

Océane Cassan

Postdoctoral researcher in statistical learning for systems biology

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

- 2024 | 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**. Supervisors: Laurent Bréhélin, Charles Lecellier
- 2022 | 2019 • **PhD - Institute for Plant Sciences in Montpellier (IPSIM)**
Systems biology approaches to discover regulatory pathways in plants under elevated CO₂. 📍 Montpellier, France
 - **Statistical inference of the gene regulatory networks in *Arabidopsis thaliana* under elevated CO₂ 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 response under elevated CO₂
 - **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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🌐 github.com/OceaneCsn
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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 3rd 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
- 2024 | 2020 • **Instructor of Rmarkdown for Master data science students**
Teaching material 📍 University Paul Valéry of Montpellier, France
- 2024 | 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 applied to gene regulation and transcriptomics
 - Master 1 data science students for an annual project on Genome-Wide-Association studies

PUBLICATIONS

- 2024 • **Optimizing data integration improves Gene Regulatory Network inference in *Arabidopsis thaliana***
Océane Cassan, Charles-Henri Lecellier, Antoine Martin, Laurent Bréhélin, Sophie Lèbre. 2024, Bioinformatics [See article](#)

- 2024 • **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. 2024, eLife [See article](#)
- 2023 • **A gene regulatory network reveals the effects of elevated CO₂ 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. 2023, New Phytologist. [See article](#)
- 2022 • **The decline of plant mineral nutrition under rising CO₂: 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 AND SEMINARS

- 2024 • **ISMB**
 Speaker & poster presenter 📍 Montreal, Canada
 • A machine-learning guided approach to explore the cis-regulatory code involved in neuronal differentiation. **Awarded Best Postdoc Poster in the Regsys track.**
- 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 CO₂ 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 CO₂ and nutritional limitations

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

- 2024 | 2023 • **Methods and Algorithms for Bioinformatics Seminars**
 Organizer 📍 Montpellier, France
 • Co-planner (with Eric Rivals) of regular team seminars on the topic of bioinformatics



ACADEMIC REFEREES

PhD:

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

Postdoc:

Laurent Bréhélin, senior researcher in computational biology, head of MAB team,
 LIRMM, co-head of the Computational Regulatory Genomics team :
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Charles Lecellier, senior researcher in computational biology, co-head of the
 Computational Regulatory Genomics team : charles.lecellier@igmm.cnrs.fr