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Navojit Dhali Pallab

Research Objective

Specializing in dynamical systems and mathematical physiology, with a focus on analyzing multiple time-scale systems and synchronization in the network of these systems and seeking to contribute to interdisciplinary research in Mathematics.

Research Interests: Dynamical Systems · Non-Hyperbolic Analysis · Mathematical Modeling · Inverse Problem · Mathematical Physiology · Neuronal Networks · Machine Learning

Education

2022/10–2025/09 **PhD in Mathematics**, *Mathematical Institute, Graduate School of Science, Tohoku University*, Sendai, Japan,
Thesis: Canard Dynamics and Synchronization in the Network of Three Time Scale Systems.
Supervisor: Prof. Dr. Hayato Chiba

2020/10–2022/09 **MSc in Mathematics**, *Mathematical Institute, Graduate School of Science, Tohoku University*, Sendai, Japan
Thesis: Bifurcation and Synchronization of Hodgkin-Huxley-Type Neurons in a Small-World Network.
Supervisor: Prof. Dr. Hayato Chiba

2017/08–2018/11 **MSc in Mathematics**, *Jahangirnagar University*, Dhaka, Bangladesh
Thesis: Numerical Studies of the Hodgkin-Huxley Model to Understand Physiological Features of Nerve Cells.
Supervisor: Prof. Dr. Mohammad Osman Gani

2013/01–2017/06 **BSc in Mathematics**, *Jahangirnagar University*, Dhaka, Bangladesh

2012 **HSC, Science Group**, *Paikgacha College*, Paikgacha, Khulna, Bangladesh

2010 **SSC, Science Group**, *Alokdwip High School*, Paikgacha, Khulna, Bangladesh

Research Experience

2025/11– **Specially Appointed Research Fellow**, *AIMR, Tohoku University*, Sendai, Japan

2022/09–2022/10 **Research Assistant**, *AIMR (Chiba Group), Tohoku University*, Sendai, Japan
Project: Mathematical modeling of diabetes using dynamical systems; conducted numerical simulations and stability analysis. (PI: Prof. Dr. Hayato Chiba)

2018–2020 **Research Student**, *Jahangirnagar University*, Dhaka, Bangladesh
Project: Mathematical analysis of cardiac electrical activities using reaction-diffusion models and bifurcation theory. Supervisor: Prof. Dr. Mohammad Osman Gani.

2017–2018 **MS Research Student**, *Jahangirnagar University*, Dhaka, Bangladesh
Project: Bifurcation analysis of the Hodgkin-Huxley model to investigate nerve cell dynamics.

2015–2017 **Undergraduate Researcher**, *Jahangirnagar University*, Dhaka, Bangladesh
Project: Numerical simulation of reaction-diffusion systems in cardiac excitation models.

Publications

2025 **Preprint**, *arXiv*,
"*Synchronization Phenomena in Three-Time-Scale Systems*", Navojit Dhali Pallab
doi.org/10.48550/arXiv.2505.21088.

2025 **Journal Article (accepted)**, *Nonlinear Science, Elsevier*,
"*Pancreatic β-Cell Dynamics in Three-Time-Scale Systems*", Navojit Dhali Pallab
doi.org/10.48550/arXiv.2505.18837.

2021 **Journal Article**, *Journal of Interdisciplinary Mathematics*,
"*Ions Conductance and External-Stimulation-Dependent Bifurcations*", **Navojit Dhali Pallab**, Mirazul Islam, M. Osman Gani
DOI:10.1080/09720502.2020.1819680.

Conference Presentations

2024 **Poster Presentation**, *EQUADIFF 2024, Karlstad University*, Karlstad, Sweden
Synchronization Phenomenon in the Network of Bursting Oscillators with Multiple-Slow-Time Scale Approach (Published in Book of Abstracts).

2023 **Oral Presentation**, *38th International Kumamoto Medical Bioscience Symposium*, Kumamoto University, Japan
Bifurcation and Synchronization of Hodgkin-Huxley-Type Neurons in a Small-World Network.

2019 **Oral Presentation**, *National Mathematics Conference*, Bangladesh
Effect of Frequency-Dependent Stimulation on Hyper-Active Nerve Cell Dynamics, with M. Osman Gani.

2018 **Poster Presentation**, *ICRAMPS*, Bangladesh
Effect of HFS Current on Nerve Cell Dynamics through Hodgkin-Huxley Model, with Mirazul Islam, M. Osman Gani.

