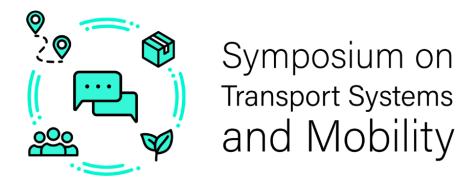# Book of Abstracts

of DCE25

Symposium on Transport Systems and Mobility

Editors:

Joana Hora, Jorge Pinho de Sousa,
Juliana Carvalho, Sérgio Pedro Duarte.

Porto
June 2025

This volume contains the peer-reviewed and accepted abstracts presented at the Symposium on Transport Systems and Mobility of the 6th Doctoral Congress in Engineering – DCE25, held at the Faculty of Engineering of the University of Porto (FEUP), between June 30th and 1st July, 2025.

WELCOME

Message from the Organizing Committee

We warmly welcome all participants to the Symposium on Transport Systems and Mobility (STSM), held in the scope of the 6th Doctoral Congress in Engineering (DCE25), hosted at the Faculty of Engineering of the University of Porto (FEUP), Portugal.

This Symposium is organized by PhD students or young PhD holders of the Doctoral Program in Transport Systems (PDST) at FEUP. This year's meeting, with 18 oral presentations, covers topics such as urban mobility and public transport, city and multimodal logistics, or transport safety.

The symposium will be an opportunity for informal networking of the participants, and in particular of young researchers and doctoral students. Master students may also enjoy participating and therefore discover this fascinating interdisciplinary area of research and professional activity.

Transport systems and mobility are, in fact, having an enormous growth and are an important part of everybody's lives. But they are also a field for a large and broad range of activities, from applied research to the development of new business models and start-ups.

The presence of peers, faculty members and industrial partners will surely create the right environment for debating some relevant current topics of research and for surveying the main trends in this area. The challenges are immense, but we will all be ready to face them by developing high quality research, together with companies, authorities and operators, to help solve some of the biggest societal problems of today.

We are truly grateful to our invited speakers for having accepted our invitation and sharing their expertise, thereby enhancing the quality and impact of the Symposium. And we would like to express our sincere appreciation to all authors for their valuable contributions, as well as to the Symposium Organizing Committee, the Scientific Committee, and all participating institutions for their invaluable support..

Porto, June 2025

The Symposium Organizing Committee

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DCE25

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Symposium on Transport Systems and Mobility

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The city of **Porto**, known as "Cidade Invicta" (the invincible city), is the second largest city of **Portugal**, the capital of the Porto district and the northern region. Porto is built along hillsides overlooking the mouth of the Douro River, and it is an outstanding urban landscape with a 2,000-year history.

Porto's continuous growth is related to the sea (the Romans gave it the name Portus, or port). It was declared a World Heritage Site by UNESCO in 1996 and considered the European Best Destination in 2014 and 2017.

Explore Porto's charming streets, historic landmarks such as the Sé Cathedral, Clérigos Tower and Dom Luís I Bridge, and savor local culinary favorites like the "Francesinha" (a must-try hearty sandwich for any visitor), "bacalhau" dishes (cod fish), and "pastel de nata" (creamy custard tart with a crisp, flaky crust).

Across the Douro River lies Vila Nova de Gaia, famed for its port wine cellars and stunning views of Porto's skyline. Visit the cellars to discover the region's rich winemaking heritage and the history of port wine production, from the historic lodges to the modern tasting rooms.

Don't miss the opportunity to witness the stunning sunset from Jardim do Morro or visit the Serra do Pilar, a UNESCO World Heritage Site offering panoramic views of Porto and the Douro River.

Together, Porto and Vila Nova de Gaia offer a unique mix of culture, history, and gastronomy. For details on accommodation, public transport, sightseeing tours, gastronomy, nightlife and culture may be found in the Official Portal of Porto Tourism and Visit Porto and the North Portal.

