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工作经历

2021-至今 **副研究员**, 华中科技大学, 电子信息与通信学院
2020-2021 **博士后研究员**, 加州大学伯克利分校, 统计系, 合作导师：Michael Mahoney 教授

教育经历

2016-2019 **博士**, 巴黎萨克雷大学, 数学与计算机, 合作导师：Romain Couillet 教授
2014-2016 **硕士**, 巴黎萨克雷大学, 信号与图像处理
2010-2014 **本科**, 华中科技大学, 光电信息工程

科研获奖

2021 湖北省武汉市“武汉英才”优秀青年人才
2021 华中科技大学东湖青年学者
2019 巴黎萨克雷大学 ED STIC 优秀博士论文
2016 巴黎萨克雷大学 Supélec Foundation Ph.D. Fellowship

学术专著

CUP Romain Couillet, **Zhenyu Liao**. Random Matrix Methods for Machine Learning. *Cambridge University Press*. 2022. DOI: 10.1017/9781009128490. ISBN: 9781009123235.

部分代表论文

NeurIPS L. Gu, Y. Du, Y. Zhang, D. Xie, S. Pu, R. C. Qiu, and **Zhenyu Liao**, “Lossless” Compression of Deep Neural Networks: A High-dimensional Neural Tangent Kernel Approach. *Advances in Neural Information Processing Systems*. Vol. 35. 2022, pp.3774–3787.

ICLR Hafiz Tiomoko Ali, **Zhenyu Liao**, and Romain Couillet. Random matrices in service of ML footprint: ternary random features with no performance loss. *The Tenth International Conference on Learning Representations*. 2022.

MCRF Yacine Chitour, **Zhenyu Liao**, and Romain Couillet. A geometric approach of gradient descent algorithms in linear neural networks. *Mathematical Control and Related Fields* 13(3) (2023), 918–945.

JSTAT **Zhenyu Liao**, Romain Couillet, and Michael W Mahoney. A random matrix analysis of random Fourier features: beyond the Gaussian kernel, a precise phase transition, and the corresponding double descent. *Journal of Statistical Mechanics: Theory and Experiment* **2021**(12) (Dec. 2021), 124006.

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COLT Michal Derezinski, **Zhenyu Liao**, Edgar Dobriban, and Michael W Mahoney. Sparse sketches with small inversion bias. *Proceedings of Thirty Fourth Conference on Learning Theory*. Vol. 134. Proceedings of Machine Learning Research. PMLR, 15–19 Aug 2021, pp.1467–1510.

ICLR **Zhenyu Liao**, Romain Couillet, and Michael W Mahoney. Sparse Quantized Spectral Clustering. *The Ninth International Conference on Learning Representations*. 2021.

AISTATS Fanghui Liu, **Zhenyu Liao**, and Johan Suykens. Kernel Regression in High Dimension: Refined Analysis beyond Double Descent. *Proceedings of The 24th International Conference on Artificial Intelligence and Statistics*. Vol. 130. Proceedings of Machine Learning Research. PMLR, 13–15 Apr 2021, pp.649–657.

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NeurIPS Michal Derezinski, Feynman T Liang, **Zhenyu Liao**, and Michael W Mahoney. Precise expressions for random projections: Low-rank approximation and randomized Newton. *Advances in Neural Information Processing Systems*. Vol. 33. pp.18272–18283. 2020.

CAMSAP **Zhenyu Liao** and Romain Couillet. On Inner-Product Kernels of High Dimensional Data. *2019 IEEE 8th International Workshop on Computational Advances in Multi-Sensor Adaptive Processing*. IEEE. 2019, pp.579–583.

IEEE-TSP **Zhenyu Liao** and Romain Couillet. A Large Dimensional Analysis of Least Squares Support Vector Machines. *IEEE Transactions on Signal Processing* **67**(4) (Feb. 2019), 1065–1074.

