

List of proposed papers for term presentations for the Course PHYS-645 - “Physics of random and disordered systems”

1. KPZ: Directed polymer on the tree

Polymers on Disordered Trees, Spin Glasses, and Traveling Waves

B. Derrida, H. Spohn

Journal of Statistical Physics, Vol. 51, Nos. 5/6, 1988

<http://www.lps.ens.fr/~derrida/PAPIERS/1988/spohn88.pdf>

Relation with cavity method, and Anderson localisation

2. KPZ: ASEP with disorder

Disordered asymmetric simple exclusion process: mean-field treatment

R. J. Harris and R. B. Stinchcombe, Phys. Rev. E 70, 016108 (2004)

<https://journals.aps.org/pre/abstract/10.1103/PhysRevE.70.016108>

Effect of disorder, relation to glassy properties / localisation?

3. Dynamics in glasses

Spin-glass theory for pedestrians

Tommaso Castellani and Andrea Cavagna, J. Stat. Mech. (2005) P05012

Part on dynamics, freezing.

4. Cavity method and its application to optimization problems

Survey propagation an algorithm for satisfiability

A Braunstein, M Mezard, R Zecchina, <https://arxiv.org/pdf/cs/0212002.pdf>

5. Neural networks

Learning algorithms with optimal stability in neural networks

W Krauth and M Mezard 1987 J. Phys. A: Math. Gen. **20** L745

Optimal storage properties of neural network models,

E Gardner, B. Derrida, Journal of Physics A 1988, 21 (1), pp.271-284.

6. Random paths, localization, locator expansion

Magnetoresistance and localization in bosonic insulators, M. Müller, EPL 102 67008, 2013

<https://iopscience.iop.org/article/10.1209/0295-5075/102/67008>

and

Magnetoresistance of an Anderson Insulator of Bosons

A. Gangopadhyay, V. Galitski, M. Müller, Phys. Rev. Lett. 111, 026801 (2013)

<https://journals.aps.org/prl/pdf/10.1103/PhysRevLett.111.026801>

see also M. Kardar's text book,

and S. V. Syzranov, A. Moor, and K. B. Efetov, Phys. Rev. Lett. 108, 256601

<https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.108.256601>

7. Glasses and localization

Les Houches Lectures 1978 Session XXXI , III-condensed matter, Eds. Balian, Maynard, Toulouse; Article by P.W. Anderson "Lectures on amorphous systems"

Glasses and localisation – *Present the thoughts and link them to the modern understanding of topics*

<https://www.worldscientific.com/worldscibooks/10.1142/0031#t=toc>

8. Localization on the Bethe lattice

A selfconsistent theory of localization

R Abou Chakra, D. Thouless, PW Anderson

Self-consistent theory of localization. II. Localization near the band edges

R Abou-Chakra and D J Thouless 1974 J. Phys. C: Solid State Phys. 7 65

<https://iopscience.iop.org/article/10.1088/0022-3719/7/1/015/pdf>

Delocalization and ergodicity on Bethe lattices,

G. Biroli and M Tarzia, <https://arxiv.org/abs/1810.07545>

9. Integrals of motion in many body localization

Integrals of motion in the many-body localized phase,

V. Ros, M. Müller, A. Scardicchio, Nuclear Physics B 891 (2015), 420–465

<https://doi.org/10.1016/j.nuclphysb.2014.12.014>

Construction of integrals of motion, approximate relation to Cayley tree, phase diagram of MBL

10. Supersymmetry approach to disordered systems: Bethe lattice, Anderson transition as symmetry breaking

Localization transition in the Anderson model on the Bethe lattice: spontaneous symmetry breaking and correlation functions

A. D. Mirlin and Y. V. Fyodorov, Nuclear Physics B366 (1991) 507—532

<https://www.sciencedirect.com/science/article/pii/055032139190028V>

11. Random matrices

Universality of level correlation function of sparse random matrices

A D Mirlin and Y V Fyodorov 1991, J. Phys. A: Math. Gen. 24 2273

<https://iopscience.iop.org/article/10.1088/0305-4470/24/10/016/pdf>

12. Random matrices: large eigenvalues // modes of spin glasses

2 papers out of these:

On the top eigenvalue of heavy-tailed random matrices, G. Biroli, J.-P. Bouchaud and M. Potters EPL, 78 (2007) 10001

On the eigenvalue spectrum of the susceptibility matrix for random spin systems, A J Bray and M A Moore, J. Phys. C: Solid State Phys., **15** L765-L771 (1982).

Evidence for massless modes in the 'solvable model' of a spin glass, A J Bray and M A Moore, J. Phys. C: Solid State Phys. 12 L441 (1979).

Other topics are possible. If you would like a paper in a specific direction don't hesitate to ask me for suggestions.