

Ph.D. in applied mathematics & signal processing

Administrative status

- 2024 **Post-doctorant - Laboratoire de probabilités, statistique et modélisation (LPSM), Sorbonne Université.**
Conformal Prediction, Selection inference
Supervised by Etienne Roquain. Part of the MARS team
- 2023 **Post-doctorant - Laboratoire de mathématiques d'Orsay (LMO).**
Conformal Prediction, Federated Learning
Supervised by Sylvain Arlot. Part of ANR Fast-Big and ANR Biscotte
- 2021 **Post-doctorant - Laboratoire de mathématiques d'Orsay (LMO), Inria CELESTE.**
Cross Validation for unstable estimators, Conformal Prediction, Federated Learning
Supervised by Sylvain Arlot.

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 Allasonnière, 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.

Teaching / 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 reconstruction.

Publications

- 2024 **Transductive conformal inference for ranking.**
 Gilles Blanchard, Jean-Batiste Fermanian, and Pierre Humbert.
Conditional Prediction Sets with Weighted Conformal Prediction.
 Jean-Batiste Fermanian and Pierre Humbert.
Marginal and training-conditional guarantees in one-shot federated conformal prediction.
 Pierre Humbert, Batiste Le Bars, Aurélien Bellet, and Sylvain Arlot.
 Submitted to *Annals of Statistics*.
Learning Network Granger causality using Graph Prior Knowledge, (Journal).
 Lucas Zorrodu, Pierre Humbert, and Laurent Oudre.
 In *Transactions on Machine Learning Research (TMLR)*.
- 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 *Proceedings of the International Conference of the IEEE Engineering in Medicine 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

2024 **Séminaire du Laboratoire de mathématiques d'Angers (LAREMA).**

Marginal and training-conditional one-shot federated conformal prediction (45 minutes talk).

Séminaire du Laboratoire de mathématiques d'Orsay (LMO).

Marginal and training-conditional one-shot federated conformal prediction (45 minutes talk).

Séminaire de l'équipe MARS.

One-shot federated conformal prediction (45 minutes talk).

Journées de Statistique (Jds).

Marginal and training-conditional one-shot federated conformal prediction (20 minutes talk).

2023 **Séminaire UQsay (online).**

One-shot federated conformal prediction (50 minutes talk).

Workshop Fast-Big.

Federated conformal prediction (20 minutes talk).

Conférence sur l'Apprentissage automatique (CAP).

One-shot federated conformal prediction (20 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 JMLR, 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 CentraleSupélec.

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

Pr. Sylvain Arlot: Postdoctorat Advisor

Pr. Nicolas Vayatis: Ph.D. Advisor

Pr. Laurent Ourdre: Ph.D. Advisor

Md. Clément Dubost: former colleague

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nicolas [dot] vayatis (at) ens-paris-saclay [dot] fr

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