PROGRAMME

07h20 – 08h20 📍 *Lobby*	**REGISTRATION**

DCE 25 General Program	

08h20 – 08h45 📍 *Main Auditorium**	**OPENING CEREMONY** **Jaime Cardoso**, *President of the DCE25 Scientific Committee, Vice-President of FEUP's Scientific Council, Head of Research Area and Doctoral Affairs*, FEUP **Vítor Vilar**, *DCE25 Chair, Principal Researcher*, LSRE-LCM/ALiCE, FEUP
08h45 – 09h10 📍 *Main Auditorium**	**KEYNOTE LECTURE** *Chair:* **Rita Lado**, *DCE25 Co-Chair, Principal Researcher*, LSRE-LCM/ALiCE, FEUP *Author Workshop: A Whistlestop Tour of Common Ethical Pitfalls of Well-Intentioned Researchers* **Kay Tancork**, *Executive Publisher, Chemical Engineering*, Elsevier
09h10 – 10h00 📍 *Main Auditorium**	**LIFE AFTER A PhD: WHAT CAN YOU DO?** *Chairs:* **Tânia Lopes**, *DCE25 Co-Chair, Assistant Researcher*, LEPABE/ALiCE, FEUP **Jaime Cardoso**, *Vice President of FEUP Scientific Council*, FEUP
09h10 – 09h35	*Carrer Horizons for Early-Stage Researchers* **Bruno Béu**, *Advisor to FCT's Board of Directors*, FCT **Rui Munhá**, *Science Officer*, FCT
09h35 – 10h00	*CoLABs and CTIs: A Catalyst for Doctorates and the Innovation Ecosystem* **João Lobo Ferreira**, *Head of Interface Mission*, ANI
10h00 – 10h30 📍 *B Corridor*	**COFFEE BREAK & POSTER SESSION & EXHIBITION**
10h30 – 12h20 📍 *Main Auditorium**	**ROUND TABLE WITH CoLABs, CTIs AND INDUSTRY: DRIVING INNOVATION, SHAPING THE FUTURE** *Chairs:* **João Lobo Ferreira**, *Head of Interface Mission*, ANI **Adélio Mendes**, *Full Professor*, FEUP **Pedro Ávila**, *Director of Operational Sustainability*, REN **Luís Seca**, *Director*, AAET (Association Alliance for the Energy Transition)

📅 **Monday, June 30th, 2025**

	Marco Ferraz, *Head of Upstream and Industrial Innovation Center*, Galp
	Joana Maria, *Executive Director*, Vortex-CoLAB
	Simão P. Cardoso, *Product Manager*, Paralab Engineering
	Jaime Gabriel Silva, *Head of innovation area*, Águas do Douro e Paiva S.A. and SimDouro S.A. (both AdP Group), and *Invited Teacher*, ISEP
	Luís Filipe Santos, *Product Prescription and Technical Support*, FIBRAN
	Ricardo Rato, *Executive Director*, HyLab
	Luís Tiago Ferreira, *Responsible for the Smart Cities, Public Lighting, and Open Data*, E-Redes
	Mónica Read, *Projects and Works Engineer*, Águas e Energia do Porto
	Joana Monte, *R&D and Innovation Senior Consultant*, KPMG
	Luís Seca, *Member of the Executive Board*, INESC TEC

12h20 – 12h30 📍 *FEUP Central Garden*	**DCE25 OFFICIAL PHOTO**
12h30 – 14h00 📍 *FEUP Central Garden*	**LUNCH BREAK**
14h00 – 15h20	**WORKSHOPS**
14h00 – 14h35 (1st Session) 14h45 – 15h20 (2nd Session) 📍 *Auditorium B001*	*Workshop 1 – "Depression and anxiety in PhD students: Preventing emotional exhaustion and burnout"* **Fernanda Mendes**, *FEUPs GOI-Orientation and Integration Unit* **Helena Lopes**, *FEUPs GOI-Orientation and Integration Unit*
14h00 – 14h35 (1st Session) 14h45 – 15h20 (2nd Session) 📍 *Auditorium B002*	*Workshop 2 – "My career with a PhD: to open up or close a gap?"* **João Henrique Almeida**, *FEUP Talent Unit*
14h00 – 14h35 📍 *Auditorium B003*	*Workshop 3 – "La Caixa: Funding Opportunities?"* **Gisela Coromines i Calders**, *Doctoral Fellowships Programme Manager*, Fundació "la Caixa" **Inês Claro**, *Doctoral INPhINIT Fellow*, Fundació "la Caixa"
14h45 – 15h20 📍 *Auditorium B003*	*Workshop 4 – "The ERC and the ERC-Portugal Programme: How Preparation Meets Opportunity"* **Bruno Béu**, *Advisor to FCT's Board of Directors*, FCT **Rui Munhá**, *Science Officer*, FCT

📅 Monday, June 30th, 2025

Symposium on Transport Systems and Mobility

15h30 – 16h30
📍 *Auditorium B012*

WELCOME SESSION
Jorge Pinho de Sousa, *Chair of the Symposium on Transport Systems and Mobility*, Full Professor, FEUP
Teresa Galvão Dias, *Director of the Doctoral Program in Transport Systems*, Associate Professor, FEUP

SESSION I: URBAN MOBILITY AND PUBLIC TRANSPORT
Chairs: **Marta Campos Ferreira,** *Assistant Professor,* FEUP
Joana Hora, *Researcher,* FEUP

15h30 – 15h50

KEYNOTE LECTURE

Revolutionize mobility in the Porto Metropolitan Area: enhance public transport
Marco Martins, *Presidente do Conselho de Administração, TMP — Transportes Metropolitanos do Porto*

15h50 – 16h30

ORAL COMMUNICATIONS

OC8. *Segmenting the Intermodal PT Traveler: A Psychometric and Behavioural Study in Porto Metropolitan Area*
João Filipe Teixeira, *Researcher, FEUP*

OC14. *Equity and Efficiency Perspectives in Public Transport Design*
Mudassar Shafiq, *Researcher,* FEUP

OC11. *Qualitative decision-support approaches for sustainable urban mobility planning: insights from metropolitan case studies*
Juliana Carvalho, *PhD Student,* FEUP

