

# REY AUDIE S. ESCOSIO

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External links: [in](#) LinkedIn · [G](#) Google Scholar · [R](#) ResearchGate · [G](#) GitHub · [ORCID](#)  
[Scopus](#) · [R](#) Web of Science ResearcherID · [Ciência Vitae](#)

## BIOSKETCH

Rey (he/him) finished his B.Sc. Applied Physics and M.Sc. Applied Mathematics from the Institute of Mathematics, University of the Philippines Diliman. Since 2013, he has received two DOST scholarships – the DOST-SEI RA 7687 program, and the DOST-ASTHRDP. A portion of his graduate thesis on gradient-based optimization with acceleration and local search and its applications was awarded a student poster prize at the Society of Mathematical Biology 2020 Annual Meeting.

He is an incoming Ph.D. student and research fellow of the project titled "*Targeted Control of COVID-19 Post Mass Vaccination*" of the BioSystems and Integrative Sciences Institute of Faculdade de Ciências, Universidade de Lisboa.

### Research interests:

infectious disease modelling   mathematical biology   optimization   complex systems  
data science   computational neuroscience   science communication   computational social science

## EXPERIENCE

### University Research Associate, COVID-19 Modelling Project

#### Natural Sciences Research Institute, University of the Philippines Diliman

📅 Jan 2022 – Dec 2022    📍 Quezon City, Philippines

- Responsible for the model formulation, preprocessing of data, programming, science writing, and other admin duties
- Worked under Dr. Carlene P.C. Pilar-Arceo and the Modelling and Applications Group of the Institute of Mathematics

### Science Research Specialist, COVID-19 Modelling Project

#### Center for Applied Modeling, Data Analytics, and Bioinformatics for Decision Support Systems in Health

📅 Nov 2021 – Dec 2021    📍 Davao City, Philippines

- Focused on parameter estimation for the COVID-19 modeling dynamics of the constituent units of the Davao Region
- Responsible for preprocessing data for parameters, programming, and automation of codes, and preparing presentations for the project
- Worked under Dr. May Anne E. Mata

### Lecturer, Precalculus Courses

#### Institute of Mathematics, University of the Philippines Diliman

📅 Sep 2021 – Jan 2022    📍 Quezon City, Philippines

- Taught precalculus to two online classes of early-stage university students

### Research Associate, COVID-19 Modelling Project

#### Modelling and Applications Group, Institute of Mathematics, University of the Philippines Diliman

📅 May 2021 – Nov 2021    📍 Quezon City, Philippines

- Focused on two projects regarding COVID-19 dynamics with objectives on infectious-specific and age-structured vaccination models.
- Responsible for handling datasets, researching methods, and preparing codes, presentations, and manuscripts for the projects
- Worked under coinvestigators Dr. Aurelio A. De los Reyes V, Dr. Carlene P.C. Pilar-Arceo, and Dr. Victoria May P. Mendoza

### Project Assistant, COVID-19 Modelling Project

#### Resilience Institute, University of the Philippines

📅 Nov 2020 – May 2021    📍 Quezon City, Philippines

- Mainly works with the Modelling and Applications Group of the Institute of Mathematics, UP Diliman, and other teams from UP Baguio, UP Mindanao, and UP Los Baños
- Assists in mathematical model building for specific interventions applicable to the National Capital Region and works further on model fitting, simulations, and projections for scenario analysis

- Worked under co-investigators Dr. Aurelio A. De los Reyes V, Dr. Carlene P.C. Pilar-Arceo, and Dr. Victoria May P. Mendoza

## EDUCATION

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### Postgraduate Studies in Scientific Research Methods and Techniques

**Faculdade de Ciências, Universidade de Lisboa**

📅 Jun 2023 – Present

📍 Lisbon, Portugal (temporary remote setup)

- Preparing for the Ph.D. Physics program at the university

**Project:** *Targeted control of COVID-19 post mass vaccination*

- Focused on the research fellowship with the BioSystems and Integrative Sciences Institute under the supervision of Dr. Ganna Rozhnova and Dr. Ana Nunes

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### Master of Science (Applied Mathematics) (Mathematics in Life and Physical Sciences)

**Institute of Mathematics, University of the Philippines Diliman**

📅 Aug 2018 – Jan 2021

📍 Quezon City, Philippines

- Department of Science and Technology-Accelerated Science and Technology Human Resource Development Program - National Science Consortium (DOST-ASTHRDP) Scholarship awardee

**Thesis:** *A perturbed accelerated gradient descent algorithm using an  $n$ -dimensional golden section search method*

- Focused on gradient-based optimization with a local search applied to benchmark functions, matrix decomposition, parameter estimation of mathematical models, signal processing, and single-layer perceptron
- Student researcher under the supervision of Dr. Renier Mendoza (Jan 2019 – present) for my graduate thesis and presented my research at various international and national conferences. Initial preprint accessible [here](#) ➡.

