



Mathematisches Forschungsinstitut Oberwolfach

Oberwolfach Seminar

Recent Methods for Sphere Packing

Date/D:

8 June - 14 June 2014 (1424b)

Organizers:

Christine Bachoc, Bordeaux
Henry Cohn, Cambridge MA
Frank Vallentin, Köln

Programme:

In recent years, semidefinite relaxations have become increasingly important in discrete geometry, coding theory, and related geometric optimization problems. In the form of linear and semidefinite programming bounds, they encompass the best asymptotic bounds known for many of these problems, as well as the exact solution of a number of cases of special interest.

In this seminar, we will explore their implications for the classical sphere packing problem: how densely can congruent balls be placed into Euclidean space without overlap? Furthermore, we will examine a number of related topics, such as error-correcting codes, more general packing problems, independence and chromatic numbers of graphs, ground states of physical systems, etc.

What ties all these problems together is nontrivial semidefinite constraints on correlation functions, and we will examine how to make use of these constraints.

Preparatory reading:

No specific background is required, but it could be useful to take a look at the following papers to get a feeling for the area:

Christine Bachoc, Dion C. Gijswijt, Alexander Schrijver, and Frank Vallentin, *Invariant semidefinite programs*, <http://arxiv.org/abs/1007.2905>

Henry Cohn, *Order and disorder in energy minimization*, <http://arxiv.org/abs/1003.3053>

Henry Cohn and Abhinav Kumar, *Universally optimal distribution of points on spheres*, <http://arxiv.org/abs/math/0607446>

Monique Laurent, *A comparison of the Sherali-Adams, Lovász-Schrijver and Lasserre relaxations for 0-1 programming*, *Mathematics of Operations Research*, 28(3):470-496, 2003.

Monique Laurent and Frank Vallentin, *Semidefinite optimization: Applications in combinatorics, geometry and algebra*, <https://sites.google.com/site/nichtlinopt/material>

Deadline for applications:

1 April 2014

The Oberwolfach Seminars are organized by leading experts in the field, and address postdocs and Ph.D. students from all over the world. The aim is to introduce the participants to a particular interesting development. The seminars take place at the Mathematisches Forschungsinstitut Oberwolfach. The Institute covers accommodation and food. By the support of the Carl Friedrich von Siemens Foundation, travel expenses can be reimbursed up to 150 EUR in average per person. Participants can ask for travel support during their stay in Oberwolfach at the guest office against copy of travel receipts. The number of participants of a seminar is restricted to 25.

Applications including:

- full name and address, including e-mail address
- short CV, present position, university
- name of supervisor of Ph.D. thesis
- a short summary of previous work and interest
- title, ID and date of the intended seminar

should be sent preferably by e-mail (pdf files) to:

Prof. Dr. Dietmar Kröner

Vice Director MFO

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