16h30 – 17h00
📍 *B Corridor*

COFFEE BREAK & EXHIBITION

17h00 – 18h30
📍 *Auditorium B012*

SESSION II: LOGISTICS
Chairs: **Jorge Pinho de Sousa***, Full Professor*, FEUP
Catarina Marques, *Researcher,* INESC TEC

17h00 – 17h40

KEYNOTE LECTURES

Sustainable Mobility - Maritime Transport, Ports, and Intermodality
Hugo Lopes, *Director of the Department of Development and Sustainability*, APDL — Administração dos Portos do Douro, Leixões e Viana do Castelo

Tackling decarbonization, from H2Driven to a more sustainable society
João Filipe Jesus, Head of Corporate & Project Finance, Dourogás Renovável

📅 **Monday, June 30ᵗʰ, 2025**

17h40 – 18h30	**ORAL COMMUNICATIONS**

OC5. *Resilience and Flexibility of Transport Systems in Tourism Management Companies: Strategies to Address Uncertainty and Risk*
Carmen Santos Lima, *PhD Student,* FEUP

OC6. *Improving Port Performance through Synchronised Operations: A Modular Decision Support System*
Catarina C. Carvalho, *PhD Student,* FEUP

OC10. *Optimizing Truck Scheduling at Container Terminals: a Heuristic-Based Approach*
José L. Moreira, *MSc Student,* FEUP

OC1. *Collaborative logistics and heuristic optimization for sustainable last-mile urban distribution*
Alisson Garcia-Herrera, *PhD Student,* Public University of Navarre

OC18. *The Critical Factors for Collaboration in Last-Mile Logistics*
Vasco Silva, *PhD Student,* FEUP

18h30 – 19h30 📍 *FEUP Central Garden*	**SOCIAL EVENT** **WELCOME DRINK (TUNAFE & TEUP)**

📅 **Tuesday, July 1ˢᵗ, 2025**

08h00 – 09h00 📍 *Lobby*	**REGISTRATION**

Symposium on Transport Systems and Mobility

09h00 – 10h30 📍 *Auditorium B012*	***SESSION III: SAFETY*** **ORAL COMMUNICATIONS** *Chairs:* **António Lobo**, *Researcher, FEUP* 　　　**Sérgio Pedro Duarte**, *Invited Assistant Professor, FEUP* **OC15.** *Planning road infrastructure interventions using crash prediction models* **Pedro Rodrigues**, *PhD Student,* FEUP **OC4.** *Influence of Weather Conditions on Railway Accident Occurrence in Portugal* **Belzénia Matsimbe**, *PhD Student,* FEUP **OC9.** *Evaluating Systematic Literature Reviews by DSAIVE - Dynamic Systematic Artificial Intelligence Vector Engine* **João Pinto Oliveira,** *PhD Student,* FEUP **OC7.** *Real-Time Detection of Driver Fatigue Using Mobile Device Sensors and Artificial Intelligence On-Device* **Gonçalo Almeida**, *PhD Student,* FEUP **OC17.** *Reconciling safety, energy efficiency and operations towards the integration of truck platooning in the freight transport ecosystem* **Telmo Costa Botelho,** *PhD Student,* FEUP
10h30 – 11h00 📍 *B Corridor*	**COFFEE BREAK & EXHIBITION**
11h00 - 12h30 📍 *Auditorium B012*	***SESSION IV: URBAN MOBILITY AND PUBLIC TRANSPORT*** *Chairs:* **Jorge Freire de Sousa**, *Associate Professor*, FEUP 　　　**Juliana Carvalho**, *PhD Student*, FEUP
11h00 – 11h20	**KEYNOTE LECTURE** *Public transit systems planning and scheduling – problems and methodologies* **Bruno Oliveira**, *Researcher, OPT — Otimização e Planeamento de Transportes*
11h20 – 12h30	**ORAL COMMUNICATIONS** **OC13.** *Synchronization Applications in Public Transport Timetabling: Insights from a Systematic Literature Review* **Luísa Bastos Leite**, *MSc Student,* FEUP **OC12.** *A Conceptual Framework to Guide Horizontal Collaborative Initiatives in Logistics* **Leandro Carvalho,** *PhD Student,* FEUP

📅 **Tuesday, July 1ˢᵗ, 2025**

OC3. *Understanding Urban Mobility Patterns - Analysis of Porto's Mobility Survey*
Beatriz Cavaleiro, *MSc Student,* FEUP

OC16. *Explainable Blackboard Architecture for User-Centered Route Recommendations in Active Mobility*
Soraia Felício, *PhD Student,* FEUP

OC2. *Mobility in low-density areas: a framework for designing Demand Responsive Transports*
Armando Dauer, *PhD Student,* FEUP

CLOSING SESSION
António Couto, *Chair of the Symposium on Transport Systems and Mobility-DCE25, Full Professor*, FEUP

12h30 – 14h00 📍 *FEUP Central Garden*	**LUNCH BREAK**

DCE 25 General Program

14h00 – 14h20
SCIENCE COMMUNICATION
📍 *Main Auditorium**
Chair: **António Coelho**, *Associate Professor*, DEI/FEUP

