Seminar Statistical Physics

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Summer term 2016

Preliminaries

This the preliminary plan of the seminar. Each talk shall be hold by one or two students. The total time of a talk is 90 minutes, but we need time for questions, discussions, etc.. Therefore, please prepare the talk for 60 minutes or less.

For each talk, a tutor will be available, see below.

You may use the black board, slides, etc., whatever means of presentation may be suitable. Please prepare a summary of your talk, one to three pages, for the other participants, where you mention as well the literature you used.

Please provide, if possible, the mathematical background of your talk. Often in statistical physics proofs for certain statements are known. You should present the theorem and its preconditions. You may sketch the proof if this is important and understandable for the participants.

The topics are in most cases too large for a 60 minutes talk, therefore feel free to specialise to a certain subtopic you are interested in. Its your talk, therefore you are setting the focus. The literature given below is always too much for a 60 minutes talk. It is intended to give you a broad background. Please make your choice. You may as well take different literature.

Talks, topics, dates

19.4.2015 Preliminary discussion and introduction

3.5.2015 Ising model and renormalisation. Florian Franz. Tutor: Sebastian Schenk

- John Cardy, Scaling and Renormalization in Statistical Physics. Cambridge Lecture Notes in Physics, Vol 5.

10.5.2015 Potts model, Percolation, Polymers on lattices. Tobias Jäger. Tutor: Weijie Fu

- F. Y. Wu, Rev. Mod. Phys. **54**, 235 (1982)
- B. Bolobas, O. Riordan, Percolation. Cambridge University Press 2006
- D. Staufer, A. Aharony, Introduction to Percolation Theory. Taylor & Francis 1991 (2nd. Edition)
- J. B. Kogut Rev. Mod. Phys. **51**, 659

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17.5.2015 no talk

24.5.2015 Mermin-Wagner-Theoren, Kosterlitz Thouless Transition, AM?

- N.D. Mermin and H. Wagner, Phys. Rev. Lett. **17**, 1133 (1966)
- D. K. Ghosh, Phys. Rev. Lett. **27**, 1584 (1971)
- T. Koma and H. Tasaki, Phys. Rev. Lett. **68**, 3248 (1992)

31.5.2015 Statistical field theory for classical particles. Sören Nolting. Tutor: Matteo Martinelli

- http://arxiv.org/pdf/1411.0806v2.pdf and the references to papers of Das and Das & Mazenko therein.

7.6.2015 Hubbard model. Marc Merstorf. Tutor: Weijie Fu

- Many-Body Physics: From Kondo to Hubbard, http://www.cond-mat.de/events/correl15/manuscripts/correl15.pdf, esp the article The Hubbard Model and its Properties by Andreas Mielke.

14.6.2015 Bose-Einstein condensation. Lilo Höcker. Tutor: Weijie Fu

- E. A. Cornell and C. E. Wieman, Rev. Mod. Phys. **74**, 875 (2002)
- http://www.nobelprize.org/nobel_prizes/physics/laureates/2001/index.html

21.6.2015 Anderson localisation. Norbert König, Kai-Niklas Schymik. Tutor: Matteo Martinelli

- P. A. Lee and T. V. Ramakrishnan, Rev. Mod. Phys. **57**, 287 (1985)
- F. Evers and A. D. Mirlin Rev. Mod. Phys. **80**, 1355 (2008)
- http://www.nobelprize.org/nobel_prizes/physics/laureates/1977/

28.6.2015 Monte-Carlo method. Benjamin Schreiner. Tutor: Matteo Martinelli

- D. P. Landau, K. Binder, A Guide to Monte Carlo Simulations in Statistical Physics 2013 (3rd Edition)

5.7.2015 Stochastic systems, esp. in Biology. Johannes Lumma. Tutor: Sebastian Schenk

- D. J. Wilkinson, Stochastic modelling for systems biology. Chapman & Hall 2011.
- N. S. Goel,N. Richter-Dyn, Stochastic models in biology. Academic Press 1974.
- L. Gammaitoni, P. Hänggi, P. Jung, F. Marchesoni, Rev. Mod. Phys. **70**, 223-287 (1998)

12.7.2015 Self organisation, pattern formation. David Stöckel . Tutor: Sebastian Schenk

- D. Walgraef, Spatio-Temporal Pattern Formation, Springer-Verlag Berlin, Heidelberg, New York 1996.
- H. Haken, Synergetics. Springer-Verlag Berlin, Heidelberg, New York 1978 (good introduction, but not deep enough)

19.7.2015 Physics of Self-Propelled Particles. Manuel Pietsch. Tutor: Sebastian Schenk

- H. Levine, W.-J. Rappel, and I. Cohen, Phys. Rev. E **63**, 017101 (2000)
- E. Bertin, M. Droz, and G. Grégoire, Phys. Rev. E **74**, 022101 (2006)
- A. Czirók and T. Vicsek, Physica A **281**, 17 (2000)

26.7.2015 Final discussion

Tutors:

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