

# David Métivier | Curriculum Vitae

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📄 David Métivier • 🌱 dmetivie

## Positions

**Chargé de Recherche (Research Scientist)** **Montpellier**  
*INRAE – MISTEA Probability & Statistics team* *2022–Now*  
Robust methods and Statistical models for climate and environmental problems

## Postdoc

**Postdoctorant Chaire Énergies durables X-EDF** **Palaiseau**  
*École Polytechnique – Centre de Mathématiques Appliquées* *2020–2022*  
Résilience au changement climatique du système de production d'énergies nucléaires et renouvelables

**CNLS Postdoctoral Research Associate** **Los Alamos NM - USA**  
*Los Alamos National Laboratory – Theoretical Division 4 - CNLS* *2017–2020*  
Statistical Physics for Uncertain Electrical Power Systems

## Education

**Physics Ph.D. advised by Julien Barré** **Nice**  
*Laboratoire J.A. Dieudonné – Université Côte d'Azur* *2014–2017*  
Kinetic models, from Kuramoto to Vlasov: bifurcations and experimental analysis of a Magneto-Optical Trap

**Physics Licence & Master** **Lyon**  
*École Normale Supérieure de Lyon* *2011–2014*  
Parcours Sciences de la matière (Theoretical physics)

**Classe préparatoire aux grandes écoles** **Paris**  
*Lycée Chaptal* *2009–2011*

## Internships

**M2 internship advised by Julien Barré** **Nice**  
*Laboratoire J.A. Dieudonné – Université Côte d'Azur* *2014 (4 months)*  
The Vlasov-Fokker-Planck equation

**M1 internship advised by Michael Kastner** **Stellenbosch - South Africa**  
*National Institute for Theoretical Physics* *2013 (3 months)*  
Velocity of a perturbation in an infinite lattice

**L3 internship advised by Alexandre Aubry** **Paris**  
*Institut Langevin (Ondes et Images) – ESPCI* *2012 (2 months)*  
Ultrasound propagation in heterogeneous media

## Teaching

### Academic.....

**École Polytechnique** **Palaiseau**  
*63h/year* *2020–2022*

- Course instructor + Tutorials: MAA204 Introduction to Statistics *Bachelor 2<sup>nd</sup> year students*
- Tutorials: MAP530 Probability Refresher *Master X/HEC, M1/3A Cycle Ingénieur students*
- Tutorials: MAP361 Aléatoire 1A *Cycle Ingénieur students*

**Polytech Nice Sophia** **Sophia Antipolis**  
*63h/year* *2014–2017*  
Physics practical work *2<sup>nd</sup> year students*

## Invited Lecture.....

<b>Master 2 SSD – Université de Montpellier</b> <i>Introduction to Recurrent Neural Networks (1h)</i>	<b>Montpellier</b> 2024
<b>Winter School Spectral Methods for Complex Systems</b> <i>Spectral analysis in finite- and infinite-dimensional dynamical systems (2h)</i>	<b>Online</b> 2019

## Mentoring

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### Ph.D.....

<b>Co-Mentor of Yoann Cartier</b> <i>École nationale des Ponts et Chaussées &amp; LEESU</i> Characterization of sources of microbiological contamination in rivers using statistical and inverse modeling	<b>Paris</b> Oct. 2023–Now
<b>Co-Mentor of Caroline Cognot</b> <i>UMR MIA Paris-Saclay &amp; EDF</i> Modélisation stochastique multisites de séries temporelles de variables météorologiques	<b>Palaiseau</b> Mar. 2023–Now

