Pierre Humbert

Paris, France
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Ph.D. in applied mathematics & signal processing

Administrative status

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 Allassonière, 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 **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.

Publications

2024 **Conditional Prediction Sets with Weighted Conformal Prediction**.
Jean-Batiste Fermanian and Pierre Humbert.
Submitted to *ICML 2024*.

Marginal and training-conditional guarantees in one-shot federated conformal prediction.
Pierre Humbert, Batiste Le Bars, Aurélien Bellet, and Sylvain Arlot.
In the process to be submitted to *Annals of Statistics*.

Learning Network Granger causality using Graph Prior Knowledge.
Lucas Zorrodu, Pierre Humbert, and Laurent Oudre.
Submitted to *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 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

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 Maths d'Orsay 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 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

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*