14h00 – 14h05
Hackathon Program
António Coelho, *Associate Professor*, DEI/FEUP

Five-Minute Pitch for 3 teams of PhD Students

14h05 – 14h10
Team 1 – *Dino e a Cadeia da Vida*
Ana Camarinha, Idea and Sketching
Jorge Ferreira, Game Development
Raushan Mukhamejanova, Idea and Sketching
Rosana Oliveira, Narrative

14h10 – 14h15
Team 2 – *Time Travelers*
Ana Cristina, Organization and Creation
Bárbara Bender, Organization and Creation
Diana Sousa, Website and App
Jadna da Cruz, Website, App, Gps, and Image Recognition
Miguel Guimarães, Website, App, Gps, and Image Recognition

14h15 – 14h20
Team 3 – *God Save the Carbon*
Elizaveta Osipovskaya, Storytelling Wizard
Fernando Osório, Calculations
Mariam Conceição, Sparkler
Priscila Reinaldo, PR Developer
Sebastião Ventura, Researcher
Safa Vakili, UI Magician

14h20 – 15h40
VENTURE SCIENTISTS
📍 *Main Auditorium**
Chair: **Liliana Antão**, *PhD Student (PRODEI)*, FEUP

14h20 – 14h30
What is Conception X?
Carrie Baptist, *Chief Strategy Officer*, ConceptionX

14h30 – 14h35
FTNanoAD-Targeted-Nanocarriers for Brain Diseases
Joana Loureiro, *Assistant Professor*, FEUP

14h35 – 14h45
School of Startups at UPTEC
Raphael Stanzani, *Entrepreneurship Programs Manager*, UPTEC

14h45 – 14h55
A Success Case of a Spin-Off FEUP: AddVolt
Bruno Azevedo, *CEO*, AddVolt

14h55 – 14h40
Five-Minute Pitch for PhD Students

LogloTrix, Smart Inventory Management
Amir Hossein Farzamiyan, *PhD Student, Doctoral Program in Telecommunications*, FEUP

FertiGo – Wastewater in. Fertilizer out.
Luiza Sena, *PhD Student, Doctoral Program in Environmental Engineering*, FEUP

EcoWires – Plastic-free smart packaging

Rita Martins, *PhD Student, Doctoral Program in Chemical and Biological Engineering*, FEUP
Inês Freitas, *PhD Student, Doctoral Program in Chemical and Biological Engineering*, FEUP

MyKneeRecovery – Precision Monitoring for Better Rehabilitation
Joana Cerqueira, *PhD Student, Doctoral Program in Biomedical Engineering*, FEUP

UPWIND – Portable, Clean and Affordable Electrical Energy for All
Manuel Fernandes, *PhD Student, Doctoral Program in Electrical and Computer Engineering*, FEUP

BodyBoost – Stop Injuries Before They Stop You
Ana Teixeira, *PhD Student, Doctoral Program in Informatics Engineering*, FEUP

Triple-Action Cutaneous Device for Skin Cancer Treatment
Rita Barros, *PhD Student, Doctoral Program in Chemical and Biological Engineering*, FEUP

15h40 – 16h10 📍 *FEUP Central Garden*	**COFFEE BREAK & POSTER SESSION & EXHIBITION**
16h10 - 17h00 📍 *Main Auditorium**	**PLENARY LECTURE** *Chair*: **Miguel Madeira**, *Full Professor*, LEPABE/ALiCE, FEUP *Leadership at the Intersection of Academia, Policy, and Development: Bridging Knowledge to Impact Society* **Margarida Mano,** *Vice-Rector*, Universidade Católica Portuguesa (Former Minister of Education and Science, Portugal, 2015)
17h00 - 17h30 📍 *Main Auditorium**	**AWARDS** *Chairs:* **Jaime Cardoso**, *Vice-Dean for Research and Doctoral Affairs*, FEUP 　　　**Francisco Vasques**, *Coordinator of FEUP's Special Project to Upgrade Doctoral Education*, FEUP *Best Oral and Poster Communication (Per Symposium)* *Science Communication* *Venture Scientists* *Sponsors*
17h30 - 18h00 📍 *Main Auditorium**	**CLOSING CEREMONY** *Chair:* **Jaime Cardoso**, *Vice-Dean for Research and Doctoral Affairs*, FEUP **Ana Maria Camanho**, *Vice-Rector*, University of Porto **Rui Calçada**, *Dean*, FEUP
18h00 – 21h00 📍 *FEUP Central Garden*	**SOCIAL EVENT** **SUNSET**

*Main Auditorium: Auditorium Prof. Dr. José Marques dos Santos

INVITED SPEAKERS

Symposium on Transport Systems and Mobility

Marco Martins

Presidente do Conselho de Administração, TMP — Transportes Metropolitanos do Porto

Revolutionize mobility in the Porto Metropolitan Area: enhance public transport

This presentation will address the main mobility challenges in the Porto Metropolitan Area (PMA), particularly in what concerns traffic congestion and the impact of the VCI (Inner Ring Road). The presentation will highlight the ongoing efforts to promote public transport, including the expansion of the metro network, the introduction of passenger services on the Leixões railway line, the extension of the Andante fare system to the Vouga line, and the development of river crossings. Focus will be given to the creation of TMP – Transportes Metropolitanos do Porto, marking a turning point in the organization and management of mobility in the PMA. TMP is a transport authority, implementing an integrated planning model, and influencing policies on fares, intermodality, and sustainability. The presentation will also discuss the initial results of TMP's operations, the challenges it faces, and its potential as a catalyst for a transformation in urban and metropolitan mobility across the region.