2018 **Poster Presentation**, *ICRAMPS*, Bangladesh
Stability of Periodic Traveling Waves in a Reaction-Diffusion Type Model of Cardiac Excitation, with Mirazul Islam, M. Osman Gani.

2017 **Poster Presentation**, *International Mathematics Conference*, Bangladesh
Effect of Different Types of Stimulation on Nerve Cell Dynamics through Hodgkin-Huxley Model, with Mirazul Islam, M. Osman Gani.

2017 **Poster Presentation**, *International Mathematics Conference*, Bangladesh
Diffusion-Dependent Stability of Periodic Traveling Waves in a Modified FitzHugh-Nagumo Model of Cardiac Cell Dynamics, with Mirazul Islam, M. Osman Gani.

Awards and Scholarships

2024/04–2025/09 **Pioneering Research Support Project for PhD Students**, *Tohoku University*, Japan
Competitive funding for innovative PhD research.

2023 **Best Presenter Award**, *38th International Kumamoto Medical Bioscience Symposium*, Kumamoto University, Japan
One of three recipients recognized for outstanding oral presentation.

2022/10–2024/03 **Doctoral Fellowship**, *Tohoku University*, Japan
Competitive funding for PhD research.

2020/10–2022/09 **MEXT Scholarship**, *Government of Japan*, Japan
Full funding for master's studies in mathematics at Tohoku University.

2018–2019 **NST Fellowship for MS Research**, *Government of Bangladesh*, Bangladesh
Supported research on nerve cell dynamics using the Hodgkin-Huxley model.

2018 **Best Poster Presentation Award**, *ICRAMPS*, Bangladesh
Recognized for one of the outstanding poster presentations.

Professional Development

2025 **Workshop**, *Kyoto University*, Kyoto, Japan
Joint Japan/US Collaborative Workshop on Geometric Analysis II.

2025 **Workshop**, *Tohoku University*, Sendai, Japan
Mini workshop related to dynamical systems and celestial mechanics.
Gained insights into dynamical networks, the Hubble tension, and three-body problem.

2025 **Workshop**, *Kyoto University*, Kyoto, Japan
9th Workshop on Hamiltonian Systems and Related Topics.

2024 **Workshop**, *Kyoto University*, Kyoto, Japan
3rd ASHBi Workshop MathHub.
Explored mathematical applications in human brain interaction.

2023 **Conference**, *Sendai International Center*, Sendai, Japan
46th Annual Meeting of the Japan Neuroscience Society: Towards the Galaxy of Neuroscience.

2023 **Conference**, *Waseda University*, Tokyo, Japan
10th International Congress on Industrial and Applied Mathematics (ICIAM).

2022 **Workshop**, *RIMS, Kyoto University*, Kyoto, Japan
Time-Delay Systems and Mathematical Sciences.
Explored time-delay systems in biological modeling.

2021 **Internship**, *AIMR, Tohoku University*, Sendai, Japan
g-RIPS Sendai 2021.
Developed mathematical models for teleoperation systems.

2020 **Workshop**, *Jahangirnagar University*, Dhaka, Bangladesh
Recent Trends in Mathematical Biology.

2019 **Workshop**, *CIMPA Research School, University of Dhaka*, Dhaka, Bangladesh
Dynamical Systems and Applications to Biology.

Professional Activities

2025 Ad-hoc Reviewer, GANIT: Journal of Bangladesh Mathematical Society, Bangladesh

Life Member Bangladesh Society for Mathematical Biology (BSMB)

Technical Skills

P. Languages C (Advanced), Python (Proficient), C++ (Proficient), FORTRAN (Proficient)

Software and Tools MATLAB (Advanced), WAVETRAIN (Proficient), Mathematica (Advanced), NEURON (Intermediate, neural modeling), AUTO (Intermediate)

Languages Bengali (Native), English (Fluent)

References

Prof. Dr. Hayato Chiba, *Advanced Institute for Materials Research (AIMR)*, Tohoku University, Sendai, Japan
Email: Available upon request
PhD and MSc Supervisor.

Prof. Dr. Mohammad Osman Gani, *Department of Mathematics*, Jahangirnagar University, Dhaka, Bangladesh
Email: Available upon request
MSc Supervisor and Research Mentor.

Prof. Dr. Muhammad Humayun Kabir, *Department of Mathematics*, Jahangirnagar University, Dhaka, Bangladesh
Email: Available upon request
Research Mentor.