

RICHMOND CRISOSTOMO

MONTPELLIER, FRANCE
richmond.crisostomo@etu.umontpellier.fr

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PERSONAL STATEMENT

Richmond is interested in the fields of Biological Physics, Quantitative Biology, Complex Systems, Computational Modeling, Signal Processing, and related fields. Currently, he is taking Masters in Quantitative Biology at the University of Montpellier, France. He graduated with a B.Sc. Applied Physics with a specialization in Instrumentation from the National Institute of Physics, University of the Philippines Diliman. His industry experience in Data Science provided him with opportunity for exposure in a collaborative setting; generating innovative data-driven solutions, developing capacity to conduct independent research, and communicating effectively to various sectors. He believes in the integration of science and society – that effective scientific collaboration and communication are essential to inclusive development of the community and creating a better society.

PERSONAL INFORMATION

Full Name: Richmond Lapira Crisostomo
Birthday: June 22, 1996
Sex: Male
Birthplace: Manila, Philippines
Citizenship: Filipino
Current Address: Montpellier, France
Mobile: +33 695133567
Personal Email: rmlcrisostomo@gmail.com

EDUCATION

M.Sc. Quantitative Biology
(September 2021 – Present)
Centre de Biologie Structurale
Faculte des Sciences
University of Montpellier, France

B.Sc. Applied Physics (Major in Instrumentation)
(August 2014 – June 2019)
National Institute of Physics,
University of the Philippines, Diliman
Thesis: “Morphological Characterization and
Optimization of Branching Biological Systems.”
Cum Laude (GWA: 1.6315/1.00)

AWARDS RECEIVED

1st Runner-up, Best Poster Presentation
Physics Society of the Philippines Annual
Conference 2018. Presented the paper entitled
“Simulation and Characterization of Tree
Branching Morphologies based on Real Tree
Images.”

University Scholar
(GWA: 1.00–1.45)
University of the Philippines, Diliman
Academic Excellence, Honorable Scholar
2014–2015, 2017–2018, and 2018–2019

College Scholar
(GWA: 1.45–1.75)
University of the Philippines, Diliman
Academic Excellence, Honorable Scholar
2016–2017

INTERESTS

Biophysics | Quantitative Biology
Complex Systems | Biological Systems
Big Data | Neuroscience | Social Dynamics
Politics | Philosophy | Poetry

ACADEMIC/ WORK EXPERIENCE

• INTERNSHIP •

Quantitative Ecology and Evolution of the Human Gut Microbiome
(February 2023 – Present) – Supervisor: Jacopo Grilli, PhD
Quantitative Life Sciences Section, International Centre for Theoretical Physics, Italy
Attempting to model eco-evolutionary dynamics of strains within the human gut microbiome – in order to characterize population trajectories at the edge of ecological differentiation.

From Neurons to Neural Networks: Computational Models for Temporal Learning
(October 2022 – December 2022) – Supervisor: Jeremie Naude, PhD
Neuroscience Department, Institut de Genomique Fonctionnelle (IGF), France
Developed class of models for Temporal Learning in terms of intrinsic plasticity of neurons to estimate the expected inter-spike timing interval by introducing the mechanism of Spike-Timing Dependent Plasticity (STDP). Providing groundwork for testing different parametric perturbations (robustness), plasticity mechanisms (genericity), and neuronal network architectures extending the level of biological computation (scalability).

Exploring Computational Neuroscience Models of Neuroplasticity and Temporal Learning
(July 2022 – August 2022) – Supervisor: Jeremie Naude, PhD
Neuroscience Department, Institut de Genomique Fonctionnelle (IGF), France
Developed computational frameworks and Python-based implementations for groundwork on investigating neuroplasticity and temporal learning at the single-neuron to the network scale interactions and spatiotemporal dynamics.

Computational Modeling of Ribosome Translation and Gene Expression Economy
(April 2022 – May 2022) – Supervisor: Luca Ciandrini, PhD
Multiscale Molecular Modeling Team, Centre de Biologie Structurale (CBS)
University of Montpellier, France

Explored gene expression economy by modeling ribosome translation mechanism and dynamics as a Totally Asymmetric Simple Exclusion Process (TASEP) to better understand the regulatory role of translation elongation and its relation to codon usage. Developed Python-based computational implementations for mean-field theory, stochastic simulation, and power-series methods to quantify steady-state dynamics and translation efficiency.

Semi-quantitative Analysis of Signaling Networks in Oncology
(February 2022 – March 2022) – Supervisor: Ovidiu Radulescu, PhD
Computational Systems Biology Team, Laboratory of Pathogen Host Interactions (LPHI)
University of Montpellier, France
Performed semi-quantitative analysis of signalling networks from phosphoproteomic data to understand differences between melanoma cancer cell lines. Developed a Python-based analysis pipeline to reconstruct semi-quantitative networks using modular response analysis.