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### Bachelor of Science in Applied Physics (Instrumentation Physics)

**National Institute of Physics, University of the Philippines Diliman**

📅 Jun 2013 – Jun 2018

📍 Quezon City, Philippines

- Department of Science and Technology-Science Education Institute (DOST-SEI) RA 7687 Scholarship awardee

**Thesis:** *Response of single and connected Hodgkin-Huxley neurons to a sinusoidal input*

- Worked on varying stimuli to coupled differential equations describing neural response analyzed dynamically and statistically in different cases
- Student researcher in Complexity Science Group under the supervision of Dr. Johnrob Bantang (Oct 2015 – May 2018)
- Presented in three Samahang Pisika ng Pilipinas (SPP) Physics Conferences (2016 – 2018) accessible on my Google Scholar profile ➡.

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### Secondary Education

**Peñaranda National High School**

📅 Jun 2009 – Mar 2013

📍 Nueva Ecija, Philippines

- Salutatorian of the Special Science Curriculum and a consistent honors student since grade school

## RESEARCH

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### Research publications

1. Escosio, R. A. S., et al., (2023). A Model-Based Strategy for COVID-19 Vaccine Roll-out in the Philippines. Accepted by the Journal of Theoretical Biology. Article available at ScienceDirect ➡.
2. Escosio, R. A. S., & Mendoza, R. G., (2022). A Modified Accelerated Gradient Descent Using an N-Dimensional Golden Section Search for Escaping Saddle Points. Preprint available at SSRN ➡.

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### Conference proceedings

1. Escosio, R. A. S., & Mendoza, R. G., (2022). A Modified Accelerated Gradient Descent Using an N-Dimensional Golden Section Search for Escaping Saddle Points. Proceedings of the 8th International Conference on Control and Optimization with Industrial Applications (oral presentation).
  2. Escosio, R. A. S., & Bantang, J. Y. (2018). Stability, periodicity, and mode-locking behaviors in a Hodgkin-Huxley neuron. Proceedings of the Samahang Pisika ng Pilipinas (poster presentation)
  3. Escosio, R. A. S., & Bantang, J. Y. (2017). Recurrence plot analysis of a Hodgkin-Huxley neuron dynamics. Proceedings of the Samahang Pisika ng Pilipinas (oral presentation)
  4. Escosio, R. A. S., & Bantang, J. Y. (2016). Frequency response analysis of a Hodgkin-Huxley neuron in a generalized current density stimulus. Proceedings of the Samahang Pisika ng Pilipinas (oral presentation)
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## Other publications

1. Liwag, J. T., Fidelino, J. S., **Escosio, R. A. S.**, Ocampo, A. B., & Santos-Ocampo, N. (2023). Practice Spotlight: Queer Scientists PH: Visibility Towards Community Building and Empowerment. *Queering Science Communication*. Bristol University Press. 124-126.

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## International conference presentations

1. **Escosio, R. A. S.**, Cawiding, O. R., Vergara, T. H. M., et al., *The What-Ifs of Early COVID-19 Transmission in the Constituent Units of the National Capital Region, Philippines*. Society of Mathematical Biology 2022 Annual Meeting (SMB 2022), hybrid meeting, September 19-23, 2022. (online poster presentation)
2. **Escosio, R. A. S.**, and Mendoza, R. G., *A Modified Accelerated Gradient Descent Using an  $n$ -Dimensional Golden Section Search for Escaping Saddle Points*. The 8th International Conference on Control and Optimization with Industrial Applications, virtual attendance, August 24-26, 2022. (oral presentation)
3. Añonuevo, L. E., **Escosio, R. A. S.**, et al., *Modeling the COVID Dynamics in Davao City, Philippines Under Different Variants-of-Concern*. Society of Mathematical Biology Mathematical Epidemiology and Immunology Subgroups Mid-Year Mini Virtual Conference, virtual meeting, February 27-28, 2022. (oral presentation, presented by Añonuevo)
4. **Escosio, R. A. S.**, de los Reyes, A. A. V, Mendoza, V. M. P, & Pilar-Arceo, C. P. C. *Modelling COVID-19 Dynamics with Different Community Quarantine Protocols in National Capital Region, Philippines*. Society of Mathematical Biology 2021 Annual Meeting (eSMB 2021), virtual meeting, June 13-17, 2021. (poster presentation)
5. **Escosio, R. A. S.**, & Mendoza, R. G., *Parameter Estimation of the Fitzhugh-Nagumo Model via a Perturbed Accelerated Gradient Descent Algorithm with an  $n$ -Dimensional Golden Section Search Method*. Society of Mathematical Biology 2020 Annual Meeting (eSMB 2020), virtual meeting, August 17-20, 2020. (poster presentation)
  - o **Won the subgroup student poster prize against submissions from around the world**
  - o Initially accepted for the 12th European Conference on Mathematical and Theoretical Biology (ECMTB 2020) but redirected to eSMB 2020

