

Cosme LOUART

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Assistant professor at CUHK (Shenzhen)

Random matrices, Machine learning, Concentration of the measure

POSITIONS

- **Assistant professor** CUHK (Shenzhen), School of data science, Statistics department. 2023-Today.
- **Research engineer** R&D, EDF China, Energy solution team. Projects : District heating in Sanmenxia, Cooling station in Sanya, electric bus fleet in Shenzhen. Designing of Python pipelines for physical model calibration, neural network modelization, optimization of operational choices thanks to those fast models - exchange with the operational team from Beijing or on-site to answer the needs. 2021-2023.

EDUCATION

- **Phd in Mathematics**, GIPSA-lab, CEA LIST, *Application of the theory of Random Matrices and of the Concentration of the Measure for the study of High Dimensional Data Processing*, under the supervision of Romain Couillet, 2018-2023 (Defense on February, 28th).
- **Master 2 “MVA”** - Machine learning techniques for image processing and learning, ENS Cachan, France, 2015-2016.
- **Bachelor 3, Master 1** - Fondamental mathematics, ENS de Paris Rue d’Ulm (“élève normalien”), France, 2013-2015.

INTERESTS

- Concentration of the measure,
- Random matrices,
- Machine learning,
- Robust statistics.

RECOGNITION/ GRANTS

- 17th on the admission list of the competitive national examination of the ENS Paris, filière MPI.
- Shenzhen CUHK (Shenzhen) Education Funding (600 000 RMB, 3 years).

SERVICES

- Associate Editor in Statistics and Computing 2024-Today.
- Member of the selection committee in Statistics for ICBS, 2024.

SKILLS

- **Programmation** Python (pytorch, scipy, dash, fmpy...), Git, Julia, Matlab, VBA, R, LaTeX.
- **Language** English (bilingual), Chinese, Russian, Spanish (communication).

TEACHING

- **Linear Algebra**, CUHK Shenzhen, *undergraduate course*, 2025, spring.
- **Statistical Learning**, CUHK Shenzhen, *undergraduate course*, 2024, fall.
- **Matrix Analysis**, CUHK Shenzhen, *postgraduate course*, 2024/25, spring.
- **Basics of OCaml**, UGA - L1 INF201, *Undergraduate course*, 2021.
- **General mathematical notions**, IUT1 - L1 mesures physiques et informatiques, *Undergraduate course*, 2020.
- **Basic notions of Algebra**, IUT2 - L1 STID, *Undergraduate course*, 2019.

TALKS

- 16 Dec 2024: **HKUST Joint workshop** on recent advances on Scientific computing, random matrices and data science - *HKUST, Hongkong, China*.
- 04-08 Nov 2024: **CIMI Workshop** “Beyond classical regimes in statistical inference and machine learning” - *International center of Mathematics and informatic of Toulouse, France*.
- 12-16 Aug 2024: **Bernouilli Conference** - *Bochum, Germany*.
- 14-29 Jul 2024: **ICBS** International Congress of Basic science - *Beijing, China*.
- 06-08 Jul 2024: International conference on Statistics and Probability, **IMS China** - *Yinchuan, Ningxia, China*.
- 10-15 Jul 2024: **Probability days** - *Bordeaux, France*.
- 28 May 2024: **Huawei seminar** - *Paris, France*.
- 25 Jun 2023: **RMTA Conference** - *CUHK (Shenzhen) School of data science, Shenzhen, China*.
- 17 Feb 2023: **GDR MEGA** - *Institut de Mathématiques de Toulouse, France*.
- 26 Oct 2022: **SDS Workshop** Topics in Random matrix Theory - *Chinese university of Hong Kong, Shenzhen, China*.
- 04 May 2021: **Huawei Seminar**, 2nd Mini-workshop RMT and machine learning - *Huawei labs, Paris, France*.
- 23 Oct 2020: **GDR MEGA** - *Institut de Mathématiques de Toulouse, France*.
- 18 Feb 2020: **Oxford Random matrix Seminar** - *Oxford Mathematical Institute, Oxford, UK*.
- 20 Jun 2019: **Journées de l’IOPS** - *Parc Ornithologique, Le Teich, France*.

PUBLICATIONS

(Journals)

- *A concentration of measure and random matrix approach to large-dimensional robust statistics* C Louart, R Couillet, The Annals of Applied Probability 32 (6), 4737-4762, 4, 2022.
- *A random matrix approach to neural networks* C Louart, Z Liao, R Couillet The Annals of Applied Probability 28 (2), 2018.

(Conferences)

- *Enhancing Multivariate Time Series Forecasting via Multi-Task Learning and Random Matrix Theory* R Ilbert, M Tiomoko, C Louart, V Feofanov, T Palpanas, I Redko, NeurIPS Workshop on Time Series in the Age of Large Models, 2024.
- *The unexpected deterministic and universal behavior of large softmax classifiers* MEA Seddik, C Louart, R Couillet, M Tamaazousti, International Conference on Artificial Intelligence and Statistics, 1045-1053, 2021.
- *Random matrix theory proves that deep learning representations of gan-data behave as gaussian mixtures* MEA Seddik, C Louart, M Tamaazousti, R Couillet, International Conference on Machine Learning, 2020.
- *Large Dimensional Asymptotics of Multi-Task Learning* M Tiomoko, C Louart, R Couillet, ICASSP 2020-2020 IEEE International Conference on Acoustics, Speech and Signal Processing, 2020.
- *A Concentration of Measure Perspective to Robust Statistics* C Louart, R Couillet 2019 IEEE 8th International Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP), 2019.
- *A random matrix and concentration inequalities framework for neural networks analysis* C Louart, R Couillet 2018 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 2018.
- *Harnessing neural networks: A random matrix approach* C Louart, R Couillet 2017 IEEE International Conference on Acoustics, Speech and Signal Processing, 2017.

(Preprints)

- *Transformer-based modular modeling scheme for Digital Twin* Z Wenrang, C Louart, submitted to ICML2025.
- *Operation with concentration inequalities* C Louart, submitted. arXiv:2402.08206. 2025
- *A concentration of the measure Framework to study convex problems and other implicit formulation problems in machine learning* C Louart arXiv preprint arXiv:2010.09877, 2023.
- *Spectral properties of sample covariance matrices arising from random matrices with independent non identically distributed columns* C Louart, R Couillet arXiv preprint arXiv:2109.02644, 2022.