# INDRANIL GHOSH

School of Mathematical and Computational Sciences • Massey University • Palmerston North, 4442
i.ghosh@massey.ac.nz • indranilg49@gmail.com • https://indrag49.github.io/ • @indraghosh314

## WORK EXPERIENCE

**PDF, Applied Mathematics** — Feb 2024-Present
**Massey University** — Palmerston North, New Zealand-4442

## EDUCATION

**Ph.D., Applied Mathematics** — 2021-Present
**Massey University** — Palmerston North, New Zealand-4442

**M.Sc., Physics** — 2018-2020
**Jadavpur University** — Kolkata, India-700032

**B.Sc., Physics** — 2015-2018
**Jadavpur University** — Kolkata, India-700032

## AWARDS & HONORS

1. Postdoctoral fellowship contract (Marsden project) MAU2209, managed by Royal Society Te Apārangi, New Zealand [2024-2025].
2. Highly Commended Student Presentation award, NSW ANZIAM Mid YEar Meeting [2023].
3. KiwiPycon Student Travel & Accomodation Grant [2023].
4. Prestigious Red Sock award for the best poster presentation, SIAM Conference on Applications of Dynamical Systems (DS23) [2023].
5. KiwiPycon Student Travel Grant [2022].
6. Marsden Ph.D. Grant contract MAU1809, managed by Royal Society Te Apārangi, New Zealand [2021-2023].
7. "Top 40" new CRAN packages under the category Computational Methods for the `R` package QGameTheory [June 2020]

## JOURNAL PUBLICATIONS

[**J1**] ***Indranil Ghosh***, Sishu Shankar Muni, and Hammed Olawale Fatoyinbo, **On the analysis of a heterogeneous coupled network of memristive Chialvo neurons.** To appear in *Nonlinear Dyn.*

[**J2**] ***Indranil Ghosh***, and David J. W. Simpson, **Renormalisation of the two-dimensional border-collision normal form.** *Int. J. Bifurcation Chaos 32(12):2250181, 2022.* https://doi.org/10.1142/S0218127422501814

[**J3**] Sishu Shankar Muni, Hammed Olawale Fatoyinbo, and ***Indranil Ghosh***, **Dynamical effects of electromagnetic flux on Chialvo neuron map: nodal and network behaviors.** *Int. J. Bifurcation Chaos 32(09):2230020, 2022.* https://doi.org/10.1142/S0218127422300208

[**J4**] ***Indranil Ghosh***, and David J. W. Simpson, **Robust Devaney chaos in the two-dimensional border-collision normal form.** *Chaos 32, 043120 (2022).* https://doi.org/10.1063/5.0079807

[**J5**] ***Indranil Ghosh***, **Quantum Game Theory - I.** *Resonance 26, 671–684 (2021).* https://doi.org/10.1007/s12045-021-1168-2 . **Quantum Game Theory - II.** *Resonance 26, 791–812 (2021).*

https://doi.org/10.1007/s12045-021-1180-6. **Quantum Game Theory - III.** *Resonance 26, 939–951 (2021).* https://doi.org/10.1007/s12045-021-1193-1.

## PUBLICATIONS IN CONFERENCE PROCEEDINGS

[**C1**] Hammed Olawale Fatoyinbo, Sishu Shankar Muni, ***Indranil Ghosh***, Ibrahim Olatunji Sarumi, and Afeez Abidemi, **Numerical bifurcation analysis of improved denatured Morris-Lecar neuron model.** *2022 International Conference on Decision Aid Sciences and Applications (DASA).* https://doi.org/10.1109/DASA54658.2022.9765094

[**C2**] Sarath Babu, ***Indranil Ghosh***, and B. S. Manoj, **Effort: A New Metric for Roadside Unit Placement in 5G Enabled Vehicular Networks.** *5GWF'2020 Proceedings.* https://doi.org/10.1109/5GWF49715.2020.9221228

