Doctorate School **PLUS**

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PARIS
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UNIVERSITÄT
SALZBURG

MARS

Models, Algorithms, Computers and Systems

Series of Talks

SS 2023

A cooperation with SMC

Department of Mathematics
Department of Computer Science

Paris Lodron University Salzburg

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PARIS **L**ODRON **U**NIVERSITÄT **S**ALZBURG   Mathematics

PARIS **L**ODRON **U**NIVERSITÄT **S**ALZBURG   Computer Science

MARS – Models, Algorithms, Computers, and Systems

Modern high tech research in science and technology requires to a great extent an interdisciplinary approach. This applies particularly to wide areas of the methodological sciences mathematics and computer science, where generally one or more aspects of a chain of consecutive closely interlocked fields of research are considered. These start with a mathematical model, continue with algorithmic problems and finally cover aspects of the implementation on computers or high performance computing environments and therefore also issues on the efficiency of computer systems.

MARS is a doctoral programme at the Doctorate School PLUS (DSP Programme), which is organized by the departments of mathematics and computer sciences of the Paris Lodron University Salzburg. Its objective is to educate doctoral students in the research fields models, algorithms, computers, and systems and also to achieve new insights and research findings especially with regard to the inter-dependency of these fields of research. The focus will be on important topics relevant for the Salzburg research site. MARS fields of research form particularly from a methodological point a cohesive and closely linked line of research and cover a wide spectrum of scientific interests.

Joint activities constitute the structured doctoral program in MARS. These include seminars with external guest speakers, one day workshops with external guests and multi day retreats away from the university, as well as summer schools on the topics of MARS.

Programm

Thursday, 15:00-15:45
Lecture room 414, 1st floor

Discrete optimization through semidefinite programming.
Angelika Wiegele (Alpen-Adria-Universität Klagenfurt und Universität zu Köln),
May 4, 2023

Semidefinite Programming (SDP) is an extension of Linear Programming (LP). A matrix-variable is optimized over the intersection of the cone of positive semidefinite matrices with an affine space. It turns out that SDP can provide significantly stronger practical results than LP and that it can be applied in a lot of different areas, like combinatorial optimization, control theory, engineering, or polynomial optimization.
In this talk we will show how to apply SDP to efficiently approximate NP-hard discrete optimization problems, like graph partitioning or minimum sum-of-squares clustering. Linked to the question of modeling a problem using semidefinite programming is the question of solving the resulting SDP. Standard methods like interior point algorithms are not applicable already to medium-sized problems due to the number of constraints or the size of the matrix. We will present alternative methods in order to obtain approximate solutions to the SDP in reasonable time and using affordable memory requirements.

Coming…

Optimization in discrete geometry
Frank Vallentin (Köln)
May 25, 2023

Singularity formation for the three-dimensional Keller-Segel model
Birgit Schörkhuber (Innsbruck)
June 29, 2023