Biography

Marco Martins is an experienced public administrator and political leader, with over two decades of experience in local governance and public service. Serving as Executive President of Transportes Metropolitanos do Porto, since February 2025, while maintaining his role as Municipal Councilor at Câmara Municipal de Gondomar, since 2013. He holds a master's degree in public administration from Universidade do Minho, and a degree in Economics and Business Management from Universidade Portucalense, combining academic knowledge with extensive practical experience in public sector leadership and metropolitan transportation governance.

SESSION II | LOGISTICS

Sustainable Mobility – Maritime Transport, Ports, and Intermodality

This presentation will highlight the strategic role of the blue economy and maritime transport in the transition towards more sustainable mobility. With a focus on the Port of Leixões, Hugo Lopes will address international and European decarbonization targets, regulatory challenges, and emerging technological solutions, such as the use of alternative fuels (hydrogen, methanol, ammonia, biofuels) and the electrification of ships and port infrastructure.

The presentation will also emphasize the importance of innovation and energy efficiency in reducing greenhouse gas emissions in the maritime sector. The decarbonization roadmap for the Port of Leixões, which aims to achieve carbon neutrality by 2035, will be presented, including ongoing actions such as the installation of onshore power supply (OPS) systems, the production of renewable energy (solar, wind, and wave), the digitalization of logistics processes, and the promotion of intermodality.

The vision to be presented positions Leixões as a sustainable urban port – deeply integrated with the surrounding community and committed to public health, operational efficiency, and environmental responsibility.

Hugo Lopes

Diretor de Desenvolvimento e Sustentabilidade, APDL — Administração dos Portos do Douro, Leixões e Viana do Castelo

Biography

Hugo Lopes is a civil engineer specializing in hydraulics, coastal engineering, and physical modeling, currently serving as Director of Development and Sustainability at APDL. With a PhD in Civil Engineering and a MBA from Porto Business School, he has over 10 years of experience in port infrastructure development. Hugo combines his executive role with academic engagement as an Invited Associate Professor at ISEP and active participation in professional organizations including APRH, PIANC International, and ICS FEUP, making him a recognized expert in sustainable maritime infrastructure in Portugal.

SESSION II | LOGISTICS

Tackling decarbonization, from H2Driven to a more sustainable society

Dourogás Renovável – Produtora de Gás, SA is a key player in Portugal's energy transition, leading the development of renewable gases such as green hydrogen and biomethane. The company has secured major wins in the country's first national auctions, including exclusive awards in the biomethane segment, and is advancing six green hydrogen projects with 150 MWh capacity by 2026. It pioneered biomethane injection into the national grid and integrates renewable energy into mobility and industrial decarbonization solutions. Through innovative projects like Move2LowC, HyFuelUp, and H2Driven, Dourogás is helping shape a regulated renewable gas market and driving Portugal towards carbon neutrality.

João Filipe Jesus
Head of Corporate Finance,
Dourogás

Biography

João Filipe began his career at Montepio Bank, as an Advisor to the Strategy and Planning Department, managing M&A processes. Hence, João pursued a career as Regional Director for Alentejo at the Ministry of Economy and Innovation, overseeing a broad spectrum of economic sectors, such as industry, energy, trade, and services. Over the past 8 years, João has been the Head of Mobility Operations at Dourogás GNV, having recently transitioned to the Head of Finance's role at Dourogás Renovável. João has also been an active non-executive board member of GASNAM, the Iberian Natural & Renewable Gas Association for Mobility. Since 2023, he's been Head of Corporate & Project Finance in the Dourogás Group.

SESSION IV | URBAN MOBILITY AND PUBLIC TRANSPORT

Bruno Oliveira

Researcher, OPT — Otimização e Planeamento de Transportes

Public transit systems planning and scheduling – problems and methodologies.

Bus planning and scheduling are critical components for the efficient operation of public transport systems.

Ensuring compliance with both passenger demand and operational constraints requires the application of optimization techniques and specialized solution methodologies. This presentation focuses on the challenges of bus and crew scheduling, outlining the principal algorithmic approaches employed to solve these problems. Additionally, we address the emerging complexities introduced by the electrification of bus fleets, which impose new constraints and require adaptations to existing planning and scheduling frameworks.

Biography

Bruno Miguel Oliveira holds a PhD in Transportation Systems from the Faculty of Engineering of the University of Porto and a master's degree in Statistics and Operations Research from the Faculty of Sciences of the University of Lisbon. Currently working at OPT – Otimização e Planeamento de Transportes, his main focus is in the development of solution methods for planning and scheduling public transport operations, using operational research methodologies.

