

## Talks on Algorithms, Optimization and Complexity

» 27 May 2025 - Room B1.06 «



- » **Speaker:** **Klaus Jansen** is a professor in the Department of Computer Science at the Christian-Albrechts-Universität zu Kiel (Kiel University) in Germany, where he leads the Algorithms and Complexity research group. His primary research focuses on the design and analysis of approximation algorithms for combinatorial optimization problems, including scheduling, packing (1D, 2D, and 3D), integer programming, and graph-theoretical challenges. He also investigates the inapproximability of these problems, contributing to the theoretical understanding of their computational complexity.

## Algorithms for Monotone Moldable Parallel Job Scheduling

09:00

- » Klaus Jansen

A moldable job is a job that can be executed on an arbitrary number of processors, and whose processing time depends on the number of processors allotted to it. A moldable job is monotone if its work does not decrease for an increasing number of allotted processors. We consider the problem of scheduling monotone moldable jobs to minimize the makespan. We argue that for certain compact input encodings a polynomial algorithm has a running time polynomial in  $n$  and  $\log m$ , where  $n$  is the number of jobs and  $m$  is the number of machines. We describe how monotony of jobs can be used to counteract the increased problem complexity that arises from compact encodings, and give tight bounds on the approximability of the problem with compact encoding: it is NP-hard to solve optimally, but admits a PTAS. The main focus of this work are efficient approximation algorithms. We describe different techniques to exploit the monotony of the jobs for better running times, and present a  $(3/2 + \epsilon)$ -approximate algorithm whose running time is polynomial in  $\log m$  and  $1/\epsilon$  and only linear in the number  $n$  of jobs.

## Break

10:00 AM

- » Informal questions

## Session 1

10:20 AM

- » On the Degree Automatability of Sum-of-Squares Proofs, **Alex Bortolotti**
- » Computational Complexity of SOS Bounds for Copositive Programs, **Marilena Palomba**
- » Branch-and-Bound Algorithms as Polynomial-time Approximation Schemes, **Koppány István Encz**
- » The problem of falsifying heuristics, **Stefano Huber**

## Break

11:40 AM

- » Informal questions

## Session 2

12:00 AM

- » Symmetric TSP: The Integrality Gap on Instances with a Small Number of Edges, **Tullio Villa**
- » Novel Properties of Hierarchical Probabilistic Partition and their Algorithmic Application, **Sandip Banerjee**
- » Logarithmic Approximation for Directed Steiner Tree on Planar Graphs, **Ramin Mousavi**

SEMINAR

SHORT TALKS