

Spectral Graph Theory and Applications

Time and Location: Wednesday 2:00PM – 4:00PM, Room 024, MPI building, Campus E1. 4

Lecturers: Dr. Thomas Sauerwald and Dr. He Sun

Credits: 5 ECTS points

Course Description: Over the past decades spectra of graphs have become an important tool in studying the properties of graphs and played manifold roles in designing approximation algorithms, constructing expander graphs and other pseudorandom objects.

This course is to review the highlights of this fascinating area in the past decades. We will discuss the spectra of graphs and their connections to various combinatorial properties of graphs. Moreover, we will show several applications of graph spectrum in designing randomized algorithm. In particular, we will study the construction of expander graphs and related pseudorandom objects.

Topics:

1. Introduction
2. Algebraic techniques in graph theory
3. Spectra of graphs and its combinatorial properties
4. Randomized algorithms and Markov chains
5. Construction of expander graphs
6. Pseudorandomness

Grading:

1. Homework 60% (3 problem sets), Final exam 40% (oral exam)
2. You need to collect at least 40% of the homework points to be eligible to take the final exam.

Prerequisites: Basic knowledge of linear algebra and probability theory

Web page. <http://www.mpi-inf.mpg.de/departments/d1/teaching/ws11/SGT/index.html>