance of Dr. Shantanu Nandi, Assistant Professor at VIT-AP University.

Research Intern , VIT-AP University, Vijayawada

AUGUST 2024 — JANUARY 2025

Investigated the dynamical and fractal characteristics of the complex perturbed rational map $z_{n+1} = ½(z_n + \frac{\lambda}{ z_n ^q})$ using the optimal control function method. This approach manipulates the Julia sets by controlling the point at infinity, enabling analysis of stability and convergence. Applied this nonlinear method, introducing a control term, to evaluate Julia sets of synchronous systems, contributing to the understanding of coupled dynamical systems.

Visiting Scholar, VIT-AP University, Vijayawada

JANUARY 2025 — PRESENT

My research interests lie in complex dynamics, fractal geometry, and computational mathematics. I am currently expanding my work in these areas to advance my academic and professional goals. My research focuses on higher-dimensional Julia and Fatou sets, the Mandelbrot Locally Connected Conjecture (MLC), and the relationship between fractal geometry and classical topology. I am also developing algorithms for fractal generation, emphasising computational efficiency and accuracy. These endeavours aim to contribute to a deeper understanding of mathematical complexity and its applications in science and technology.

Visiting Student

Visiting Research Student, Presidency University, Kolkata

MAY 2025 — PRESENT

Visiting Research Student at Presidency University, Kolkata under Dr. Kuntal Banerjee, focusing on Ergodic Theory and its connections to fractal geometry.
My research explores how ergodic methods and dynamical systems illuminate the structure and dimension of fractals through tools like thermodynamic formalism, symbolic dynamics, and iterated function systems.

Licenses & Certifications

Faculty Development Program on Advances in Nonlinear Dynamics: Methods & Application (ANDMA 2024) , Amaravati, Andhra Pradesh

JUNE 2024 — JUNE 2024

The 5 days international faculty development program on 'Advances in Nonlinear Dynamics: Methods & Application (ANDMA 2024)' organized virtually by the Department of Mathematics, School of Advanced Science, VIT-AP, University, from 11th to 15th June, 2024.

International Conference on Recent Trends in Mathematical & Computational Science , Kolkata

JULY 2022 — JULY 2022

An international conference where I presented my academic research **Simulation of Covid-19 Lateral Test Process Using R simmer**

MATHEMATICAL METHODS & MODELS IN APPLIED SCIENCES, Kolkata

2020 — NOVEMBER 2020

Publication

Published Author | Ganit Charcha (10th Anniversary Print Edition), Kolkata

SEPTEMBER 2024 — SEPTEMBER 2025

Authored "Embracing Nature's Paradoxical Edges: The Puzzle of Coastal Borders," featured in the 10th Anniversary print edition of Ganit Charcha. The article explores the mathematical intricacies of coastal geometries, highlighting the paradoxes in measuring natural boundaries.

Published Author | Cosmic Charade (2024 Print Edition), Kolkata

NOVEMBER 2024 — NOVEMBER 2024

Contributed the article *"The Cosmic Cipher: The Surprising Connection Between Numbers and the Nature of Reality"* to the **2024 print edition** of **Cosmic Charade**. The piece explores the profound relationship between numerical structures and fundamental aspects of reality, bridging mathematics and the natural world.

Dynamics of Julia Sets in Rational Maps - Control and Synchronization

FEBRUARY 2025 — FEBRUARY 2025

Dynamics of Julia Sets in Rational Maps - Control and Synchronization

This work deals with the study of the dynamical and fractal characteristics of the complex perturbed rational map provided by $z_{n+1} = ½(z_n + \lambda/ z_n ^q)$,- Published by Ganit Charcha | Category -Advanced Math Article section.

Mathematical Aesthetics in Ragas

FEBRUARY 2025 — FEBRUARY 2025

Mathematical Aesthetics in Ragas

This research uncovers a surprising connection between measure theory and the Indian Raga system. Measure theory, which rigorously defines size and probability, extends beyond pure mathematics to reveal patterns in music. Through concepts like sigma-algebras and probability spaces, the study shows how the structured randomness of measure theory beautifully aligns with the expressive, melodic frameworks of Indian classical music, highlighting a hidden harmony between mathematics and art, Published by Ganit Charcha | Category -Advanced Math Article section.