OCÉANE CASSAN

Postdoctoral researcher in statistical learning for gene regulation

EDUCATION

2022 | 2019 — **University of Montpellier**
PhD in Systems Biology — Montpellier, France

2019 | 2018 — **University Claude Bernard (UCBL)**
MSc in Computer Science - Artificial Intelligence — Lyon, France

2019 | 2014 — **National Institute of Applied Sciences (INSA)**
Engineering degree in Bioinformatics and Modelling — Lyon, France

RESEARCH

2023 — **Postdoc - Laboratory of Computer Science, Robotics and Microelectronics of Montpellier (LIRMM)**
Statistical learning to predict and interpret biological signals at transcription initiation sites from DNA sequence.
Montpellier, France

- Prediction of R-loops formation (DNA-RNA hybrids with roles in gene regulation and genomic instability) from low complexity DNA sequence features at transcription initiation sites. Collaborators : Rosemary Kiernan (IGH) and Jérôme Moreaux (CHU).
- Prediction of transcriptional activity at enhancers and promoters in the course of neuron differentiation from low complexity DNA sequence features and TF binding motifs. Collaborators : FANTOM6 international consortium
- Team : Joint IGMM/LIRMM/IMAG Computational Regulatory Genomics

2022 | 2019 — **PhD - Institute for Plant Sciences in Montpellier (IPSIM)**
Systems biology approaches to discover regulatory pathways in plants under climate change.
Montpellier, France

- **Statistical inference of the gene regulatory networks in *Arabidopsis thaliana* under elevated CO_2 and nutritional limitations**. Development of novel network reconstruction methods via ensembles of regression trees or penalized linear regression based on transcriptomic data and regulatory sequences information. **Computational and experimental validation** of network-derived hypotheses and candidate genes.
- **Genome Wide Association studies** to identify genetic determinants of mineral status repsonse under elevated CO_2
- **Development of an interactive suite** for reproducible transcriptomic analyses and the inference of regulatory networks
- Supervisors : Antoine Martin, Sophie Lèbre
- Team : SIRENE

CONTACT

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SKILLS

Pluridisciplinarity : ability to understand and articulate biology, statistics and computer science to test hypotheses

Statistics : statistical learning, interpretable machine learning, (sparse) regression and feature selection, mixed models, tree-based methods

Computer science : R (ggplot, tidyverse, package developement, Rmarkdown, Shiny), Python, LaTeX-beamer, Bash, calculation server administration and usage, web application deployment

Biology : gene regulation, systems biology, regulatory genomics, omics data analysis (RNA-Seq, (ONT-)CAGE-Seq, TF Binding experiments, GWAS data)

2019

6 months research internship - Laboratory of Computer Science, Robotics and Microelectronics of Montpellier (LIRMM)
Supervised statistical learning to predict chromosomic interactions in the human genome, based on CAGE data and chromatin contact data.

Montpellier, France

- Supervisor : Laurent Bréhélin
- Team : Joint IGMM/LIRMM/IMAG Computational Regulatory Genomics

2017

1 month research internship - Laboratory of Computer Science, Robotics and Microelectronics of Montpellier (LIRMM)
Sparse logistic regression to model transcription factor combinatorics for gene regulation in human

Montpellier, France

- Supervisor : Laurent Bréhélin
- Team : Joint IGMM/LIRMM/IMAG Computational Regulatory Genomics

PROFESSIONAL EXPERIENCE

2018

4 months internship in quantitative biology - Nanolive SA
Development of software tools for the 3D detection and tracking of biological objects in label free images

Lausanne, Switzerland

TEACHING EXPERIENCE

2023 | 2021

Instructor of R for 3^{rd} year bachelor plant biology students
Teaching material — University of Montpellier, France

- Good practices and scientific integrity around data analysis
- Data manipulation and visualisation in R

2023 | 2020

Instructor of Rmarkdown for Master data science students
Teaching material — University Paul Valery of Montpellier, France

2023 | 2022

Statistical inference of regulatory networks for Master plant biology students
Lecture and practical session — University of Montpellier, France