• RESEARCH •

Data Scientist
(July 2019 – March 2021)
UnitedHealth Group R&D
Provided innovative solutions driven by exploratory data analysis from unstructured diverse datasets. Applied relevant techniques in statistics, machine learning, programming, computational modeling and simulation utilizing strong backgrounds in Physics and Mathematics. Utilized these techniques and methodologies to recognize patterns, identify opportunities, and pose business questions, to make valuable discoveries for prototype development and product improvement in the company.

Undergraduate Student Researcher
(October 2016 – June 2019)
Complexity Science Group, Instrumentation Physics Laboratory (INSTRU)
National Institute of Physics, University of the Philippines Diliman
Modeled complex natural, physical, and biological branching systems using computational methods and data analysis. Particularly, the underlying complexities involved in the growth, interactions, optimization, and evolution of tree canopies. Applied complex systems perspective in modeling, simulation, and characterization, and understanding the dynamics arising from growth and optimization, and system-environment interactions in the final thesis.

ACADEMIC/ WORK EXPERIENCE

• APPRENTICESHIP/TRAINING •

Measuring Protein-Cytoskeleton Interaction from Pulling Membrane Nanotubes

(June 2022) – Supervisor: Pierre-Henri Puech, PhD

CENTURI Summer School, Laboratoire Adhesion et Inflammation (LAI)

Luminy Campus, Aix-Marseille University, France

Quantified protein-cytoskeleton interactions by performing exploratory data analysis on force-curve experiments data from optical tweezer pulling of membrane nanotubes in immunological cells. Applied signal processing techniques (optical tweezer data analysis in Python), statistical methods (data analysis with bootstrap-coupled estimation), and model-fitting (piece-wise parametric approximation) to characterize pulling events and extract relevant physiological information.

Structural Elucidation of LukED Protein Complex

(March 2022 – April 2022) Supervisors: Stefano Trapani, PhD and Cherine Bechara, PhD

Applied Structural Biology: Protein Crystallography and Mass-Spectrometry

University of Montpellier, France

Performed structural characterization of LukD and LukE using protein crystallography and native mass spectrometry. Explored the CCP4-based suite software for macromolecular crystallography to obtain high resolution geometrical molecular models from x-ray diffraction images by exploiting molecular replacement, electron density mapping, and amino acid assignment. Developed a Python-based preliminary analysis pipeline for nMS spectrum characterization.

Two-photon Fluorescence Correlation Spectroscopy (2p-FCS)

(December 2021 – January 2022) Supervisor: Caroline Clerte, PhD

Imaging Biological Systems: Advanced Imaging Technique, Centre de Biologie Structurale

University of Montpellier, France

Performed 2p-Fluctuation-FCS to quantify promoter activity and measure GFP expression on engineered *E. Coli* promoter libraries. Developed a Python-based analysis pipeline to characterize volume, diffusion time, and oligomerization state from acquired in-vitro fluorescence correlation spectroscopy signal and perform number and brightness (N&B) analysis from live bacterial cell imaging.

Varying Regulatory Elements on Gene Expression

(November 2021 – December 2021) – Supervisors: Jerome Bonnet and Pauline Mayonove, PhD

Practical Synthetic Biology, Centre de Biologie Structurale

University of Montpellier, France

Explored impacts of varying regulatory elements on bacterial gene expression using a range of quantitative techniques (plate reader, cytometry) and gene expression systems (living cells and cell-free). Developed a Python-based analysis pipeline for fluorescence measurements.

Building an Atomic Force Microscope

(October 2021 – November 2021) – Supervisor: Luca Costa, PhD

Imaging Biological Systems: Build-your-own Microscope, Centre de Biologie Structurale

University of Montpellier, France

Designed and constructed an Atomic Force Microscope (AFM) utilizing Fabry-Perot interferometry to obtain surface topography and image of silicon grating TGX01 samples. Developed a Python-based pipeline for image processing and 3D visualization of specimen.

• OTHER INVOLVEMENTS •

Student Assistant

(October 2021 – April 2022)

Quantitative Biology (qbio) Program,

Centre de Biologie Structurale, University of Montpellier, France

Prepared pertinent academic materials and resources for preparatory courses in qbio, consolidated guidelines for administrative procedures, and provided guidance and support for prospective incoming 2022 cohort of qbio master students.

Research Laboratory Assistant

(January 2019 – June 2019)

Instrumentation Physics Laboratory (INSTRU)

National Institute of Physics, University of the Philippines, Diliman

Managed logistical concerns of the laboratory: procurement and processing of necessary documents, equipment, and materials in research or academic work. Ensured accounting of all expenses of the laboratory, provided assistance to the program coordinator.

PUBLICATIONS

Exploring the Mean-field and Stochastic Solutions for Simple Open TASEP-based models of Ribosome Translation

Article, *Proceedings of the Samahang Pisika ng Pilipinas (Physics Society of the Philippines) 2022*

R. L. Crisostomo

Simulating and quantifying ribosome translation dynamics by exploring parameters in TASEP-based models.

Sunlight Allocation in an L-System Tree Model

Article, *Proceedings of the Samahang Pisika ng Pilipinas (Physics Society of the Philippines) 2019*

R. L. Crisostomo and J. Y. Bantang

Incorporating environmental constraints to parametric models of tree branching growth dynamics.

