CMM
Center for Mathematical Modeling

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Beauchef 851, Edificio Norte, piso 7
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AGCO Seminar.

15:00 hrs.

Speakers: Luis Rademacher

***Title*:** Expansion of random 0/1 polytopes and the Mihail and Vazirani conjecture.

Abstract:

A 0/1 polytope is the convex hull of a set of 0/1 d-dimensional vectors. A conjecture of Milena Mihail and Umesh Vazirani says that the graph of vertices and edges of every 0/1 polytope is highly connected. Specifically, it states that the edge expansion of the graph of every 0/1 polytope is at least one. Any lower bound on the edge expansion gives an upper bound for the mixing time of a random walk on the graph of the polytope. Such random walks are important because they can be used to generate an element from a set of combinatorial objects uniformly at random. A weaker form of the conjecture of Mihail and Vazirani says that the edge expansion of the graph of a 0/1 polytope in R^d is greater than 1 over some polynomial function of d. This weaker version of the conjecture would suffice for all applications. Our main result is that the edge expansion of the graph of a random 0/1 polytope in R^d is at least 1/12d with high probability. This is joint work with Brett Leroux.

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AGCO Seminar.

16:00 Hrs

Speakers: Max Klimm, TU Berlin

Title**:** Generalized Assignment and Knapsack Problems in the Random-Order Model

Abstract:

We study different online optimization problems in the random-order model.
There is a finite set of bins with known capacity and a finite set of items arriving in a random order.

Upon arrival of an item, its size and its value for each of the bins is revealed and it has to be decided immediately and irrevocably to which bin the item is assigned, or to not assign the item at all. In this setting, an algorithm is α-competitive if the total value of all items assigned to the bins is at least an α-fraction of the total value of an optimal assignment that knows all items beforehand. We give an algorithm that is α-competitive with $\alpha = (1-\ln(2))/2 \approx 1/6.52$ improving upon the previous best algorithm with $\alpha \approx 1/6.99$ for the generalized assignment problem and the previous best algorithm with $\alpha \approx 1/6.65$ for the integral knapsack problem.

We then study the fractional knapsack problem where we have a single bin and it is also allowed to pack items fractionally. For that case, we obtain an algorithm that is α-competitive with $\alpha = 1/e \approx 1/2.71$ improving on the previous best algorithm with $\alpha = 1/4.39$. We further show that this competitive ratio is the best-possible for this model. (Joint work with Martin Knaack)

Where**:** Sala de Seminario von Neuman, 7th floor, CMM, Av. Beauchef 851, Torre Norte.