ORAL COMMUNICATIONS

List of Oral Communications

OC 1. Collaborative logistics and heuristic optimization for sustainable last-mile urban distribution

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Abstract

The rapid growth of cities and e-commerce has made last-mile logistics increasingly complex, challenging traditional delivery systems with rising costs, congestion, and environmental concerns. In this context, crowdshipping has emerged as a promising, technology-enabled alternative. It relies on occasional drivers, individuals who deliver parcels during their regular routes, coordinated by digital platforms. This model, inspired by city and crowd logistics principles, seeks to optimize urban resources and improve service accessibility while promoting social inclusion. However, its effectiveness depends on how well it is integrated with existing systems, as it may also introduce logistical inefficiencies and negative externalities if not properly managed [1].

This study explores crowdshipping as a complement to traditional last-mile delivery systems by developing optimization models that consider both environmental and economic objectives. One such model is based on a variant of the Team Orienteering Problem which aims to design efficient routes that maximize delivery rewards and minimize travel distance, subject to constraints such as driver availability, travel time, and load capacity. The system allows in-store customers to act as occasional carriers, while companies coordinate tasks, set compensation schemes, and manage the interaction between traditional and crowd-based logistics.

To support efficient decision-making under operational constraints, the study also addresses optimization algorithms capable of producing high-quality solutions in short computing times. Among these, heuristic-based approaches with probabilistic elements are considered for their ability to balance solution quality and computational efficiency in complex routing scenarios.

The research evaluates the system's performance in terms of cost savings, reduction of vehicle kilometers traveled, and lower emissions. The results offer insights into how collaborative and sustainable logistics strategies can improve the resilience and efficiency of last-mile delivery in evolving urban environments.

Acknowledgments

References

[1] Buldeo Rai, H., Verlinde, S., Merckx, J., & Macharis, C. 2017. "Crowd logistics: an opportunity for more sustainable urban freight transport?" European Transport Research Review, 9, 1-13.

OC 2. Mobility in low-density areas: a framework for designing Demand Responsive Transports

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Abstract

Large urban centers are usually served by traditional Public Transport (PT) systems, which take advantage of the large demand available to center their operations on efficient routes and schedules. By contrast, in regions with a low population density, the availability of transportation is highly impaired since these same systems struggle to find an economically viable operation. The technological advances of the last decades allowed the design of transport alternatives to mitigate this problem, such as the Demand Responsive Transport (DRT) systems [1]. These are systems with flexible configurations, capable of adapting their operation to the current demand, by altering their vehicle routes, schedule, type, and size of the fleet, among other characteristics [2]. However, the designing process of these systems involves the selection of their operational configuration through a large number of possibilities. Moreover, the heterogeneity of service areas and the lack of expertise of planners turn designing these systems into a hindered endeavor [3]. Focusing on assisting the project of DRTs, this work presents a framework for designing DRTs on a strategic level. Through the analysis of the available literature, along with a set of real-world DRTs from 24 different countries, this work proposes a methodological process to select, test, and evaluate different configuration proposals for designing a DRT suitable for the scenario presented. The APOLO framework, lists and groups key systems variables according to their impacts on the DRT (strategic decisions, operational impacts, or passenger service). Then, a group of decision and simulation tools are presented to assist in selecting the most suitable domains for the system configuration, through an interactive process.

Acknowledgments

References

[1] P. Bakker (1999). Large scale demand responsive transit systems-a local suburban transport solution for the next millennium. in public transport planning and management. proceedings of seminar e held at the aet european transport conference, robinson college, cambridge, uk, 27-29
[2] J. Mageean et al. (2003) Demand responsive transport: responding to the Urban Bus Challenge. In Proceedings Of The European Transport Conference (Etc) 2003 Held 8-10 October 2003, Strasbourg, France.
[3] A. Papanikolaou et al. (2017) A methodological framework for assessing the success of Demand Responsive Transport (DRT) services. Transportation Research Procedia, 24, 393-400.

OC 3. Understanding Urban Mobility Patterns - Analysis of Porto's Mobility Survey

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Abstract

Urban mobility is a key factor in achieving Europe's climate, environmental and social goals. The European Commission's New Urban Mobility Framework 2021 emphasises a shift to-wards sustainable, inclusive and efficient mobility systems, highlighting the importance of collective and active transport, zero-emission urban logistics and improved connectivity be-tween urban and rural areas [1]. Sustainable Urban Mobility Plans (SUMPs) play a crucial role in this strategy by integrating transport planning with climate, energy and spatial strate-gies [1]. The implementation of sustainable mobility policies may face significant social, economic and cultural challenges that need to be carefully assessed [2]. Understanding the distribution of transport modes used by the population for both daily and long-distance trips is fundamental to evaluating the sustainability of a transport system. Several factors influ-ence the population's choice of transport mode, some are related to the availability of infra-structure and services, while others are more social in nature, linked to demographic struc-ture, economic activity or spatial patterns [2].

