Nils **Giordano**

Research scientist · Computational Systems Biologist

Nantes, France

www.normalesup.org/~giordano/ | nigiord | nils-giordano | Nils Giordano

Microbial communities – Metabolic Modeling – Data Science – Metagenomics

Skills

Bioinformatics	Scripting (Python/Bash), Version control (Git), Pipeline design (Snakemake), Metagenomics (Illumina), Genome binning, Genome annotation (EggNOG/KO), Metabolic reconstruction (CarveMe)
Biomathematics	Network analysis, Optimal control, Optimization, Metabolic modeling, Linear/non-linear dynamical systems, Time-series analysis (Kalman filtering/smoothing), Image analysis (segmentation/tracking), Sensitivity analysis
Microbiology	Cloning (molecular design, overlap PCR, Gibson assembly), Chromosome editing (electroporation, lambda-red recombineering), Microplate reader, Fluorescence microscope, Microfluidic
Languages	French (native), English (fluent), Italian (basic)

Experience

CNRS – Université de Nantes

Nantes, France

Postdoctoral Researcher

Jan. 2018 - Dec. 2019

Mentor: Dr. Samuel Chaffron (team COMBI, LS2N, CNRS).

- Constructed a global network of microbial interactions in the global ocean from Tara expeditions metagenomic and metatranscriptomic data.
- Identified communities of co-active cultivated and non-cultivated microbes (bacteria/archaea).
- Uncovered functional traits linked to mutualism, including cross-feeding interactions derived from metabolic network reconstruction.

Inria – Université Grenoble Alpes

Grenoble, France

Research and Teaching Assistant, PhD Student

Sep. 2012 - Mar. 2017

Supervisors: Dr. Hidde de Jong (Project-team Ibis, Inria) & Pr. Johannes Geiselmann (team BIOP, LIPhy).

- Constructed an abstract mathematical model of nutrient allocation in a microorganism.
- Applied Optimal Control to predict the optimal regulation of nutrient allocation during an environmental change.
- Showed that such a regulation is reminiscent of known regulatory processes in E. *coli* (published in *Plos Comp. Biol.*).
- Engineered bacteria with fluorescent ribosomes and monitored them during an environmental change using a microfluidic device.

Internships

Inria

Grenoble, France

Research Assistant, Intern

Feb.-Jun. 2012

Supervisors: Dr. Hidde de Jong & Dr. Delphine Ropers (Project-team Ibis, Inria).

- Reviewed and implemented state-of-the-art methods of sensitivity analysis on a complex model of the gene expression machinery in E. *coli*.
- Developed a brand-new dynamical method of global sensitivity analysis.
- Helped to identify the key parameters driving the model dynamics and to reduce its complexity.

University of Cambridge

Cambridge, United Kingdom

Research Assistant, Intern

Feb.-Jun. 2011

Supervisor: Pr. Raymond E. Goldstein, Department of Applied Mathematics and Theoretical Physics.

- Led a theoretical study about the evolution towards multicellularity in microalgae (Volvocales)
- Developed a general model of phosphate uptake and growth in microalgae
- Explored the role of the extracellular matrix for phosphate storage, especially in changing environmental conditions.

École Normale Supérieure

Paris, France

Research Assistant, Intern

Jun.-Jul. 2010

Supervisor: Dr. Silvia de Monte (Eco-evolutionary Mathematics, IBENS).

- Analyzed time-series fluorescence data of oscillating yeast cells suspensions subject to periodic forcing.
- Modified an existing mathematical model based on Hopf bifurcation to recreate the observed dynamics.
- Showed that even when an irrational forcing is applied, the biological system does not exhibit any chaotic behavior (published in *JCIS*).

