CD04

Mathematical Optimization

Optimización Matemática

Organizers **Organizadores** **Antolatzaileak**

Alberto Torrejón Valenzuela
(Universidad de Sevilla)

Paula Terán Viadero
(Universidad Complutense de Madrid)

Concepción Domínguez Sánchez
(Universidad de Murcia)

Description **Descripción** **Deskribapena**

The phrase "you can always be better" has a limit: finding the global optimum. One cannot be "more optimal" than optimal. Mathematical optimization aims to achieve this in various decision-making areas. It improves decision-making by providing optimal solutions to complex problems, maximizing resources, and minimizing costs for greater efficiency. Optimization algorithms tackle difficult problems by efficiently exploring large solution spaces using techniques like dimensionality reduction or problem decomposition. When exact optimal solutions are unfeasible, heuristics provide good approximations. This session will present papers on optimization techniques, showcasing researchers' progress and contributions.

La frase “siempre se puede ser mejor” tiene un claro límite dibujado en su horizonte, encontrar el óptimo global. No se puede ser mejor que el óptimo. La optimización matemática busca este objetivo en diversos ámbitos de toma de decisiones, mejorando la eficiencia y ahorrando recursos al proporcionar soluciones óptimas a problemas complejos. Los algoritmos de optimización exploran eficientemente grandes espacios de soluciones, utilizando técnicas como la reducción de dimensionalidad o descomposición del problema. Cuando las instancias son demasiado grandes para soluciones exactas, se emplean heurísticas para aproximaciones. En esta sesión, se presentarán trabajos sobre técnicas de optimización y sus avances.

MSC Codes **Códigos MSC** **MSC Kodeak**

90Bxx

(primary)

Slots **Bloques** **Blokeak**

1.C (Aula 0.17); 2.A (Aula 0.17)

QR Code **Código QR** **QR Kodea**

Session Schedule **Horario de la Sesión** **Saioaren Ordutegia**

M14 | 17:30-17:50 | 0.17
Optimisation approaches for solving the two-dimensional cutting stock problem with variable-sized stock
Paula Terán Viadero (Complutense University of Madrid)

M14 | 18:00-18:20 | 0.17
Exact methods for solving the premarshalling problem with limited crane time assumption
Consuelo Parreño-Torres (Department of Statistics and Operations Research, University of Valencia, Spain)

M14 | 18:30-18:50 | 0.17
Advances in ordered optimization methods
Alberto Torrejón (Universidad de Sevilla)

J16 | 11:00-11:20 | 0.17
Tightening branch-and-bound schemes with conic constraints
Brais González Rodríguez (Universidad de Vigo)

J16 | 11:30-11:50 | 0.17
A New Linkage in Hierarchical Clustering
Lorena Nácher (Universidad Miguel Hernández de Elche)

J16 | 12:00-12:20 | 0.17
Forward-backward algorithms devised by graphs
César López-Pastor (Universidad de Alicante)

J16 | 12:30-12:50 | 0.17
Weakly stable solutions for the Capacitated Facility Location problem with Customer Preferences
Concepción Domínguez (Universidad de Murcia)

Tuesday 14	**Martes 14**	**Asteartea 14**
17:30-17:50	**17:30-17:50**	**17:30-17:50**
[Room 0.17]	**[Aula 0.17]**	**[Gela 0.17]**

Optimisation approaches for solving the two-dimensional cutting stock problem with variable-sized stock

Paula Terán Viadero
(Complutense University of Madrid)

The two-dimensional cutting stock problem (2D-CSP) involves cutting large rectangular pieces into smaller ones, minimizing waste. Complexity increases when the stock dimensions are not known in advance. We present and compare exact algorithms and metaheuristics for solving 2D-CSP with variable sized stock (2D-VSCSP), highlighting trade-offs between accuracy and computational cost, and suggesting strategies to choose the best approach based on industry-specific needs.

Joint work with Antonio Alonso Ayuso and F. Javier Martín Campo.