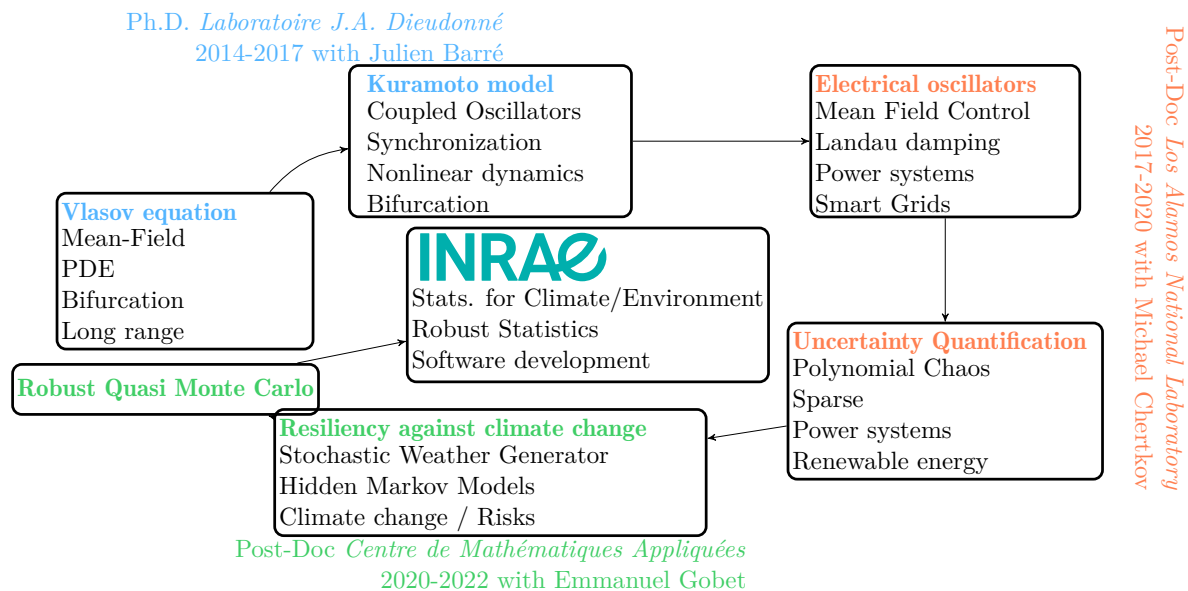
### Internships.....

<b>M2 student Ali Elhishi</b> <i>École polytechnique</i> Modélisation des variables lacustres à l'aide d'équations différentielles neuronales améliorées par la physique	<b>Montpellier</b> Mar.-Aug. 2025
<b>M2 student Arnaud Gonin</b> <i>Université d'Angers</i> Générateurs stochastiques de météo pour évaluer l'impact du changement climatique sur les pommes et les vignes	<b>Montpellier</b> Mar.-Sep. 2025
<b>M1 student Robin Davenne</b> <i>Ense<sup>3</sup></i> PINNs for lake temperature modeling	<b>Montpellier</b> May-Aug. 2024
<b>M2 student Mathieu Le Séac'h</b> <i>Université de Montpellier</i> NeuralODEs for lake surface temperature and oxygen modeling	<b>Montpellier</b> Apr-Aug. 2024
<b>M1 student Lucie Attwood</b> <i>Université Claude Bernard Lyon 1</i> Machine Learning for lake pollution forecast	<b>Montpellier</b> May-Aug. 2023
<b>Co-Mentor of Ph.D. student Ilia Luchnikov</b> <i>Los Alamos National Laboratory</i> Disorder in Thermostatic Controlled Loads	<b>Los Alamos NM - USA</b> Summer 2018

### Student Projects.....

<b>Mentor</b> <i>Master SSD – Université de Montpellier</i> I mentored several projects each year from February to June on topics I proposed related to climate, robust statistics, deep learning	<b>Montpellier</b> 2023–Now
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## Research Interests



KEYWORDS Flowchart of my research keywords

## Responsibilities

- Role**.....
- Representative** **Montpellier**  
*UMR MISTEA – INRAE* *2023–Now*  
Representative of the permanent researchers at the *Conseil d’unité MISTEA*
- Organizing**.....
- Organizer** **Los Alamos NM - USA**  
*Los Alamos National Laboratory* *2018–2019*  
Weekly Post-Doc/Student seminar at Center for Nonlinear Studies
- Reviewing**.....
- Europhysics Letters
  - Journal of Statistical Mechanics
  - Institute of Electrical and Electronics Engineers (IEEE)
  - Journal of Geophysical Research - Machine Learning and Computation
  - Journal of Physics A: Mathematical and Theoretical
  - Electric Power Systems Research
  - IEEE Control Systems Letters
  - EGUsphere
- Examiner**.....
- Oral examiner for the Polytechnique Bachelor program entrance *2020-2022*