Publications

A complete list of publications is available at https://www.normalesup.org/~giordano/research.html

Mathematical Modelling of Microbes: Metabolism, Gene Expression and Growth
Hidde de Jong, Stefano Casagranda, Nils Giordano, Eugenio Cinquemani, Delphine Ropers, Johannes Geiselmann, Jean-Luc Gouzé
Journal of The Royal Society Interface 14.136 (Nov. 2017) p. 20170502. 2017

Dynamical Allocation of Cellular Resources as an Optimal Control Problem: Novel Insights into Microbial Growth Strategies
Nils Giordano, Francis Mairet, Jean-Luc Gouzé, Johannes Geiselmann, Hidde Jong
PLOS Computational Biology 12.3 (Mar. 2016) e1004802. 2016

Dynamical Responses of Oscillating Yeast Cell Suspensions to Periodic Forcing.
Nils Giordano, Francesco D'Ovidio, Sune Danø, Preben G. Sø rensen, Silvia De Monte
Journal of Computational Interdisciplinary Sciences 3.2 (2012) pp. 77–86. 2012

Education

PhD, Systems Biology
Grenoble, France

Université Grenoble Alpes — *2017*

- Title – Microbial growth control in changing environments: Theoretical and experimental study of resource allocation in *Escherichia coli*
- Supervisors – Dr. Hidde de Jong & Pr. Johannes Geiselmann
- Labs – Project-team Ibis (Inria Grenoble – Rhône-Alpes) and team BIOP (Laboratoire Interdisciplinaire de Physique, Université Grenoble Alpes)

ENS Diploma
Paris, France

École Normale Supérieure — *2009–2013*

- French leading research school, selected via a national competitive exam

MSc, Cell Systems Biology
Paris, France

École Normale Supérieure & Université Pierre et Marie Curie — *2012*

- Gene regulatory networks, cell ecosystems, cell machinery, microscopy (quantification, image processing), graph theory, comparative genomics, population genetics, structural bioinformatics, modeling of biopolymers, *in silico* biology, genes and genomes, from gene to function, ecological systems biology, biophysics, biomathematics

BSc, Life sciences
Paris, France

École Normale Supérieure & Université Pierre et Marie Curie — *2010*

- Experimental practice, ecology, physiology, molecular and cellular biology, genetics and epigenetics, bioinformatics, statistics, biomathematics, statistical and optical physics, weak-bond chemistry, modeling in biology

Teaching

Extensive description of each lecture available at https://www.normalesup.org/~giordano/teaching.html

Angers Bioinformatic Summer School
Angers, France

Invited speaker (1/2 day) — *Jul. 2018*

- Lecture and training on Environmental Genomics for PhD students and young scientists, in collaboration with Dr. Samuel Chaffron.

Ecole Normale Supérieure
Paris, France

Invited speaker (3 x 1 day) — *Sept. 2013 – Aug. 2016*

- Lecture and training on modeling and simulation of genetic regulatory networks for MSc students, in collaboration with Dr. Hidde de Jong.

Université Grenoble Alpes
Grenoble, France

Teaching assistant (211 hours) — *Sept. 2013 – Aug. 2016*

- Bioinformatics: from genome analysis to modeling (BSc)
- Population genetics, conservation biology, biodiversity and evolution (BSc and MSc)
- Prokaryotic genetics and microbiology (BSc)

Presentations

Public scientific events where I have been selected to give a talk.

2019

8 Oct.	**Workshop on Environmental Genomics (GDR-GE, 5th edition)**, 15 min	*La Rochelle, France*
30 Sept.	**Workshop Recent Computational Advances in Metagenomics (RCAM'19)**, 25 min	*Paris, France*
3 Jul.	**Journées Ouvertes Biologie, Informatique & Mathématiques (Omics Dark Matter session)**, 15 min	*Nantes, France*

2018

23 Oct.	**International Conference on Ecological Sciences (SFEcologie 2018)**, 15 min	*Rennes, France*
3 Jul.	**Workshop on Systemic and Symbolic Biology (BIOSS, 4th edition)**, 15 min	*Marseille, France*

2016

1 Jul.	**Workshop on Systemic and Symbolic Biology (BIOSS, 2nd edition)**, 15 min	*Lyon, France*

2015

21 Oct.	**Seminar on the Modeling of Life (SeMoVi)**, 20 min	*Grenoble, France*
7 Apr.	**Advanced Lecture Course on Computational System Biology (CompSysBio)**, 15 min	*Aussois, France*

Extracurricular Activity

Sports	Outdoor/indoor climbing and bouldering (6A/B outdoor, 6B/C indoor, French numerical grades)
Community	Former contributor on bioinfo-fr.net, a communautary French blog for bioinformaticians
Misc	Advocate for the open-source and libre cultures