Pierre Humbert

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Professional experiments

2025   **CNRS researcher - Laboratoire de Mathématiques et Modélisation d'Évry (LaMME)**.
Part of the Statistic and Genomic team.

2024-2025   **Post-doctoral researcher - Laboratoire de probabilités, statistique et modélisation (LPSM), Sorbonne Université**.
Conformal Prediction, Selection inference
Supervised by Etienne Roquain. Part of the MARS team.

Visiting researcher - Budapest University of Technology and Economics.
Conformal Prediction, Multivariate outputs
Invited by László Györfi to work in the Department of Computer Science and Information Theory.

2023-2024   **Post-doctoral researcher - Laboratoire de mathématiques d'Orsay (LMO)**.
Conformal Prediction, Federated Learning
Supervised by Sylvain Arlot. Part of ANR Fast-Big and ANR Biscotte.

2021-2023   **Post-doctoral researcher - Laboratoire de mathématiques d'Orsay (LMO), Inria CELESTE**.
Cross Validation, Conformal Prediction, Federated Learning
Supervised by Sylvain Arlot.

Winter 2021   **Post-doctoral researcher - Centre Borelli, École Normale Supérieure Paris-Saclay**.

Education

2016 – 2020   **Ph.D. in applied mathematics - Centre Borelli, department of Mathematics of École Normale Supérieure Paris-Saclay**.
Multivariate analysis with tensors and graphs – application to neuroscience.
Supervised by Nicolas Vayatis, Laurent Oudre, and Julien Audiffren.
Jury: Rémi Gribonval, Dimitri Van De Ville, Cédric Richard, Stéphanie Allassonnière, Alexandre Gramfort.

Complementary formations - M2 MVA, ENS de Cachan.
– Convex optimization and applications in machine learning,
– Kernel Methods for machine learning,
– High Dimensional Signal Analysis.

2015 – 2016   **Master 2 - Statistic and Probability Major - UFR Science et Technique, Nantes**.
Statistic/Probability.

Final Project Internship - Centre de Mathématique et de leurs Application (CMLA), department of Mathematics of ENS Cachan.
Analysis of physiological signals during a general anesthesia.
Supervised by Nicolas Vayatis and Laurent Oudre.

2014 – 2015   **Master 1 - Statistic and Probability Major - UFR Science et Technique, Nantes**.
Statistic/Probability and Numerical analysis.

Supervisions

2023   **Co-supervision of the thesis of Lucas Zoroddu - ENS Paris-Saclay**, *(with Pr. Laurent Oudre)*.
– CIFRE thesis with Volta Medical.

Supervision of a student in M2 MVA - ENS Paris-Saclay, *(with Pr. Laurent Oudre)*.
– Learning Granger Network.

2021   **Supervision of a student in M2 MVA - ENS Paris-Saclay**, *(with Pr. Laurent Oudre)*.
– Anomaly detection in multimodal signals.

Supervision of a student in M2 Bioengineering and Innovation in Neurosciences - Paris Descartes, *(with Pr. Laurent Oudre and Md. Clément Dubost)*.
– Analysis of electroencephalogram 3 hours after a general anaesthesia.

2020   **Supervision of a Normalien in M1 - ENS Paris-Saclay**, *(with Pr. Laurent Oudre)*.
– Learning product graph from signal with sparse spectral representation.

2018 **Supervision of a student in M2 BIN - Paris Descartes**, *(with Md. Clément Dubost)*.
– Electroencephalogram channel selection to predict the depth of anesthesia.

2017 **Supervision of a student in M2 BIN - Paris Descartes**, *(with Md. Clément Dubost)*.
– Estimation of the bispectral index based on electroencephalogram feature.

2016 **Supervision of a student in M2 BIN - Paris Descartes**, *(with Md. Clément Dubost)*.
– Analysis of electroencephalogram 3 hours after a general anaesthesia.

Supervision of 2 Normaliens in L3 - ENS Cachan.
– Tensor completion with applications in image recontruction.

Teaching

2025 **M2 Topics in modern machine learning**.
Teacher for the introduction to conformal prediction, Sorbonne Université (3h)

2024 **Machine learning and medicine**.
Teacher, APHP and Sorbonne Université (7h)

Pre-prints

2025 **Online selective conformal inference: adaptive scores, convergence rate and optimality**.
Pierre Humbert, Ulysse Gazin, Ruth Heller, and Etienne Roquain.
Submitted to *Annals of Statistics*.