## Science popularization

- Apprentis Chercheurs** **Montpellier**  
*INRAE* *2024*  
10 × 3h for a 3ème and 1ère on the topic *Les Maths à la rescousse des agriculteurs: Anticipation de la météo et optimisation du choix de culture*
- Paroles de Chercheuses et de Chercheurs** **Bondy**  
*Lycée Renoir* *2021*  
Discussion in front of three classes of high school about research, researchers and my work
- Ma Thèse en 180s** **Nice**  
*Université Côte d’Azur edition* *2016*  
Audience prize and 2<sup>nd</sup> jury’s prize at the 3-minute thesis popularization contest
- Fête de la science** **Nice**  
*University Côte d’Azur edition* *2015*  
Science activities with middle schoolers

## Computer skills

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- Julia
- Mathematica
- L<sup>A</sup>T<sub>E</sub>X, HTML, Markdown
- C
- Parallel computing (distributed, GPU)
- Python, MATLAB

## Packages list

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### **StochasticWeatherGenerators.jl**

*A package for La Pluie et le beau temps*

**Creator**

2024–Now

### **QuasiMonteCarlo.jl**

*Lightweight and easy generation of quasi-Monte Carlo sequences with a ton of different methods.*

**Contributor**

2022–Now

### **ExpectationMaximization.jl**

*A simple but generic implementation of Expectation Maximization algorithms to fit mixture models.*

**Creator**

2022–Now

### **RobustMeans.jl**

*Implement some Robust Mean Estimators*

**Creator**

2022–Now

## Publication list

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### **Stochastic Weather Generators**

- [1] Cognot C., Bel L., Métivier D., Parey S. (2025). *A Spatio-Temporal Weather Generator for the Temperature over France*; *Advances in Statistical Climatology, Meteorology and Oceanography* 11(2), 203–228 (2025).
- [2] Gobet E., Métivier D., Parey S. (2025). *Interpretable Seasonal Multisite Hidden Markov Model for Stochastic Rain Generation in France*; *Advances in Statistical Climatology, Meteorology and Oceanography* 11(2), 159–201 (2025).

### **Statistical Computational Methods**

- [3] Baragatti M., Casenave C., Cloez B., Métivier D., Sanchez I. (2025). *Approximate Bayesian Computation with Deep Learning and Conformal Prediction*; *Journal of Computational and Graphical Statistics* (2025).
- [4] Gobet E., Lerasle M., Métivier D. (2026). *Accelerated Convergence of Error Quantiles Using Robust Randomized Quasi Monte Carlo Methods*; *Journal of Complexity* 92, 101989 (2026).
- [5] Métivier, D., Vuffray M., Misra S. (2019). *Efficient Polynomial Chaos Expansion for Uncertainty Quantification in Power Systems*. *Electric Power Systems Research* 189, 106791 **Proceedings of the 2020 Power Systems Computation Conference**, Porto Portugal; arXiv:1910.06498

### **Mean Field Control**

- [6] Luchnikov I., Métivier D., Ouerdane H., Chertkov M. (2021) *Super-relaxation of space–time-quantized ensemble of energy loads to curtail their synchronization after demand response perturbation*; *Applied Energy* 285, 116419 arXiv:2008.03118
- [7] Métivier, D., Chertkov C. (2020). *Mean Field Control for Efficient Mixing of Energy Loads*; *Phys. Rev. E* 101, 022115; arXiv:1810.00450.
- [8] Métivier, D., Luchnikov I., Chertkov C. (2019). *Power of Ensemble Diversity and Randomization for Energy Aggregation*; *Scientific Reports* 9(1), 5910; arXiv:1808.09555.

### **Bifurcations in Vlasov and Kuramoto models**

- [9] Barré J., Métivier D., Yamaguchi Y. Y. (2020). *Towards a classification of bifurcations in Vlasov equations*. *Phys. Rev. E* 102, 052208; arXiv:1909.11344
- [10] Métivier, D., Wetzels, L., Gupta S., *Onset of synchronization in networks of second-order Kuramoto oscillators with delayed coupling: Exact results and application to phase-locked loops* (2020). *Phys. Rev. Research* 2, 023183 arXiv:1906.02643

