HDP Participating Seminar – suggested papers

- Quantum entropy and Lieb's concavity theorem [Tro15, Chapter 8]. See also these lecture notes from course by James R. Lee (lecture 7).
- **(Jack and Sofia)** The spectrum of random inner-product kernel matrices [CS13, LY]
- Berry's Conjecture for random regular graphs (Bakhaus–Szegedy theorem) [BS19], see also [Ana22, Chapter 7] for a presentation better adapted for a seminar talk.
- (Suggested by Jianfeng) Plug-in estimation of Schrödinger bridges [PNW]
- Concentration for quadratic forms and applications [RV13], [Ver18, Chapter 6]
- Dvoretzky–Milman theorem [Ver18, Chapter 11]
- Restricted Isometry Property for sub-sampled Fourier matrices: [RV08, Bou14, HR17] (these build on each other)
- Braess's paradox for the spectral gap of random graphs [ERS17]
- CLTs for random tensors [Mik22]
- Small ball probabilities for high-dimensional distributions [RV15]
- Spectral stability from Gaussian noise (toward applications in numerical linear algebra) [BKMS19]
- Matrix Spencer conjecture: [BJM]; see also series of three posts by Meka at the Windows on Theory blog
- Introduction to some topics on determinantal point processes (could be focused on eigenvalues of random matrices, or more general spaces for data science applications)
- ...

References

[Ana22] Nalini Anantharaman. *Quantum ergodicity and delocalization of Schrödinger eigenfunctions*. Zurich Lectures in Advanced Mathematics. European Mathematical Society (EMS), Zürich, [2022] ©2022. doi:10.4171/zlam/27.

[BJM] Nikhil Bansal, Haotian Jiang, and Raghu Meka. Resolving matrix spencer conjecture up to poly-logarithmic rank. https://arxiv.org/abs/2208.11286.

[BKMS19] Jess Banks, Archit Kulkarni, Satyaki Mukherjee, and Nikhil Srivastava. Gaussian regularization of the pseudospectrum and davies' conjecture, 2019. arXiv:1906.11819.

[Bou14] Jean Bourgain. An improved estimate in the restricted isometry problem. In *Geometric aspects of functional analysis*, volume 2116 of *Lecture Notes in Math.*, pages 65–70. Springer, Cham, 2014. URL: https://doi.org/10.1007/978-3-319-09477-9_5, doi:10.1007/978-3-319-09477-9_5.

[BS19] Ágnes Backhausz and Balázs Szegedy. On the almost eigenvectors of random regular graphs. *Ann. Probab.*, 47(3):1677–1725, 2019. doi:10.1214/18-AOP1294.

[CS13] Xiuyuan Cheng and Amit Singer. The spectrum of random inner-product kernel matrices. *Random Matrices Theory Appl.*, 2(4):1350010, 47, 2013. doi:10.1142/S201032631350010X.

[ERS17] Ronen Eldan, Miklós Z. Rácz, and Tselil Schramm. Braess's paradox for the spectral gap in random graphs and delocalization of eigenvectors. *Random Structures Algorithms*, 50(4):584–611, 2017. doi:10.1002/rsa.20696.

[HR17] Ishay Haviv and Oded Regev. The restricted isometry property of subsampled Fourier matrices. In *Geometric aspects of functional analysis*, volume 2169 of *Lecture Notes in Math.*, pages 163–179. Springer, Cham, 2017.

[LY] Yue M. Lu and Horng-Tzer Yau. An equivalence principle for the spectrum of random inner-product kernel matrices with polynomial scalings. arXiv:2205.06308. URL: https://arxiv.org/pdf/2205.06308.pdf, arXiv:2205.06308.

[Mik22] Dan Mikulincer. A CLT in Stein's distance for generalized Wishart matrices and higher-order tensors. *Int. Math. Res. Not. IMRN*, (10):7839–7872, 2022. doi:10.1093/imrn/rnaa336.

[PNW] Aram-Alexandre Pooladian and Jonathan Niles-Weed. Plug-in estimation of schrödinger bridges. Preprint, arXiv:2408.11686.

[RV08] Mark Rudelson and Roman Vershynin. On sparse reconstruction from Fourier and Gaussian measurements. *Comm. Pure Appl. Math.*, 61(8):1025–1045, 2008. doi:10.1002/cpa.20227.

[RV13] Mark Rudelson and Roman Vershynin. Hanson-Wright inequality and sub-Gaussian concentration. *Electron. Commun. Probab.*, 18:no. 82, 9, 2013. doi:10.1214/ECP.v18-2865.

[RV15] Mark Rudelson and Roman Vershynin. Small ball probabilities for linear images of high-dimensional distributions. *Int. Math. Res. Not. IMRN*, (19):9594–9617, 2015. doi:10.1093/imrn/rnu243.

[Tro15] Joel A. Tropp. An introduction to matrix concentration inequalities. *Foundations and Trends® in Machine Learning*, 8(1-2):1–230, 2015. URL: http://dx.doi.org/10.1561/2200000048, doi:10.1561/2200000048.

[Ver18] Roman Vershynin. *High-dimensional probability*, volume 47 of *Cambridge Series in Statistical and Probabilistic Mathematics*. Cambridge University Press, Cambridge, 2018. An introduction with applications in data science, With a foreword by Sara van de Geer. doi:10.1017/9781108231596.