Tuesday 14	**Martes 14**	**Asteartea 14**
18:00-18:20	**18:00-18:20**	**18:00-18:20**
[Room 0.17]	**[Aula 0.17]**	**[Gela 0.17]**

Exact methods for solving the premarshalling problem with limited crane time assumption

Consuelo Parreño-Torres
(Department of Statistics and Operations Research, University of Valencia, Spain)

The premarshalling problem involves reorganizing a container yard during low workload periods to prepare for efficient ship loading and unloading. Traditionally, unlimited crane time is assumed to retrieve all containers in order. This work considers limited crane time, aiming to maximize accessible containers. A novel lower bound on crane time is proposed, along with heuristic algorithms within a branching framework. Computational experiments show that this approach outperforms existing methods.

Joint work with Juan Romero del Hombrebueno Martínez.

Tuesday 14	**Martes 14**	**Asteartea 14**
18:30-18:50	**18:30-18:50**	**18:30-18:50**
[Room 0.17]	**[Aula 0.17]**	**[Gela 0.17]**

Advances in ordered optimization methods

Alberto Torrejón
(Universidad de Sevilla)

Ordered optimization generalizes many known problems using the lambda vector, which multiplies ordered costs in the objective function. This talk covers recent advances in applying this method to discrete facility location problems. With an appropriate lambda vector, various models like median, center, centdian, and even obnoxious location or fairness problems can be addressed. The presentation includes mathematical formalization, applications, and computational results to support the findings.

Joint work with Ivana Ljubic, Miguel A. Pozo, and Justo Puerto.

Thursday 16	**Jueves 16**	**Osteguna 16**
11:00-11:20	**11:00-11:20**	**11:00-11:20**
[Room 0.17]	**[Aula 0.17]**	**[Gela 0.17]**

Tightening branch-and-bound schemes with conic constraints

Brais González Rodríguez
(Universidad de Vigo)

This talk explores the use of conic constraints to tighten the relaxations of spatial branch-and-bound algorithms for solving nonconvex polynomial optimization problems. We integrate linear SDP-cuts, SOCP, and SDP constraints into an RLT-based algorithm and present a computational study. The results show that these new relaxations outperform standard RLT in about 50% of cases. Additionally, we discuss the use of machine learning to select the best constraints for a given instance.

Joint work with Raúl Alvite Pazó, Samuel Alvite Pazó, Bissan Ghaddar, and Julio González Díaz.

Thursday 16
11:30-11:50
[Room 0.17]

Jueves 16
11:30-11:50
[Aula 0.17]

Osteguna 16
11:30-11:50
[Gela 0.17]

A New Linkage in Hierarchical Clustering

Lorena Nácher
(Universidad Miguel Hernández de Elche)

This work introduces a new linkage for hierarchical clustering, aimed at improving how distances are represented in dendrograms. The objective is to align the dendrogram distances with the original data distances. To achieve this, an optimization model is formulated to adjust the linkage, maximizing similarity between original and represented distances, with a focus on solving large problems efficiently. This new linkage also has potential applications in minimum spanning trees.

Joint work with Mercedes Landete, Marina Leal and Hande Yaman.

Thursday 16
12:00-12:20
[Room 0.17]

Jueves 16
12:00-12:20
[Aula 0.17]

Osteguna 16
12:00-12:20
[Gela 0.17]

Forward-backward algorithms devised by graphs

César López-Pastor
(Universidad de Alicante)

This work introduces a methodology for developing forward-backward methods to minimize the sum of convex functions, extending recent techniques to smooth functions evaluated via gradients rather than proximal mappings. The algorithms are guided by three graphs that dictate variable interactions and iteration computation, ensuring minimal lifting and frugality. Each proximal mapping and gradient is evaluated only once per iteration. The framework recovers known methods and generates new ones.

Joint work with Francisco J. Aragón-Artacho and Rubén Campoy.

Thursday 16	**Jueves 16**	**Osteguna 16**
12:30-12:50	**12:30-12:50**	**12:30-12:50**
[Room 0.17]	**[Aula 0.17]**	**[Gela 0.17]**

Weakly stable solutions for the Capacitated Facility Location problem with Customer Preferences

Concepción Domínguez
(Universidad de Murcia)

The Capacitated Facility Location problem with Customer Preferences (CFLCP) seeks to open facilities and assign customers while minimizing total location and allocation costs. Facilities have limited capacity, and customers rank preferences. To avoid unfair allocations and envious customers preferring full facilities, three stability-based criteria are proposed. Two new formulations generate weakly stable allocations, with computational results showing model efficiency and stable solutions.