

# INDRANIL GHOSH

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## EDUCATION

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Ph.D., Applied Mathematics Massey University	2021-Present Palmerston North, New Zealand-4442
M.Sc., Physics Jadavpur University	2018-2020 Kolkata, India-700032
B.Sc., Physics Jadavpur University	2015-2018 Kolkata, India-700032

## AWARDS & HONORS

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

## JOURNAL PUBLICATIONS

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- [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

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[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

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[P1] *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>

[P2] Costas J. Efthimiou, Gregory DeCamillis, and *Indranil Ghosh*, A physics-driven study of dominance space in soccer. <https://arxiv.org/abs/2202.00414>

## SOFTWARES

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[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

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

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

## RESEARCH AND WORK EXPERIENCE

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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

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Python: A career changing/shaping language    October 2023  
PyGotham TV, 2023    *Talk (Upcoming)*

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

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

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 Python Delhi User Group Meetup, 2023	February 2023 <i>Tutorial</i>
Bifurcation structure of robust chaos in two-dimensional piecewise-linear maps New Zealand Mathematical Society Colloquium, 2022	December 2022 <i>Talk</i>
Bifurcation structure of robust chaos in 2D piecewise-linear maps Dynamical Systems in NZ - Castaways, 2022	November 2022 <i>Invited Talk (E-poster)</i>
Unconstrained Numerical Optimization using Python Kiwi Pycon XI, 2022	August 2022 <i>Tutorial</i>
Dynamical Effects of Electromagnetic Flux on Chialvo Neuron Map: Nodal and Network Behaviors SIAM Conference on the Life Sciences, 2022	July 2022 <i>Talk</i>
Renormalisation of the Two-Dimensional Border-Collision Normal Form SIAM Annual Meeting, 2022	July 2022 <i>Talk</i>
Renormalisation of the Two-Dimensional Border-Collision Normal Form NSW ANZIAM 2022 Mid-Year Conference, 2022	July 2022 <i>Talk</i>
Dynamical effects of electromagnetic flux on Chialvo neuron map: nodal and network behaviors BAMC, 2022	April 2022 <i>Talk</i>
Renormalisation of the Two-Dimensional Border-Collision Normal Form ANZIAM Annual Conference, 2022	February 2022 <i>Talk</i>
Learn Football Data Analysis with Python PyCode Conference, 2021	December 2021 <i>Talk</i>
Football (soccer) data analysis: A Pedagogic introduction PyCon Taiwan, 2021	October 2021 <i>Talk</i>
An introduction to hands-on football data analysis in Python PyCon Espana, 2021	October 2021 <i>Talk</i>
Football (soccer) data analysis: A pedagogic introduction PyConline AU, 2021	September 2021 <i>Talk</i>
Introduction to Soccer Pass Network Analysis with Python PyOhio, 2021	July 2021 <i>Thunder Talk</i>
Introducing a blog: Introductory Football Data Analysis EuroPython Conference, 2021	July 2021 <i>Lightning Talk</i>
Using Python to start learning Unconstrained Numerical Optimization Algorithms Pycon Colombia, 2021	June 2021 <i>Talk</i>

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 Presentation + 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 Presentation*

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 presentation*

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 *SNBNCBS, Kolkata, India*

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 *Washington D. C, USA*

Analysis of Quantum Game Theoretic Models with a Python Simulator December 2018  
SciPy India *IIT-B, Mumbai*

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

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

## TUTORING/MARKING

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Marking assistant for Calculus.  
Marking assistant for Linear Algebra.

## SERVICE

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Journal Referee

Chaos: An Interdisciplinary Journal of Nonlinear Science

## SKILLS

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Softwares	Expert: R, Python, Fortran, git, $\text{\LaTeX}$ , HTML, Markdown
Social	Twitter: @indraghosh314, Github: <a href="https://github.com/indrag49">https://github.com/indrag49</a> ,

## REFERENCES

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- [R1] *David J. W. Simpson* (Ph.D. Supervisor). *Email: [d.j.w.simpson@massey.ac.nz](mailto: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](mailto:r.mclachlan@massey.ac.nz)*  
<https://www.massey.ac.nz/~rmclachl/>
- [R3] *Tammy Lynch* (Head of Mathematics group, Deputy Head of the School of Mathematical and Computational Sciences). *Email: [t.a.lynch@massey.ac.nz](mailto:t.a.lynch@massey.ac.nz)*