## PREPRINTS

[**P1**] ***Indranil Ghosh***, Robert I. McLachlan, and David J.W. Simpson, **The bifurcation structure within robust chaos for two-dimensional piecewise-linear maps.** https://arxiv.org/abs/2402.05393

[**P2**] ***Indranil Ghosh***, Robert I. McLachlan, and David J.W. Simpson, **Robust chaos in orientation-reversing and non-invertible two-dimensional piecewise-linear maps.** https://arxiv.org/abs/2307.05144

[**P3**] Costas J. Efthimiou, Gregory DeCamillis, and ***Indranil Ghosh***, **A physics-driven study of dominance space in soccer.** https://arxiv.org/abs/2202.00414

## SOFTWARES

[**S1**] ***Indranil Ghosh***, **QGameTheory: Quantum Game Theory Simulator (v0.1.2).** *CRAN Repository, 2020.* https://cran.r-project.org/web/packages/QGameTheory/index.html

## BLOGS

***Indranil Ghosh***, **Introduction to Mathematical Optimiztion (with Python).** https://indrag49.github.io/Numerical-Optimization/

***Indranil Ghosh***, **Introductory Football Data Analysis.** https://realsoccerexpand.netlify.app/

## PAST WORK EXPERIENCE

**Sirpi Products and Services Pvt. Ltd.,** Bangalore, India August 2020-December 2020.
*Research Lead and SHEAR Project Lead (Remote)*

**Indian Institute of Space Science and Technology,** Kerala, India. May 2019-June 2019.
*Computer Science Intern*

## CONFERENCE PRESENTATIONS

**Understanding the Topology of Chaotic Attractors for Piecewise-Linear Maps using Renormalisation.** December 2023
New Zealand Mathematical Society Colloquium, 2023 *Talk*

**Bifurcation structure of robust chaos in a generalised setting of piecewise-linear maps.** December 2023
New Zealand Mathematical Society Colloquium, 2023 *Poster*

**Understanding the Topology of Chaotic Attractors for Piecewise-Linear Maps using Renormalisation.** December 2023
New Zealand Mathematics and Statistics Postgraduate Conference, 2023 *Talk*

**Chaos, Robust Chaos and Applications.** October 2023
Café Scientifique *Talk*

**Python: A career changing/shaping language.** October 2023
PyGotham TV, 2023 *Talk*

**Python: from the perspective of an applied mathematician.** September 2023
Kiwi Pycon XII, 2023 *Talk*

**Understanding the bifurcation structure of robust chaos in piecewise-linear maps using renormalisation.** July 2023
ICDEA 2023 *Talk*

**The Bifurcation Structure Within Robust Chaos of Piecewise-Linear Maps** May 2023
SIAM Conference on Applications of Dynamical Systems (DS23) *Poster*

**Introduction to mathematical optimization using Python** February 2023
Python Delhi User Group Meetup, 2023 *Tutorial*

**Bifurcation structure of robust chaos in two-dimensional piecewise-linear maps** December 2022
New Zealand Mathematical Society Colloquium, 2022 *Talk*

**Bifurcation structure of robust chaos in 2D piecewise-linear maps** November 2022
Dynamical Systems in NZ - Castaways, 2022 *Invited Talk (E-poster)*

**Unconstrained Numerical Optimization using Python** August 2022
Kiwi Pycon XI, 2022 *Tutorial*

**Dynamical Effects of Electromagnetic Flux on Chialvo Neuron Map: Nodal and Network Behaviors** July 2022
SIAM Conference on the Life Sciences, 2022 *Talk*

**Renormalisation of the Two-Dimensional Border-Collision Normal Form** July 2022
SIAM Annual Meeting, 2022 *Talk*

**Renormalisation of the Two-Dimensional Border-Collision Normal Form** July 2022
NSW ANZIAM 2022 Mid-Year Conference, 2022 *Talk*

**Dynamical effects of electromagnetic flux on Chialvo neuron map: nodal and network behaviors** April 2022
BAMC, 2022 *Talk*

