

Zhenyu Liao

Curriculum Vitae

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🏠 <https://zhenyu-liao.github.io>
✉ zhenyu.liao@berkeley.edu
📄 Male, Chinese, born in 28/08/1992.
📍 Office 475, 367 Evans Hall, [Department of Statistics](#),
[University of California, Berkeley](#), CA 94720, USA.

Education

- 2019 **Ph.D.** Statistics and Machine Learning [L2S, CentraleSupélec, Université Paris-Saclay](#), France.
- 2016 **M.Sc.** Signal and Image Processing [CentraleSupélec & University Paris-Sud](#), France.
- 2014 **B.Sc.** Electronic Engineering [University Paris-Sud](#), France.
- 2014 **B.Sc.** Optical & Electronic Information [Huazhong university of Science and Technology](#), China.

Experiences

- 2020-now: **Postdoctoral Scholar** at [Dept. of Statistics, UC Berkeley](#), hosted by Prof. [Michael Mahoney](#).
- 2016-2019: **Ph.D. Research Scholar and Teaching Assistant** at [L2S, CentraleSupélec, Université Paris-Saclay](#), France, advised by Prof. [Romain Couillet](#) and Prof. [Yacine Chitour](#).

Awards and prizes

- 2019: 2nd prize of [ED STIC Ph.D. Student Award](#) of University Paris-Saclay, France.
- 2016: Recipient of the [Supélec Foundation Ph.D. Fellowship](#), France.

Publications

Papers in conference proceedings

1. **Zhenyu Liao**, Romain Couillet, and Michael W Mahoney. Sparse Quantized Spectral Clustering. In: *The Ninth International Conference on Learning Representations (ICLR)*. 2021.
2. Fanghui Liu, **Zhenyu Liao**, and Johan AK Suykens. Kernel Regression in High Dimension: Refined Analysis beyond Double Descent. In: *The 24th International Conference on Artificial Intelligence and Statistics (AISTATS)*. 2021.
3. **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. In: *The 34th Conference on Neural Information Processing Systems (NeurIPS)*. 2020.
4. Michał Dereziński, Feynman Liang, **Zhenyu Liao**, and Michael W Mahoney. Precise expressions for random projections: Low-rank approximation and randomized Newton. In: *The 34th Conference on Neural Information Processing Systems (NeurIPS)*. 2020.
5. **Zhenyu Liao** and Romain Couillet. On Inner-Product Kernels of High Dimensional Data (invited paper to special session). In: *2019 IEEE 8th International Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP)*. IEEE. 2019, pp.579–583.
6. Xiaoyi Mai, **Zhenyu Liao**, and Romain Couillet. A Large Scale Analysis of Logistic Regression: Asymptotic Performance and New Insights. In: *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. IEEE. May 2019, pp.3357–3361.
7. Romain Couillet, **Zhenyu Liao**, and Xiaoyi Mai. Classification Asymptotics in the Random Matrix Regime (invited paper to special session). In: *The 26th European Signal Processing Conference (EUSIPCO)*. IEEE. Sept. 2018, pp.1875–1879.
8. **Zhenyu Liao** and Romain Couillet. The Dynamics of Learning: A Random Matrix Approach. In: *Proceedings of the 35th International Conference on Machine Learning (ICML)*. Vol. 80. PMLR, July 2018, pp.3072–3081.
9. **Zhenyu Liao** and Romain Couillet. On the Spectrum of Random Features Maps of High Dimensional Data. In: *Proceedings of the 35th International Conference on Machine Learning (ICML)*. Vol. 80. PMLR, July 2018, pp.3063–3071.
10. **Zhenyu Liao** and Romain Couillet. Random Matrices Meet Machine Learning: A Large Dimensional Analysis of LS-SVM. In: *IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. IEEE. Mar. 2017, pp.2397–2401.

Journal papers

1. **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.

2. 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.

Tutorials and invited talks

- Invited talk on “Performance-complexity Trade-off in Large Dimensional Spectral Clustering”, **STA 290 Seminar**, Department of Statistics, University of California, Davis, 2021.
- Invited talk on “Dynamical Aspects of Learning Linear Neural Networks”, The Fields Institute for Research in Mathematical Sciences, *Second Symposium on Machine Learning and Dynamical Systems*, 2020.
- Invited talk on “Random Matrix Advances in Large Dimensional Machine Learning”, Shanghai University of Finance and Economics, *Random Matrices and Complex Data Analysis Workshop*, Shanghai, 2019.
- Invited talk on “Random Matrix Viewpoint of Learning with Gradient Descent”, **DIMACS**, *Workshop on Randomized Numerical Linear Algebra, Statistics, and Optimization*, Rutgers University, 2019.
- Invited talk on “Recent Advances in Random Matrix Theory for Machine Learning and Neural Nets”, workshop of the **Matrix** series on “Random matrix theory faces information era”, Kraków, Poland, 2019.
- Invited talk on “Dynamical Aspects of Deep Learning” (with Y. Chitour), *Séminaire d’Automatique du plateau de Saclay of iCODE institute*, Paris, France, 2019.
- Invited talk on “Recent Advances in Random Matrix for Neural Networks”, *Workshop on deep learning theory*, Shanghai JiaoTong University, China, 2018.
- **Tutorial** on “Random Matrix Advances in Machine Learning and Neural Nets” (with R. Couillet and X. Mai), *The 26th European Signal Processing Conference (EUSIPCO’18)*, Roma, Italy, 2018.

Ph.D. thesis

Z. Liao, “A Random Matrix Framework for Large Dimensional Machine Learning and Neural Networks”, CentraleSupélec, University Paris-Saclay, September 2019.

Peer reviewing activities

- External reviewer of **Natural Sciences and Engineering Research Council of Canada (NSERC)**.
- Conferences: **NeurIPS**, **ICML**, **ICLR**, **AISTATS**, **AAAI**, **CAMSAP**.
- Journals: **Journal of Machine Learning Research (JMLR)**, **IEEE Trans. on Pattern Analysis and Machine Intelligence (IEEE-TPAMI)**, **IEEE Trans. on Signal Processing (IEEE-TSP)**, **Pattern Recognition (PR)**, **Random Matrices: Theory and Applications (RMTA)**, **NPL**, **PLOS ONE**.

References

- **Prof. Romain Couillet**
 - Full Professor at CentraleSupélec, University Paris-Saclay, Paris, France.
 - Holder of the UGA IDEX GSTATS DataScience Chair, University of Grenoble-Alpes, France.
 - ✉ romain.couillet@gipsa-lab.grenoble-inp.fr
- **Prof. Yacine Chitour**
 - Full Professor at Pairs-Sud, University Paris-Saclay, Paris, France.
 - Director of the iCODE institute, University Paris-Saclay, Paris, France.
 - ✉ yacine.chitour@l2s.centralesupelec.fr
- **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.
 - ✉ mmahoney@stat.berkeley.edu