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## Local conference presentations

1. Tongol, C. A. L., **Escosio, R. A. S.**, & Cawiding, O. R., *Mathematical Modeling of COVID-19 Dynamics with Information-Dependent Vaccination in the Philippines*. 2022 MSP Annual Convention, virtual meeting, May 21, 28 & June 4, 2022. (oral presentation, presented by Tongol)
2. **Escosio, R. A. S.**, et al., *Multi-City Mathematical Modeling of the Early Months of COVID-19 Transmission and Mitigation in Metro Manila, Philippines*. 2022 MSP Annual Convention, virtual meeting, May 21, 28 & June 4, 2022. (oral presentation)
3. Cawiding, O. R., **Escosio, R. A. S.**, et al., *Optimal Control Applied to Age-Dependent Vaccine Prioritization in the National Capital Region of the Philippines*. 2022 MSP Annual Convention, virtual meeting, May 21, 28 & June 4, 2022. (oral presentation, presented by Cawiding)
4. **Escosio, R. A. S.**, *The What-Ifs of Early COVID-19 Transmission in the Constituent Units of the National Capital Region, Philippines*. 3rd Graduate Student Research Conference, College of Science, University of the Philippines Diliman, virtual meeting, May 23, 2022. (poster presentation)
  - o **Won the poster prize under the Health category against other graduate students of the college.**
5. **Escosio, R. A. S.**, & Mendoza, R. G., *Implementing an  $n$ -Dimensional Golden Section Search as a Modified Local Search for an Accelerated Gradient Descent*. 2021 MSP Annual Convention, virtual meeting, May 15, 22, 29, 2021. (oral presentation)
6. **Escosio, R. A. S.**, & Mendoza, R. G., *A Perturbed Accelerated Gradient Descent Algorithm using an  $n$ -Dimensional Golden Section Search Method*. 2020 ASTHRDP Graduate Scholars Conference, virtual meeting, November 26-27, 2020. (poster presentation)
7. **Escosio, R. A. S.**, & Mendoza, R. G., *Parameter Estimation of Fitzhugh-Nagumo Model using an Accelerated Gradient Descent Algorithm with a Local  $n$ -Dimensional Golden Section Search Method*. 38th Samahang Pisika ng Pilipinas (SPP) Physics Conference and Annual Meeting, virtual meeting, October 19-23, 2020. (contributed talk)
8. **Escosio, R. A. S.**, & Munar, V. P., *Compartmental Modeling of Voter Turnout in a Three Party Election with Voter Inhomogeneity*. 38th Samahang Pisika ng Pilipinas (SPP) Physics Conference and Annual Meeting, virtual meeting, October 19-23, 2020. (contributed talk)
9. **Escosio, R. A. S.**, & Mendoza, R. G., *Gradient-Based Optimization with a Local  $n$ -Dimensional Golden Section Search*. National Academy of Science and Technology (NAST) 42nd Annual Scientific Meeting, virtual meeting, July 8-10, 2020. (poster presentation)

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## In-person participation

1. 6th International Workshop on Mathematical Biology (IWOMB 2023), Paradise Garden Resort Hotel and Convention Center, Boracay, January 22-25, 2024.
2. 5th International Workshop on Mathematical Biology (IWOMB 2023), University of the Philippines Baguio, July 26-27, 2023.
3. **Unifying the Epidemiological and Evolutionary Dynamics of Pathogens** Program, Nordic Institute for Theoretical Physics, May 29-June 23, 2023 (attended first two weeks).
4. **Spring College on the Physics of Complex Systems**, International Center for Theoretical Physics, Trieste, Italy, February 20-March 17, 2023

5. SEAMS School 2022 on Modern Trends in Signal and Data Processing, University of the Philippines Diliman, December 5-13, 2022.
6. 3rd International Workshop on Mathematical Biology (IWOMB 2020), University of the Philippines Los Baños, January 6-8, 2020.
7. ICTP Asian Network School and Workshop on Condensed Matter and Complex Systems 2019, University of the Philippines Diliman, November 4-8, 2019.
8. 16th International Conference on Molecular Systems Biology (ICMSB 2019), De La Salle University, October 28-31, 2019.
9. 2nd International Workshop on Mathematical Biology (IWOMB 2019), Bohol Bee Farm, January 6-10, 2019.