**Renormalisation of the Two-Dimensional Border-Collision Normal Form** February 2022
ANZIAM Annual Conference, 2022 *Talk*

**Learn Football Data Analysis with Python** December 2021
PyCode Conference, 2021 *Talk*

**Football (soccer) data analysis: A Pedagogic introduction** October 2021
PyCon Taiwan, 2021 *Talk*

**An introduction to hands-on football data analysis in Python** October 2021
PyCon Espana, 2021 *Talk*

**Football (soccer) data analysis: A pedagogic introduction** September 2021
PyConline AU, 2021 *Talk*

**Introduction to Soccer Pass Network Analysis with Python** July 2021
PyOhio, 2021 *Thunder Talk*

**Introducing a blog: Introductory Football Data Analysis** July 2021
EuroPython Conference, 2021 *Lightning Talk*

**Using Python to start learning Unconstrained Numerical Optimization Algorithms** June 2021
Pycon Colombia, 2021 *Talk*

**QGameTheory: An R package for teaching quantum computing and quantum game theory to students** April 2021
International Series of Online Research Software Events (SORSE) *Poster + Talk*

**QGameTheory: A Quantum Game Theory Simulator written in R for teaching quantum computing and game theory to starting programmers and undergraduate students** March 2021
APS March Meeting 2021 *Poster*

**Develop and Document Your First R Package** December 2020
Sirpi Products and Services Pvt. Ltd. *Talk*

**Learn Lambda Calculus with Python** December 2020
Pycode Conference 2020 *Talk*

**Teaching quantum computing and game theory with QGameTheory package** September 2020
Why R? 2020 Conference *Talk*

**Introducing Lambda Calculus with Python** September 2020
Pycon Australia *Talk*

**Quantum Game Theory with Julia: A computational analysis** July 2020
JuliaCon *Poster*

**Build Your Own Quantum Simulator With R** June 2020
The European R Users Meeting *Lightning talk*

**A Computational Study of Sequential Deposition: A Dynamic Monte Carlo Process in Statistical Physics** September 2019
Flatlands and beyond (2019) – A meet on 2D materials *Poster*

**A Python implementation of Quantum Evolutionarily Stable Strategy Game, an interdisciplinary study of Quantum Computation and Game Theory in population biology**

February 2019
SLAS Conference *Poster*

**Analysis of Quantum Game Theoretic Models with a Python Simulator** December 2018
SciPy India *Talk*

**Analysis of Chaos Game Simulator in Pygame** October 2018
International Conference on Complex Dynamical Networks, 2018 *Poster*

**Computation of Analytic Structure Factor for Macromolecules** June 2018
Research Topic of Statistical Physics to young Physicists, 2018 *Poster*

## TUTORING/MARKING

**Tutor** for Engineering Mathematics.
**Marking assistant** for Calculus.
**Marking assistant** for Linear Algebra.

## JOURNAL REFEREE

- Chaos: An Interdisciplinary Journal of Nonlinear Science
- Nonlinear Dynamics: An International Journal of Nonlinear Dynamics and Chaos in Engineering Systems
- Communications in Theoretical Physics
- IEEE Transactions on Cybernetics

## SKILLS

| | |
|---|---|
| **Softwares** | Expert: R, Python, Fortran, git, LaTeX, HTML, Markdown |
| **Social** | Twitter: **@indraghosh314**, |
| | Github: `https://github.com/indrag49`, |

## REFERENCES

[**R1**] ***David J. W. Simpson*** (**Ph.D. Supervisor).** *Email: d.j.w.simpson@massey.ac.nz* `https://www.massey.ac.nz/~djwsimps`

[**R2**] ***Robert McLachlan*** (**Ph.D. Co-supervisor).** *Email: r.mclachlan@massey.ac.nz* `https://www.massey.ac.nz/~rmclachl/`

[**R3**] ***Tammy Lynch*** (**PDF Manager, Deputy Head of the School of Mathematical and Computational Sciences).** *Email: t.a.lynch@massey.ac.nz*