- [11] Métivier D., Gupta S. (2019). *Bifurcations in the time-delayed Kuramoto model of coupled oscillators: Exact results*; J Stat Phys 176: 279; arXiv:1808.10436.
- [12] Barré J, Métivier D. (2018) *Vlasov-Fokker-Planck equation: stochastic stability of resonances and unstable manifold expansion*; Nonlinearity 31 4667; arXiv:1703.01668.
- [13] Barré J., Métivier D. (2016). *Bifurcations and singularities for coupled oscillators with inertia and frustration*; Physical Review Letters, 117(21), 214102.; arXiv:1605.02990.
- [14] Barré J., Métivier D., Yamaguchi Y. Y. (2016). *Trapping scaling for bifurcations in the Vlasov systems*. Physical Review E, 93(4), 042207.; arXiv:1511.07645

### Magneto-Optical Traps

- [15] Barré J., Kaiser R., Labeyrie G., Marcos B., Métivier, D. (2019). *Towards a measurement of the Debye length in very large Magneto-Optical traps*. Phys. Rev. A 100, 013624; arXiv:1808.02098.

### Lieb-Robinson bounds

- [16] Métivier D., Bachelard R., Kastner M. (2014). *Spreading of Perturbations in Long-Range Interacting Classical Lattice Models*. Physical Review Letters, 112(21), 210601.; arXiv:1405.7556.

## After Ph.D. Talks

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Not up to date.

- **Jun. 23** International Conference on Monte Carlo Methods and Applications, *Talk* Paris
- **Jun. 23** Colloque Processus markoviens, semi-markoviens et leurs applications, *Talk* Montpellier
- **Oct. 22** Séminaire SEMSTAT at INRAE/IMAG, *Talk* Montpellier
- **May 22** Séminaire MISTEA at INRAE, *Talk* Montpellier
- **Mar. 22** Séminaire DATA at LJK, *Talk* Grenoble
- **Mar. 22** Workshop Nouveaux challenge en apprentissage statistiques *Short Talk* Font Romeu
- **Feb. 22** Séminaire Géostatistique at MINES ParisTech, *Talk* Fontainebleau
- **Feb. 22** Séminaire GT Mathématiques financières, probabilités numériques at LPSM, *Talk* Paris
- **Jan. 22** Séminaire at Laboratoire des Sciences du Climat et de l'Environnement, *Talk* Saint-Aubin
- **Jan. 22** Weather extremes and Climate Change, *Short talk* IHP
- **Sep. 21** Les XVe Journées de Géostatistique, *Talk* Fontainebleau
- **Mar. 21** Séminaire Analyse Numérique et Équations aux Dérivées Partielles du LMO, *webinar* Orsay
- **Dec. 20** Séminaire Dynamique Quantique et Classique du CPT, *webinar* Marseille
- **Nov. 20** Virtual Informal Systems Seminar at McGill, *webinar* Montréal
- **Nov. 20** Magneto-Fluid Dynamics MFD division at the Courant Institute, *webinar* New York
- **Jul. 20** XXI Power Systems Computation Conference PSCC, *webinar* Porto
- **Jun. 20** Tokamak Disruption Simulation SciDAC *webinar* series
- **Jun. 20** BLABS Theoretical Division seminar, *webinar* Los Alamos NM
- **May 20** Conference Arizona - Los Alamos Days, *webinar* Tucson AZ
- **Mar. 20** Seminar at Laboratoire Matière et Systèmes Complexes, *webinar* Paris

- **Dec. 19** Seminar at R&D of Réseau de Transport d'Électricité, La Défense
- **Dec. 19** Seminar at Laboratoire de Physique, École Normale Supérieure de Lyon
- **Dec. 19** Seminar at Laboratoire de Physique Théorique et Modélisation, Cergy-Pontoise
- **Dec. 19** Conference PGMO days, Optimization of energy session, EDF'Lab Palaiseau
- **July 19** Conference StatPhys 27, Nonlinear physics session, Buenos Aires
- **May 19** External Advisory Committee and Review of the CNLS, Los Alamos NM
- **Apr. 19** Conference Arizona - Los Alamos Days, Tucson AZ
- **Apr. 19** Postdoc Seminar CNLS, Los Alamos NM
- **Mar. 19** Seminar at School of Mathematical and Statistical Sciences, Phoenix AZ
- **Oct. 18** Seminar at Institute for Physical Science and Technology, College Park MD
- **May. 18** Workshop on Long-range Interactions and Synchronization, São Paulo
- **Apr. 18** Postdoc Seminar CNLS, Los Alamos NM