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### Online participation

1. ICTP-ICTS Winter School on Quantitative Systems Biology (QSB 2022), virtual meeting, December 5-16, 2022.
2. Data Science Summer School 2022, Hertie School Data Science Lab, virtual meeting, July 20-August 5, 2022.
3. Workshop in Mathematical and Computational Biology 2022, virtual meeting, June 9-10, 2022.
4. UJ Infectious Disease Modelling through Mathematics and Machine Learning (IDML) Postgraduate Student Workshop, virtual meeting, January 17-21, 2022.
5. ICTP-ICTS Winter School on Quantitative Systems Biology (QSB 2021), virtual meeting, December 6-17, 2021.
6. 7th International Conference on Mathematical Neuroscience (ICMNS 2021), virtual meeting, June 28-July 1, 2021.
7. 4th International Workshop on Mathematical Biology (IWOMB 2021), virtual meeting, June 9-11, 2021.
8. MSRI: Topological Insights in Neuroscience, virtual meeting, May 4-11, 2021.
9. 12th Conference on Dynamical Systems Applied to Biology and Natural Sciences (DSABNS 2021), virtual meeting, February 2-5, 2021.
10. Princeton Center for the Physics of Biological Function (CPBF) Online Summer School 2020, weekly virtual meeting, June 15-August 3, 2020.

## SKILLS

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### Programming languages and version control

Proficient in Python and Matlab and similar platforms such as Octave; familiar with R, C++, and SQL; familiar with the GitHub environment



### Typesetting and other software

Effective in using  $\text{\LaTeX}$  for documents, presentations, and so on (including this CV); proficient in MS Office and similar softwares and in Adobe Photoshop and other graphics editing software



### Languages

English and Filipino – proficient in both oral and written communication



### Interpersonal skills

Held leadership positions from my organizations and affiliations; thinks critically and creatively; communicates effectively; works efficiently with teams; fun to be with

## INVOLVEMENTS

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### Philippine Society for Mathematical Biology

- Renewed as student member (Jan 2024 – present)

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### Mathematical Society of the Philippines

- Renewed as member (Oct 2020 – present)

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### Samahang Pisika ng Pilipinas

- Sworn in as an associate member (Oct 2020 – present)

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### Queer Scientists PH

- Involved from conception specifically for the internal affairs and volunteers' engagement and participation
- Collaborated with other various volunteers from different sectors for the publicity and activities of the organization

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### UP DOST Scholars' Association

- Served as *President* (Jun 2016 – May 2017) handling monthly general assemblies, assuring successful national and local events, and leading the organization overall
- Served as *Vice President for External Affairs* (Apr 2014 – May 2015) handling marketing strategies, org recognition, alumni relations, organizational and campus relations, partnerships and sponsorship, and meetings and alliances
- Affiliated with the Philippine Alliance of DOST Scholars and held position as Vice President (Mar 2015 – Mar 2016)

- Spearheaded the DOST Scholars' Summit 2015 (Mar 2015) when I was only 17 years old with more than 200 participants all around Metro Manila and Laguna; event wins the Best Career Event of the UP College of Science Council of Organization Leaders (CS COOL)
  - Led the programs committee of the yearly National DOST Scholars' Summit 2018 (Apr 2018) handling 400 participants from around the Philippines, contacting speakers, delegating tasks, and managing a smooth program
  - Spearheaded the anniversary dinner of the organization (Nov 2017) that reached out to alumni from even way back 1970's
  - In charge of the first-ever Coalesce of the National DOST Scholars' Summit 2016 (Apr 2016)
  - Worked as a marketing co-head for the DOST Scholars' Summit 2014 (Mar 2014) when I was only 16 years old
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### **UP Organization of Novo Ecijanos**

- Served as *Vice President for Marketing and Finance* (Jun 2019 – May 2020) and the term coincides with the start of the pandemic wherein donations are immediately garnered for in-need Nueva Ecija residents
  - Yearly taught high school students in topics of math and physics for the annual College Admission Tests Review Sessions for four years (Jul 2017 – Jul 2020)
  - Co-headed the research team of the Tagisan ng Talino at Talento (Feb 2018) creating questions and topics for various sub-events such as quiz bees, performances, and other contests
  - Collaborated to head the publicity team of the Tagisan ng Talino at Talento 2016 (Feb 2016) and worked on publicity materials and other creative means for event exposure
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### **Volunteering and Assistantship in UP**

- Student assistant for the UP Office of Student Activities (Feb 2018 – May 2018) working hand-in-hand with the staff with their daily tasks
- Worked with the organizing team of the International Conference on Mathematical and Computational Modeling of Biological Systems (Nov 2016) assisting on logistics
- Part of the UP Diliman Online Dorm Application Team (2015 – 2017) at the front receiving applications for three years
- Student volunteer for the technical team of the student elections of UP Diliman (2015 – 2019) for five years and UP Los Baños (2015 – 2016) for two years assisting on technicals and voting systems and creating final results presentations