

Cosme Louart

Ph.D. Student at GIPSA-lab & CEA
Random Matrices, Concentration of Measure,
Machine Learning and Deep Learning

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Education

- 2015-2016 **M2 - “Master Vision et Apprentissage” (MVA)**, *ENS Cachan*, Paris, France, Courses: Machine Learning, Deep Learning, Reinforcement Learning, Statistical learning, Kernel techniques, wavelet transforms, Optimization, Random Matrix Theory.
- 2014-2015 **M1 - Fundamental Mathematics**, *Ecole Normale Supérieure de Paris*, France, Courses: Topological algebra, Statistics, Dynamical Systems, Partial Derivative Equations.
- 2013-2014 **B3 - Fundamental Mathematics**, *Ecole Normale Supérieure de Paris*, France, Courses: Algebra, Topology, Differential Geometry, Complex Analysis, Functional Analysis, Integration and Probabilities, Galois Algebra.
- 2010-2013 **“Classes préparatoires”**, *Lycée Michel Montaigne*, Bordeaux, France, MPSI, MP, MP*.

Experiences

- 2018-today **Ph.D. in Mathematics**, *GIPSA-lab and CEA LIST*, France, Thesis: *Random Matrix Theory and Concentration of measure theory to understand neural networks*.
Under the supervision of Romain Couillet and Mohamed Tamaazousti
- 2018 **Internship at FIPU1**, *Direction Générale du Trésor*, Quartier de Bercy, Paris, France, update in R language of an Excel spreadsheet for the prevision of the national accounts.
Under the direction of Antonin Aviat
- 2017 **“predoctorate” Internship**, *Centrale-Supélec*, Gif-sur-Yvette, France, Research on Machine Learning Techniques with Random Matrix Theory and Concentration of Measure Theory.
under the supervision of Romain Couillet
- 2016-2017 **Year off on the American continent**, *Peru, Bolivia, Ecuador, Colombia, Mexico, USA*, Discovery.
- 2016 **M2 intership**, *Centrale-Supélec*, Gif-sur-Yvette, France, Research on Neural networks and Random Matrices.
under the supervision of Romain Couillet
- 2015 **M1 intership**, *High School of Economics*, Moscow, Russia, Research on the ergodicity of some equivalence relations of sequences of \mathbf{Z} .
under the supervision of Alexander Bufetov

Skills

- Languages** JULIA, MATLAB, PYTHON, VBA, R, L^AT_EX.
- Languages** French, English (bilingual), Russian, Spanish, Italian (communication).

Publications

2021

EJP *Concentration of measure and generalized product of random vectors with an application to Hanson-Wright-like inequalities.*, C.Louart, R.Couillet, (submitted to) Electronic Journal of Probability.

AISTATS *The Unexpected Deterministic and Universal Behavior of Large Softmax Classifiers*, MEA.Seddik, C.Louart, R.Couillet, M.Tamaazousti, Artificial Intelligence and Statistics, virtual conference, 2021.

2020

AAP *A Concentration of Measure Approach to Large Dimensional Robust Statistics*, Submitted C.Louart, R.Couillet, (submitted to) Annals of Applied Probability.

ICASSP *Large Dimensional Asymptotics of Multi-Task Learning*, M. Tiomoko, C. Louart, R.Couillet, Submitted to Random Matrices Theory and Applications, IEEE International Conference on Acoustics, Speech and Signal Processing, Barcelona, Spain.

2019

RMTA *Concentration of Measure and Large Random Matrices with an application to Sample Covariance Matrices*, C. Louart, R.Couillet, (submitted to) Random Matrices Theory and Applications.

ICML *Random Matrix Theory Proves that Deep Learning Representations of GAN-data Behave as Gaussian Mixtures*, MEA.Seddik, C.Louart, M.Tamaazousti, R.Couillet.

CAMSAP *A concentration of measure perspective to robust statistics*, C.Louart, R.Couillet, IEEE International Workshop on Computational Advances in Multi-Sensor Adaptive Processing, Guadeloupe, France.

2018

AAP *A Random Matrix Approach to Neural Networks*, C. Louart, Z. Liao, R. Couillet, The Annals of Applied Probability, vol. 28, no. 2, pp. 1190-1248, 2018.

ICASSP *A Random Matrix and Concentration Inequalities Framework for Neural Networks Analysis*, C. Louart, R. Couillet, IEEE International Conference on Acoustics, Speech and Signal Processing, Calgary, Canada.

2017

ICASSP *Harnessing neural networks: a random matrix approach*, C. Louart, R. Couillet, IEEE International Conference on Acoustics, Speech and Signal Processing, New-Orleans, USA.

References Contact Details

Romain Couillet, Full Professor at CentraleSupélec, University of ParisSaclay.

Webpage: <https://romaincouillet.hebfree.org/>

Antonin Aviat, DG Trésor, Sous-directeur en charge du diagnostic et des prévisions macroéconomiques.

Pierre Comon, Directeur de Recherche CNRS, GIPSA-lab, Grenoble.

Alexander Bufetov, CNRS, Steklov Mathematical Institute, IITP RAS, NRU Higher School of Economics.