Based on these considerations, this study focuses on the municipality of Porto, the second-largest city in Portugal, using data collected from a mobility survey conducted at the end of 2024, which yielded a total of 4,749 responses. The primary objective is to explore mode choice patterns and examine their correlations with socio-demographic variables, providing data-driven insights to support the development of more sustainable and inclusive transport strategies. Following a comprehensive literature review, the survey data was cleaned using the CRISP-DM methodology to ensure accuracy and consistency. An exploratory data analy-sis was then conducted to identify relevant mobility patterns and key influencing factors. By analyzing travel behavior in Porto, this research provides insights to support targeted policies for sustainable development, improved quality of life, and transport system efficiency. It also reflects how mobility patterns relate to the city's socio-demographic and spatial context, contributing to broader European goals for climate neutrality and sustainable urban mobility.

Acknowledgments

References

[1] EUROPEAN COMMISSION. (2021). COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS-.Pathway to a Healthy Planet for All EU Action Plan: 'Towards Zero Pollution for Air, Water and Soil' [2]Ruiz-Pérez, M., & Seguí-Pons, J. M. (2020). Transport mode choice for residents in a tourist destination: The long road to sustainability (the case of mallorca, Spain). Sustainability (Switzer-land), 12(22), 1–31.

OC 4. Influence of Weather Conditions on Railway Accident Occurrence in Portugal

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Abstract

Extreme weather events increasingly threaten railway safety and infrastructure reliability. In Portugal, the contribution of meteorological conditions to railway accidents remains insufficiently studied. This research investigates the association between weather and two accident types defined by the Instituto da Mobilidade e dos Transportes (IMT): derailments and collisions with obstacles on the track. The analysis focuses on three heavy rail lines with distinct operational characteristics: Linha da Beira Alta, Linha do Norte, and Linha de Sintra.

Accident data from 2014 to 2024 will be obtained from IMT and combined with meteorological records from the Instituto Português do Mar e da Atmosfera (IPMA). The selected variables include daily total precipitation, maximum and minimum air temperature, mean wind speed, and wind gusts. Storm events will be defined as days with precipitation above the 95th percentile and gusts exceeding 50 km/h, following IPMA thresholds. To address class imbalance resulting from the rarity of these accidents, logistic regression models will be applied using oversampling methods, including the synthetic minority oversampling technique (SMOTE). Time-series analysis will complement the statistical approach by identifying seasonal variability.

Geospatial analysis will be conducted using QGIS software. Accident locations and meteorological exposure will be analysed using line segmentation based on operational divisions provided by Infraestruturas de Portugal (IP). The study recognises limitations in the spatial resolution of meteorological data, especially for wind and storm events, and accounts for potential confounding factors such as technical failures and human error.

This methodological approach builds on prior research regarding the impacts of climate on railway safety and operations (Vicente et al., 2020; Kim et al., 2024). The findings aim to inform climate adaptation and risk mitigation strategies for the Portuguese railway network.

This study is part of an ongoing PhD project at the University of Porto.

Acknowledgments

References

[1] L. Vicente, T. Calçada, and J. P. Marques (2020). Natural Hazard Management in Railway Infrastructures Considering a Climate Change Scenario. International Journal of Environmental Research and Public Health, 17(14), 5120.

[2] Kim, JM., Adhikari, M.D. & Yum (2024). Development of a deep neural network-based life accident evaluation model for weather-related railway accidents. KSCE Journal of Civil Engineering, 28, 1551–1565.

OC 5. Resilience and Flexibility of Transport Systems in Tourism Management Companies: Strategies to Address Uncertainty and Risk

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Abstract

Tourism management companies operate in dynamic and uncertain environments, marked by demand volatility, policy shifts, disruptive events, and technological change. Ensuring the resilience and flexibility of transport systems is therefore critical to maintaining operational continuity and long-term competitiveness. This research develops a conceptual framework to enhance transport system resilience and flexibility in tourism contexts. The methodology combines a systematic literature review with qualitative data collection, including expert interviews, participant observation, and surveys. Drawing on key contributions from [1-3], the framework integrates transport infrastructure, service design, and organisational structures.

The study is guided by three core research questions: (1) What are the major challenges tourism companies face in strengthening transport resilience and flexibility? (2) What strategies can effectively mitigate risks and uncertainty? (3) What are the measurable benefits of adopting such strategies?

Preliminary results identify key vulnerabilities and strategic responses, which will inform the development of best practices and decision-support tools. Fieldwork is currently being conducted within a company of the Mystic Invest Group, ensuring practical application and relevance.

This research offers valuable insights for both academic and industry audiences by contributing to the design of transport systems capable of adapting to continuous change in the tourism sector.

Acknowledgments

References

[1] Sharma, G. D., Thomas, A., & Paul, J. (2021). Reviving tourism industry post-COVID-19: A resilience-based framework. Tourism Management Perspectives, 37, 100786. https://doi.org/10.1016/j.tmp.2020.100786

[2] Hall, C. M., Prayag, G., & Amore, A. (2017). Tourism and Resilience: Individual, Organisational and Destination Perspectives. Channel View Publications.