Simulation and Characterization of Tree Branching Morphologies Based on Real Tree Images

Article, *Proceedings of the Samahang Pisika ng Pilipinas (Physics Society of the Philippines) 2018*

R. L. Crisostomo and J. Y. Bantang

Modeling and characterization of branching morphologies as idealized and stochastic Lindenmayer Systems.

SCIENTIFIC CONFERENCES

40th Samahang Pisika ng Pilipinas (Physics Society of the Philippines) Physics Conference and Annual Meeting

(October 19, 2022 – October 21, 2022)

Legazpi City, Bicol Philippines.

PLENARY SPEAKER – Exploring the Mean-field and Stochastic Solutions for Simple Open TASEP-based models of Ribosome Translation.

2022 CENTURI Turing Centre for Living Systems, Summer School: From Data to Biology and Back

(June 20, 2022 – July 1, 2022)

CENTURI Turing Centre for Living Systems, Marseille, France.

PARTICIPANT – 2-week intensive program on data-driven quantitative biology addressing major open questions in systems biology through a series of lectures, seminars, and workshops tackling current challenges and culminating to a hands-on capstone project.

2022 Institut Pascal, Summer School: Disorder in Complex Systems

(June 7, 2022 – June 17, 2022)

Institut Pascal, University of Paris-Saclay, Orsay, France

PARTICIPANT – 2-week intensive program on Physics of Disorder in Complex Systems covering concepts, tools, and current topics relevant to overcome traditional disciplinary boundaries, including glassy systems, nonlinear dynamics, scaling, soft matter, etc.

2022 Annual Meeting of the International Physics of Living Systems (iPOLs) Network

(May 31, 2022 – June 3, 2022)

Montpellier, France

STUDENT ASSISTANT – assisted in the event preparations, logistics, and documentation.

2021 International Center for Theoretical Physics, Spring College: Physics of Complex Systems, Virtual Meeting

(February 22, 2021 – March 19, 2021)

Trieste, Italy

PARTICIPANT – 4-week intensive program exposing students to selection of topics at the forefront of research using theoretical and computational tools for quantitative analysis of complex systems.

37th Samahang Pisika ng Pilipinas (Physics Society of the Philippines) Physics Conference and Annual Meeting

(June 2019)

Tagbilaran City, Bohol Philippines.

PLENARY SPEAKER – Sunlight Allocation in an L-Systems Tree Model.

36th Samahang Pisika ng Pilipinas (Physics Society of the Philippines) Physics Conference and Annual Meeting

(June 2018)

Puerto Princesa City, Palawan Philippines

POSTER PRESENTER – Simulation and Characterization of Tree Branching Morphologies Based on Real Tree Images.

International Conference on Mathematical and Computational Modeling of Biological Systems (December 2016)

National Institute of Physics, University of the Philippines Diliman, Quezon City, Philippines

STUDENT ASSISTANT – assisted in the event preparations, logistics, and documentation.

SKILLS AND PROFICIENCIES

Physics

Fundamental theoretical mechanics, electromagnetic theory, quantum physics, thermodynamics, statistical physics, and optics. Computational methods for numerical approximation and simulation, complex systems modeling and analysis. Instrumentation systems design, analog and digital electronics, multidimensional signal processing and pattern recognition.

Mathematical Methods

College algebra and trigonometry, differential, integral, and multivariable calculus. Linear algebra, differential equations; elementary differential geometry and complex analysis. Special functions, Sturm-Liouville theory, integral equations, and Green's functions. Probability and statistics, random variables, and stochastic processes.

Quantitative Biology

Imaging and microscopy techniques for single-molecule localization; synthetic and living system structure and dynamics. Synthetic biology engineering, quantitative modeling of transcription and translation; design of sequences and genetic circuits. Structural characterization of macromolecules on various spatio-temporal scales (NMR, Crystallography, cryoEM, native MS). Mechanistic and data-driven modeling of biological processes from systems-level interactions down to molecular dynamics.

Languages

English – excellent in both verbal and written communication.
Filipino – excellent in both verbal and written communication.

Operating Systems

Windows
Apple
Ubuntu

Programming

Python
MATLAB
R
SQL

Software

MS Office
LaTeX
Version control
Cytoscape, Gephi

Industry

Mathematical Modeling
Numerical Simulation
Statistical Analysis
Signal/Image Processing
Data Science and Analytics

REFERENCES

Luca Ciandrini, PhD
Associate Professor, Researcher
Centre de Biologie Structurale,
University of Montpellier, France
(luca.ciandrini@umontpellier.fr)

Cherine Bechara, PhD
Associate Professor, Researcher
Institut de Genomique Fonctionnelle
University of Montpellier, France
(cherine.bechara@igf.cnrs.fr)

Jeremie Naude, PhD
Researcher
Institut de Genomique Fonctionnelle
University of Montpellier, France
(jeremie.naude@igf.cnrs.fr)

Johnrob Bantang, PhD
Associate Professor of Physics
National Institute of Physics,
University of the Philippines, Diliman
(jyabantang@nip.upd.edu.ph)