

# Zhenyu Liao

## Curriculum Vitae

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🏠 <https://zhenyu-liao.github.io>  
✉ [zhenyu.liao@berkeley.edu](mailto: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

- 2021-now: **Research Associated Professor** at [School of Electronic Information and Communications, Huazhong University of Science & Technology](#).
- 2020-2021: **Postdoctoral Scholar** at [ICSI](#) and [Department of Statistics, University of California, Berkeley](#), hosted by Prof. [Michael Mahoney](#).

### Awards and prizes

- 2021: Recipient of East Lake Youth Talent Program Fellowship of Huazhong University of Science & Technology, Wuhan, China.
- 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 Suykens. Kernel Regression in High Dimension: Refined Analysis beyond Double Descent. In: *Proceedings of The 24th International Conference on Artificial Intelligence and Statistics (AISTATS)*. Vol. 130. Proceedings of Machine Learning Research. PMLR, 13–15 Apr 2021, pp.649–657.
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: *Advances in Neural Information Processing Systems (NeurIPS)*. Vol. 33. Curran Associates, Inc., 2020, pp.13939–13950.
4. Michal Dereziński, Feynman T Liang, **Zhenyu Liao**, and Michael W Mahoney. Precise expressions for random projections: Low-rank approximation and randomized Newton. In: *Advances in Neural Information Processing Systems (NeurIPS)*. Vol. 33. Curran Associates, Inc., 2020, pp.18272–18283.
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 “A Data-dependent Theory of Overparameterization: Phase Transition, Double Descent, and Beyond” at **Workshop on the Theory of Over-parameterized Machine Learning (TOPML) 2021**. April 20-21, 2021.
- Invited talk on “Performance-complexity Trade-off in Large Dimensional Spectral Clustering”, **Statistics Seminar**, Research School of Finance, Actuarial Studies and Statistics, Australian National University, Canberra, 2021.
- Invited talk on “Performance-complexity Trade-off in Large Dimensional Spectral Clustering”, HUAWEI First Mini-workshop on Random Matrix Theory and Machine Learning, Paris, 2021.
- 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.

## 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](mailto: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](mailto: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](mailto:mmahoney@stat.berkeley.edu)