EUSIPCO Romain Couillet, **Zhenyu Liao**, and Xiaoyi Mai. Classification Asymptotics in the Random Matrix Regime. *The 26th European Signal Processing Conference*. IEEE. Sept. 2018, pp.1875–1879.

ICASSP Xiaoyi Mai, **Zhenyu Liao**, and Romain Couillet. A Large Scale Analysis of Logistic Regression: Asymptotic Performance and New Insights. *IEEE International Conference on Acoustics, Speech and Signal Processing*. IEEE. May 2019, pp.3357–3361.

ICML **Zhenyu Liao**, and Romain Couillet. On the Spectrum of Random Features Maps of High Dimensional Data. *Proceedings of the 35th International Conference on Machine Learning*. Vol. 80. PMLR, July 2018, pp.3063–3071.

ICML **Zhenyu Liao**, and Romain Couillet. The Dynamics of Learning: A Random Matrix Approach. *Proceedings of the 35th International Conference on Machine Learning*. Vol. 80. PMLR, July 2018, pp.3072–3081.

AAP Cosme Louart, **Zhenyu Liao**, and Romain Couillet. A Random Matrix Approach to Neural Networks. *The Annals of Applied Probability* **28**(2) (Apr. 2018), 1190–1248.

ICASSP **Zhenyu Liao** and Romain Couillet. Random Matrices Meet Machine Learning: A Large Dimensional Analysis of LS-SVM. *IEEE International Conference on Acoustics, Speech and Signal Processing*. IEEE. Mar. 2017, pp.2397–2401.

科研项目

2023-2025 国家自然科学基金青年科学基金项目：基于随机矩阵方法的神经网络模型剪枝基础理论研究（NSFC-62206101），30 万元，**主持**

2022-2025 国家自然科学基金“面向未来通信的数学基础（信息论）”专项项目：智能反射面辅助的新型无线通信数学理论与数学技术（NSFC-12141107），300 万元，核心成员

2021-2024 中国中央高校基本科研业务费专项资金资助（No. 2021XXJS110）：高维随机矩阵方法在机器学习模型中的理论和应用，50 万元，**主持**

2021-2023 湖北省重点研发计划项目：新一代工业互联网网络关键技术研究（2021BAA037），100 万元，核心成员

2021-2022 中国计算机学会 CFF-海康威视斑头雁基金项目：基于随机矩阵和信息瓶颈理论的神经网络表达和压缩的研究（20210008），28 万元，**主持**

2021-2024 广西省重点研发计划项目：交通路网重要节点主动安全防控智能一体化成套技术研究与产业化（桂科 AB21196034），500 万元，核心成员

2018-2021 NSF Research Grant, *Combining Stochastics and Numerics for Improved Scalable Matrix Computations* (NSF-1815054)，500k 美元，核心成员

2018-2021 法国高等教育、研究与创新部：GSTATS-IDEX DataScience Chair，300k 欧元，核心成员

2015-2017 法国自然科学基金委：*Random Matrix Theory for Large Dimensional Graphs* （ANR-14-CE28-0006），300k 欧元，核心成员

科研服务

外部审稿人 欧洲研究理事会European Research Council (ERC)，加拿大自然科学与工程研究委员会 NSERC

审稿人或 PC NeurIPS, ICML, ICLR, AISTATS, AAAI, CAMSAP, Journal of Machine Learning Research (JMLR), IEEE Trans. on Pattern Analysis and Machine Intelligence (IEEE-TPAMI), IEEE Trans. on Signal Processing (IEEE-TSP), IEEE Trans. on Neural Networks and Learning Systems (IEEE-TNNLS), Transactions on Machine Learning Research (TMLR), Springer Statistics and Computing (STCO), SIAM Journal on Scientific Computing (SISC), Pattern Recognition (PR), Random Matrices: Theory and Applications (RMTA), Latin American Journal of Probability and Mathematical Statistics (ALEA), Neural Processing Letters (NPL), PLOS ONE

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