

# 21st ESICUP Meeting

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**LECTRA**

université  
de **BORDEAUX**

*Jonas Tollenaere; Toni Martinez Sykora; Tony Wauters;*

4.2 – Exploiting GPU capabilities for voxel-based approaches to the 3D Irregular Strip Packing Problem

*Alessio La Greca; Jonas Tollenaere; Tony Wauters;*

4.3 – A Sequential Positioning Method for Three-Dimensional Irregular Items with Dynamic Collision Constraints

*António, G. Ramos; Pedro, Rocha; Elsa, Silva; Fillipe, Ribeiro*

4.4 – Online 3D Irregular Packing: A Case Study in Cork Industry

*Pedro Rocha; António G. Ramos; Fillipe Ribeiro; Manuel Lopes*

## Friday

9:00 – 10:00

### Keynote 2

*Chair: François Clautiaux*

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– Solving Bin packing problem with Constraint Programming

*Jean-Charles Régin*

10:00 – 11:00

### Session 5

*Chair: Jean-François Côté*

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5.1 – An Efficient Solver for Integral Flows in Directed Hypergraphs with Applications to Cutting Problems

*Arthur Leonard; Francois Clautiaux*

5.2 – Arc-flow models for the Cutting Stock Problem with Usable Leftovers

*François Clautiaux; Quentin Monnereau*

5.3 – An Exact Algorithm for Small Orthogonal Packing Problems

*Jean-François Côté*

11:20 – 12:40

### Session 6

*Chair: Célia Paquay*

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6.1 – The pallet packing problem with realistic constraints: integer linear programming models and matheuristics

*Giménez-Palacios Iván; Álvarez-Valdés Ramón; Alonso Martínez María Teresa; Parreño Torres Francisco*

6.2 – Container Loading Optimization in a real-world industrial Environment

*Ângelo Soares; António G. Ramos; Elsa Silva; Ilídio Cardoso*

6.3 – Multi-Objective Optimization of Stack-Based Pallet Loading for Warehouse Automation

*João Araújo; Ângelo Soares; António G. Ramos; José F. Oliveira; Elsa, Silva; António Fernandes*

6.4 – A two-phase heuristic for the three-dimensional loading vehicle routing problem with split pickup and time windows under real-time disruptions

*Emeline Leloup; José Fernando Oliveira; Célia Paquay; Thierry Pironet*

14:00 – 14:40

### Session 7

*Chair: José Fernando Oliveira*

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7.1 – Solving location-allocation problem for mobile medical facilities using predictive analytics

*Sergiy Yakovlev; Kirpich Alexander; Lyudmyla Kirichenko; Olha Matsyi; Tetyana Chumchenko*

7.2 – Optimizing Facade Manufacturing and Packing: A Pull System Approach

*José Fernando Oliveira; Maria Antónia Carravilla; Elsa Silva; Tiago Silveira; Fernando Sousa; Rui Guerreiro*

14:40 – 15:00

### Closing Session

*Tony Wauters*

*QuantOM, HEC - Management School of the University of Liege, Belgium; INESC TEC, Faculty of Engineering, University of Porto, Portugal; QuantOM, HEC - Management School of the University of Liege, Belgium; QuantOM, HEC - Management School of the University of Liege, Belgium*

This work studies a three-dimensional loading vehicle routing problem with split pickup and time windows. Throughout the day, real-time changes, called disruptions, occur, such as the arrival of a new customer, the addition of boxes to a planned customer request and the cancelation of a customer. The logistics service provider (LSP) has to react by adapting the loading, route and customer scheduling. By focusing on pickup operations, even if the products are customer-specific, the recourse actions differ from those in delivery operations. This is because the vehicle is initially empty and progressively filled up.

We present a two-phase heuristic that will help the LSP to adapt his ongoing routes while minimizing the total travel distance and visiting the highest number of customers.

**Keywords:** loading; routing; real-time disruptions

Session 7-1

### **Solving location-allocation problem for mobile medical facilities using predictive analytics**

*Sergiy Yakovlev Kirpich Alexander Lyudmyla Kirichenko Olha Matsyi Tetyana Chumchenko Lodz University of Technology, Lodz, Poland; Georgia State University, Atlanta, GA, USA; Lodz University of Technology, Lodz, Poland; V.N. Karazin Kharkiv National University, Kharkiv, Ukraine; Kharkiv National Medical University, Kharkiv, Ukraine*

The paper focuses on the problem of mobile medical unit deployment in crisis situations such as infectious disease outbreaks or armed conflicts. This problem involves several interrelated aspects, including predictive modeling to forecast disease spread, accounting for restricted access zones due to natural, logistical, or security constraints, and managing resource limitations, such as medical personnel, equipment, and medications. The primary objective is to develop an optimal strategy for positioning mobile medical facilities that maximizes population coverage while considering location constraints and ensuring the efficient allocation of limited resources. Given the dynamic nature of service zones, their boundaries may shift in response to resource availability, while geospatial analytics is used to model and account for location-based restrictions. We formulate this problem as a maximum coverage location problem, where a demand zone is to be optimally served by a set of mobile medical facilities. The goal is to determine their optimal placement while adhering to spatial constraints. Service areas are represented as circles of varying radii, corresponding to the volume of medical services that can be provided. This paper presents a mathematical model of the problem and discusses its key features. To address the challenge, we propose an optimization approach based on gradient methods for local search, allowing for the dynamic redistribution of both service locations and the volume of medical services provided. The repositioning of service areas is guided by predictive models of disease spread while also considering potential changes in restricted zones that limit facility placement. The proposed approach is illustrated through a case study of a specific region. The study was partially supported by the IMPRESS-U program, an international collaboration between the United States, Poland, and Ukraine (NSF grant OISE-2412914; NCN grant 2023/05/Y/ST6/00263).

**Keywords:** location-allocation problem; maximum coverage location problem; mathematical modeling; predictive analytics; optimization

Session 7-2

### **Optimizing Facade Manufacturing and Packing: A Pull System Approach**

*José Fernando Oliveira; Maria Antónia Carravilla; Elsa Silva; Tiago Silveira; Fernando Sousa; Rui Guerreiro*

*INESC TEC, Faculdade de Engenharia, Universidade do Porto; INESC TEC, Faculdade de Engenharia, Universidade do Porto; Centro Algoritmi, Universidade do Minho; Faculdade de Engenharia, Universidade do Porto; CEI; Inocam*

Efficiency in production and logistics is critical for timely project completion in the construction industry. This study presents a pull system approach, demonstrating the seamless progression from facade design to factory production planning.

The workflow begins with the reception of 2D CAD files, which are converted into 3D models and validated to ensure geometric accuracy before manufacturing. Once approved, components are grouped by installation sequence, facilitating an optimized container loading and pallet packing process. The packing strategy maximizes transport efficiency, considering volume utilization, weight distribution, and fragility constraints, while factory scheduling ensures smooth production flow.