

Nils Giordano, PhD

Computational Systems Biologist

Microbial communities - Metabolic Modeling - Data Science - Metagenomics

Fluent in Biology, Maths, and Computer Sciences
Love smart code, elegant equations, and Life's fundamental laws

Research experience

Jan. 2018 -
present

Postdoctoral Researcher at LS2N CNRS UMR 6004 (Nantes, France)

Close collaborators: Dr. Samuel Chaffron (Computational Biology team, LS2N, CNRS) & Dr. Damien Eveillard (Computation Biology team, LS2N, Université de Nantes)

- Project: From Environmental Omics to Eco-Systems Metabolic Modeling of Microbial Communities

Sep. 2012 -
Mar. 2017

Research and Teaching Assistant (PhD Student) at Université Grenoble Alpes - INRIA (Grenoble, France)

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

- Led a theoretical and experimental study of resource allocations in bacterium *E. coli*
- Used Optimal Control Theory principles to show that unexpected resource allocation behaviors can be predicted by assuming that bacteria optimize growth (published in Plos Comp. Biol.)
- Engineered and monitored cells with fluorescent ribosomes using a microplate reader, microscope and microfluidic device

Feb.-Jun. 2012

Research Assistant (Intern) at INRIA (Grenoble, France)

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 bacterium *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

Feb.-Jun. 2011

Research Assistant (Intern) at University of Cambridge - DAMTP (Cambridge, United Kingdom)

Supervisor: Pr. Raymond E. Goldstein (Goldstein lab, University of Cambridge)

- 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 environments

Jun.-Jul. 2010

Research Assistant (Intern) at École Normale Supérieure (Paris, France)

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 Journal of Computational Interdisciplinary Sciences)

Teaching experience

Sept. 2013-
Aug. 2016

Teaching assistant; Université Grenoble Alpes (Grenoble, France), 229 hours

- **Bioinformatics: from genome analysis to modeling (BSc)**
This introductory course was taught to 2nd-year students in collaboration with Dr. Thierry Gautier. I was in charge of the part about modeling, which means I was responsible for choosing the content, designing and teaching the lectures, tutorials, and practical exercises, but also designing the final exam and grading.
- **Population genetics, conservation biology, biodiversity and evolution (BSc and MSc)**
These different courses were taught from 2nd-year to 4th-year students. I mostly supervised tutorials and helped to design and grade the final exams.
- **Prokaryotic genetics and microbiology (BSc)**
This course was taught to 2nd-year students. I supervised tutorials and practical exercises at the bench.
- **Modeling and simulation of genetic regulatory networks (MSc)**
This course was taught to 5th-year students. It was organized for students of École Normale Supérieure, and taught in collaboration with Dr. Hidde de Jong. I helped to choose the content, teach the lectures and supervise the practical exercises. I also helped to design and grade the final exam.

Education

2017

PhD, Systems Biology – Université Grenoble Alpes (Grenoble, France)

- 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*
- Laboratories: *Project-team Ibis (INRIA Grenoble - Rhône-Alpes) and team BIOP (Laboratoire Interdisciplinaire de Physique, Université Grenoble Alpes)*

2012

MSc, Cell Systems Biology with honours – École Normale Supérieure & Université Pierre et Marie Curie (Paris, France)

- 2nd year: Gene regulatory networks, cell ecosystems, cell machinery, microscopy (quantification, image processing), graph theory, comparative genomics, population genetics, structural bioinformatics, modeling of biopolymers
- 1st year: *In silico* biology, genes and genomes, from gene to function, ecological systems biology, biophysics, biomathematics

2010

BSc, Life sciences with honours – École Normale Supérieure & Université Pierre et Marie Curie (Paris, France)

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

2009-2013

ENS Diploma – École Normale Supérieure (Paris, France)

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

Publications

2017

Mathematical Modeling of Microbes: Metabolism, Gene Expression, and Growth

de Jong H, Casagrande S, Giordano N, Cinquemani E, Ropers D, Geiselmann J, Gouzé J-L

Journal of The Royal Society Interface. 14.136 (2017): 20170502.

- 2016 **Dynamical allocation of cellular resources as an optimal control problem: Novel insights into microbial growth strategies.**
Giordano N, Mairet F, Gouzé J-L, Geiselmann J, de Jong H.
PLoS Computational Biology. 2016;12(3):e1004802.
- 2012 **Dynamical responses of oscillating yeast cells suspensions to periodic forcing.**
Giordano N, D'Ovidio F, Danø S, Sørensen PG, De Monte S.
Journal of Computational Interdisciplinary Sciences. 2012;3(2):77-86.

Technical skills

###Computing

- Daily user of Python, Git, and Unix/shell scripting.
- Experienced with Matlab/Octave, Scilab, R, PHP, SQL, HTML/CSS.
- Curious about Julia, Ruby, Rust

###Mathematics

- Proficient in data analysis and modeling, in particular linear and non-linear dynamical systems.
- Familiar with time-series analysis, image analysis, sensitivity analysis. More recently Kalman filtering, calculus of variations and optimal control theory.
- Curious of statistics, graph theory, molecular modeling, machine learning (deep-learning).

###Biology

Bioinformatics	Metagenomics, next-generation sequencing
Molecular biology	Cloning (molecular design, overlap PCR, Gibson assembly), chromosomic modifications (electroporation, lambda-red recombineering)
Laboratory	Microplate reader (Perkin Elmer, Tecan), fluorescence microscope (Zeiss),
Robotics	microfluidic device (Mother machine)

Languages

French	Native speaker
English	Fluent
Italian	Basic

Extracurricular activities

- Outdoor and indoor climbings (~ 6A/B outdoor, 6B/C indoor, french quotations)
- Contributor on bioinfo-fr.net, a communaury French blog for bioinformaticians
- Member of RSG France - JeBIF, the French society for young bioinformaticians
- Advocate for the open-source and libre cultures

nils.giordano@normalesup.org
Marseille (France)