2024 **Marginal and training-conditional guarantees in one-shot federated conformal prediction**.
Pierre Humbert, Batiste Le Bars, Aurélien Bellet, and Sylvain Arlot.
Submitted to *JMLR*.

Publications

2025 **Transductive conformal inference for full ranking**.
Jean-Batiste Fermanian, Pierre Humbert, and Gilles Blanchard.
In *Conference on Neural Information Processing Systems 2025 (NeurIPS)*.

On volume minimization in conformal regression.
Batiste Le Bars and Pierre Humbert.
In *International Conference on Machine Learning 2025 (ICML)*.

Localization of arrhythmogenic sites in post-ischemic ventricular tachycardia using Network Granger Causality.
Lucas Zoroddu, Pierre Humbert, Laurent Oudre, Thomas Demarcy, Laurent Launay, and Francis Bessiere.
In *International Conference of the IEEE Engineering in Medecine and Biology Society 2025 (EMBC)*.

2024 **Learning Network Granger causality using Graph Prior Knowledge**, *(Journal)*.
Lucas Zorrodu, Pierre Humbert, and Laurent Oudre.
In *Transactions on Machine Learning Research (TMLR)*.

Using graph prior to learn network Granger causality.
Lucas Zorrodu, Pierre Humbert, and Laurent Oudre.
In European Signal Processing Conference 2024 (EUSIPCO).

2023 **One-Shot Federated Conformal Prediction**.
Pierre Humbert, Batiste Le Bars, Aurélien Bellet, and Sylvain Arlot.
In *International Conference on Machine Learning 2023 (ICML)*.

2022 **Robust Kernel Density Estimation with Median-of-Means principle**.
Pierre Humbert[*], Batiste Le Bars[*], and Ludovic Minvielle[*].
In *International Conference on Machine Learning 2022 (ICML)*
[*]Authors with equal contribution to this work.

2021 **Adaptive Subsampling of Multidomain Signals With Product Graphs**.
Théo Gnassounou, Pierre Humbert, and Laurent Oudre.
In *IEEE International Conference on Acoustics, Speech and Signal Processing 2021 (ICASSP)*.

Learning spatial filters from EEG signals with graph signal processing methods.
Pierre Humbert, Laurent Oudre, and Clément Dubost.
In *International Conference of the IEEE Engineering in Medecine and Biology Society 2021 (EMBC)*.

Tensor Convolutional Sparse Coding with Low-Rank activations, *(Journal)*.
Pierre Humbert, Laurent Oudre, Nicolas Vayatis, and Julien Audiffren.
In *IEEE Transactions on Signal Processing (TSP)*.

2020 **Learning the piece-wise constant graph structure of a varying Ising model**.
Batiste Le Bars, Pierre Humbert, Argyris Kalogeratos, and Nicolas Vayatis.
In *International Conference on Machine Learning 2020 (ICML)*.

Low rank activations for tensor-based convolutional sparse coding.
Pierre Humbert, Julien Audiffren, Laurent Oudre, and Nicolas Vayatis.
In *IEEE International Conference on Acoustics, Speech and Signal Processing 2020 (ICASSP)*.

Quantitative assessment of consciousness during anesthesia without EEG data, *(Journal)*.
Clément Dubost, Pierre Humbert, Gaël De Rocquigny, Laurent Oudre, Christophe Labourdette, Nicolas Vayatis and Pierre-Paul Vidal.
In *Journal of Clinical Monitoring and Computing 2020 (JCMC)*.

Prediction of the Depth of anesthesia with Hidden Markov Model.
Clément Dubost, Pierre Humbert, Gaël De Rocquigny, Nicolas Vayatis and Pierre-Paul Vidal.
In *Virtual Physiological Human 2020 (VPH)*.

2019 **Learning Laplacian Matrix from Graph Signals with Sparse Spectral Representation**, *(Journal)*.
Pierre Humbert*, Batiste Le Bars*, Laurent Oudre, Argyris Kalogeratos, and Nicolas Vayatis
In *The Journal of Machine Learning Research (JMLR)*.
*Authors with equal contribution to this work.

