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男, 中共党员



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, 合作导师: Romain Couillet 教授

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.
- NeurIPS** **Zhenyu Liao** and Michael W. Mahoney. Hessian Eigenspectra of More Realistic Nonlinear Models. *Advances in Neural Information Processing Systems*. Vol. 34. 2021, pp.20104–20117.
- COLT** Michal Dereziński, **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.

- NeurIPS** **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. *Advances in Neural Information Processing Systems*. Vol. 33. pp.13939–13950. 2020.
- NeurIPS** Michal Dereziński, 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 CCF-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 ERC, 加拿大自然科学与工程研究委员会 NSERC, 中国国家自然科学基金委员会 NSFC
- 审稿人或程序委员会委员 NeurIPS, ICML, ICLR, AISTATS, AAAI, ECAI, 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), Foundations of Computational Mathematics (FoCM), Neural Processing Letters (NPL), PLOS ONE.
- 学术活动组织
 - 华中科技大学-巴黎萨克雷大学2022 联合工作坊“数据科学中的数学奥秘”
 - 吸引了超过 **40 000** 名相关领域的科研人员、老师和同学参与
 - 回放链接: <https://www.bilibili.com/video/BV1G8411b7ir/>
 - 1st Workshop in High-dimensional Learning Dynamics (HiLD) at ICML 2023, Honolulu, Hawaii.

Organization of Scientific Activities

- 2022 Joint workshop on “Math for Data Science” between HUST and University of Paris-Saclay, with more than **40 000** online attendees, see playback.
- 1st Workshop in High-dimensional Learning Dynamics (HiLD) at ICML 2023, Honolulu, Hawaii.
 - List of plenary speakers: Sanjeev Arora, SueYeon Chung, Murat A. Erdogdu, Surya Ganguli, and Andrea Montanari.

推荐人

邱才明教授 华中科技大学电子信息与通信学院院长, IEEE Fellow。Email: caiming@hust.edu.cn

Prof. Michael Mahoney Associate Adjunct Professor at Department of Statistics, UC Berkeley, CA, USA. Director of the UC Berkeley FODA (Foundations of Data Analysis) Institute, Berkeley, CA, USA. Email: mmahoney@stat.berkeley.edu

Prof. Romain Couillet Full Professor at University Grenoble-Alps, France. Holder of the UGA MIAI LargeDATA Chair, University-Grenoble-Alps, France. Email: romain.couillet@gipsa-lab.grenoble-inp.fr