2021 | 2022

Student supervision

- Master 2 intern in biostatistics appied to gene regulation and transcriptomics
- Master 1 data science students for an annual project on Genome-Wide-Association studies

PUBLICATIONS

2023

Optimizing data integration improves Gene Regulatory Network inference in *Arabidopsis thaliana*
Océane Cassan, Charles-Henri Lecellier, Antoine Martin, Laurent Bréhélin, Sophie Lèbre. 2023, Preprint. See preprint

2023 **A gene regulatory network reveals the effects of elevated CO_2 on nutrient signaling pathways and mineral composition in Arabidopsis**
Océane Cassan, Léa-Lou Pimparé, Antoine Beckers, Alain Gojon, Liên Bach, Christian Dubos, Sophie Lèbre, Antoine Martin. 2022, New Phytologist. See article

2023 **Natural genetic variation underlying the negative effect of elevated CO2 on ionome composition in *Arabidopsis thaliana***
Océane Cassan, Léa-Lou Pimparé, Timothy Mozzanino, Cécile Fizames, Sébastien Devidal, Fabrice Roux, Alexandru Milcu, Sophie Lèbre, Alain Gojon, Antoine Martin. 2023, Preprint. See preprint

2022 **The decline of plant mineral nutrition under rising CO_2: physiological and molecular aspects of a bad deal**
Alain Gojon, Océane Cassan, Liên Bach, Laurence Lejay, Antoine Martin. 2022 Review article, Trends in Plant Science. See article

2022 **Loss of Polycomb proteins CLF and LHP1 leads to excessive RNA degradation in Arabidopsis**
David Séré, Océane Cassan, Fanny Bellegarde, Cécile Fizames, Jossia Boucherez, Geoffrey Schivre, Jacinthe Azevedo, Thierry Lagrange, Alain Gojon, Antoine Martin. 2022 Journal of Experimental Botany. See article

2021 **Inferring and Analyzing Gene Regulatory Networks from Multi-Factorial Expression Data: A Complete and Interactive Suite**
Océane Cassan, Sophie Lèbre, and Antoine Martin. 2021 BMC Genomics 22 (1). See article

2019 **Probing Transcription Factor Combinatorics in Different Promoter Classes and in Enhancers**
Vandel Jimmy, Océane Cassan, Sophie Lèbre, Charles-Henri Lecellier, and Laurent Bréhélin. 2019 BMC Genomics 20 (1): 1–19. See article

CONFERENCES

2023 **FANTOM6 consortium meeting**
Speaker — Milan, Italy
- Probing the contribution of DNA low complexity regions in transcriptional regulations during neuron differentiation

2023 **ISMB-ECCB**
Speaker — Lyon, France
- Gene-specific optimisation of data integration in regression-based Gene Regulatory Network inference. **Awarded the best oral presentation in the NETBIO session.**

2022 **Machine Learning in Montpellier, Theory & Practice**
Speaker — University of Montpellier, France
- Discussing : Reconciling modern machine-learning practice and the classical bias–variance trade-off, Belkin et al, 2019.

2022 **Molecular responses of plants facing climate change**
Organizer and poster presenter — Montpellier, France
- Genetic determinants of the mineral status response under elevated CO_2 in Arabidopsis populations

2021 **JOBIM**
Poster presenter — Virtual
- Dashboard for the Inference and Analysis of Networks from Expression data

2021 **International Plant Systems Biology**
Poster presenter — Virtual
- Gene Regulatory Network inference of Arabidopsis under elevated CO_2 and nutritional limitations

2020 **Netbio, biological networks inference**
Speaker — Virtual
- Presenting the Dashboard for the Inference and Analysis of Networks from Expression data

ACADEMIC REFEREES

Antoine Martin, senior researcher in plant biology, head of SIRENE team, IPSiM, CNRS : antoine.martin@cnrs.fr

Sophie Lèbre, lecturer and researcher in statistics, IMAG, University of Montpellier, University Paul Valéry : sophie.lebre@umontpellier.fr

Laurent Bréhélin, senior researcher in computational biology, head of MAB team, LIRMM : brehelin@lirmm.fr