Apprenticeship Learning for a Predictive State Representation of Anesthesia, *(Journal)*.
Pierre Humbert, Clément Dubost, Julien Audiffren, and Laurent Oudre.
In *IEEE Transactions on Biomedical Engineering (TBME)*.

Learning Laplacian Matrix from Bandlimited Graph Signals.
Batiste Le Bars*, Pierre Humbert*, Laurent Oudre, and Argyris Kalogeratos.
In *IEEE International Conference on Acoustics, Speech and Signal Processing 2019 (ICASSP)* .
*Authors with equal contribution to this work

Subsampling of Multivariate Time-Vertex Graph Signals.
Pierre Humbert, Laurent Oudre, and Nicolas Vayatis.
In *European Signal Processing Conference 2019 (EUSIPCO)*.

Selection of the Best Electroencephalogram Channel to Predict the Depth of Anesthesia, *(Journal)*.
Clément Dubost, Pierre Humbert, Arno Benizri, Jean-Pierre Tourtier, Nicolas Vayatis, and Pierre-Paul Vidal.
In *Frontiers in computational neuroscience*.

2016 **Learning from an expert**, *(Workshop)*.
Pierre Humbert, Julien Audiffren, and Laurent Oudre.
In *Neural Information Processing Systems 2016 (NeurIPS) Workshop on Machine Learning for Health*.

Selected international talks

2025 **Invited talk at SMPGD (keynote)**.
Tutorial on conformal prediction (45 minutes talk).

2024 **Séminaire du Laboratoire de mathématiques d'Orsay (LMO)**.
Marginal and training-conditional one-shot federated conformal prediction (45 minutes talk).

2023 **Séminaire UQsay (online)**.
One-shot federated conformal prediction (50 minutes talk).

Séminaire du Laboratoire de mathématiques d'Orsay (LMO) et Inria Celeste.
One-shot federated conformal prediction (45 minutes talk).

International Conference on Machine Learning (ICML).
One-shot federated conformal prediction.

2022 **Séminaire parisien de statistique, Institut Henri Poincaré (IHP)**.
Robust kernel density estimation with median-of-means principle (50 minutes talk).

International Conference on Machine Learning (ICML).
Robust kernel density estimation with median-of-means principle.

2021 **IEEE International Conference on Acoustics, Speech and Signal Processing**.
Adaptive subsampling of multidomain signals with product graphs (15 minutes talk).

2020 **IEEE International Conference on Acoustics, Speech and Signal Processing**.
Low rank activations for tensor-based convolutional sparse coding (15 minutes talk).

French-German Summer School on Transfer Learning.
Low rank activations for tensor-based convolutional sparse coding (15 minutes talk).

2019 **Parietal team – Inria-CEA joint team part of the Neurospin research center**.
Detection of the depth of anesthesia with and without electroencephalogram signals (50 minutes talk).

European Signal Processing Conference.
Subsampling of multivariate time-vertex graph signals (25 minutes talk).

IEEE International Conference on Acoustics, Speech and Signal Processing.
Learning Laplacian matrix from bandlimited graph signals (25 minutes talk).

Services

– **Reviewing for JASA, JMLR, EJS, Neurips, ICML, ICLR, Aistat**.
2023 **Co-organizer of the GT Conformal Prediction**.
2021 **Co-organizer of the GT Robust Statistics**.
Jury member, IdF AI Challenge.
2017 **Jury member**, Machine Learning project M2 CentraleSupelec.

Computer skills

Advanced Python, R, LaTeX
Intermediate Git, Java, Android, C/C++
Basic HTML, PHP, SQL, Javascript, CSS

Languages

French **Native speaker**
English **Professional proficiency** *good working knowledge*

Referees

Dr. Etienne Roquain: Postdoctorat advisor *etienne [dot] roquain (at) upmc [dot] fr*
Pr. Sylvain Arlot: Postdoctorat advisor *sylvain [dot] arlot (at) universite-paris-saclay [dot] fr*
Pr. Nicolas Vayatis: Ph.D. advisor *nicolas [dot] vayatis (at) ens-paris-saclay [dot] fr*
Pr. Laurent Ourdre: Ph.D. advisor *laurent [dot] oudre (at) ens-paris-saclay [dot] fr*
Md. Clément Dubost: Former colleague *clement [dot] dubost (at) intradef.gouv [dot] fr*