[3] Sheffi, Y. (2005). The Resilient Enterprise: Overcoming Vulnerability for Competitive Advantage. MIT Press.

OC 6. Improving Port Performance through Synchronised Operations: a Modular Decision Support System

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Abstract

Despite playing a critical role in global supply chains, container terminals face persistent challenges related to operational inefficiencies, resource misalignment, and environmental impacts. This research addresses those challenges by developing a modular decision support system (DSS) aimed at improving the performance of container operations in the terminal, through the synchronised management of its key subsystems. The proposed DSS integrates three interconnected modules to support decision-making across different stages of terminal operations [1].

The first module investigates the application of Just-In-Time (JIT) strategies to regulate vessel arrivals and optimise sailing speeds as ships approach the port. By reducing early arrivals and idle time at the anchorage, this module aims to lower fuel consumption and minimise emissions [2]. The second module evaluates terminal performance metrics, such as productivity, waiting times, and equipment utilisation, under various operational scenarios. It allows port managers to test strategic adjustments and investment options in a risk-free virtual environment. The third module addresses the coordination between terminal yard operations and hinterland transport systems, aiming to improve the synchronisation of internal and external logistics flows.

To effectively address these challenges, this research explores the synergies between simulation and optimisation models to design a DSS that provides strategic recommendations to improve seaport operations and enhance the whole system resilience.

Therefore, together, these modules form an integrated DSS designed to enhance the efficiency, sustainability, and resilience of container terminal operations. This research contributes to the growing body of knowledge on simulation and optimisation in port logistics and provides actionable tools for decision-makers facing complex operational challenges in maritime transport systems.

References

[1] C.C. Carvalho, J. Pinho de Sousa, R. Santos, C.M. Marques (2025). A simulation tool for container operations management at seaport terminals. Transp. Res. Procedia 86, 604–611. https://doi.org/10.1016/j.trpro.2025.04.076.

[2] J. Pahl (2024). Just-in-Time Port Call Optimization: Challenges and IT-Systems. J. Phys. Conf. Ser. 2867(1), 012009. https://doi.org/10.1088/1742-6596/2867/1/012009.

OC 7. Real-Time Detection of Driver Fatigue Using Mobile Device Sensors and Artificial Intelligence On-Device

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Abstract

Driver fatigue is a leading contributor to road accidents worldwide, particularly due to its impact on cognitive performance and reaction time [1]. While high-end commercial vehicles have adopted Advanced Driver Assistance Systems (ADAS), their limited accessibility in low and middle-income contexts demands cost-effective alternatives [2]. This research presents a smartphone-based driver monitoring system that leverages embedded sensors and on-device Artificial Intelligence (AI) to detect fatigue indicators in real-time. Unlike approaches relying on physiological sensors [3] or vehicle-integrated systems [4], this work focuses on image-based methods deployable on mobile platforms. The system integrates lightweight machine learning models (Mediapipe and ML Kit) with facial features such as Percentage of eyelid closure (PERCLOS), Eye Aspect Ratio (EAR), Mouth Aspect Ratio (MAR), and head pose, which are widely used in literature as indicators of fatigue-related behaviors [2]. These features are then interpreted using a custom rule-based decision layer for real-time operation. The system was validated using two public datasets, YawDD [5] and DMD [6], and a native Android proof-of-concept application, designed and implemented by the author, which is being evaluated in real-world sessions with multiple participants. During these sessions, simulated fatigue behaviors are monitored using two smartphones running the app and recorded with a separate device for ground-truth video, enabling robust performance analysis across different AI models and devices. Preliminary results are promising, and a more complete analysis will be presented at the conference. This work contributes to intelligent transport safety by demonstrating the feasibility of real-time, non-intrusive fatigue monitoring using only smartphone-based technology.

Acknowledgments

References

[1] K. Hatoyama et al. (2019). Perception of time in traffic congestion and drivers' stress. Proc. ICTD 2019, ASCE, 165-174.
[2] B.-T. Dong et al. (2021). On-board monitoring for driving fatigue and distraction. Proc. IEEE ICIT 1, 850-855.
[3] A. Amidei et al. (2021). Validating PPG data for drowsiness detection. Proc. IEEE MetroAutomotive, 147-151.
[4] Z. Li et al. (2019). A fuzzy recurrent neural network for fatigue detection using steering-wheel data. Int. J. Distrib. Sens. Netw., 15(9).
[5] S. Abtahi et al. (2020). YawDD: Yawning detection dataset. IEEE Dataport.
[6] J. D. Ortega et al. (2020). DMD: A Large-Scale Multi-modal Driver Monitoring Dataset for Attention and Alertness Analysis. Proc. ECCV Workshops, Springer, 387–405.

OC 8. Segmenting the Intermodal PT Traveler: A Psychometric and Behavioural Study in Porto Metropolitan Area

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Abstract

As a consequence of the several negative externalities associated with car usage, there is a growing pressure to promote more sustainable mobility habits through supporting transport alternatives. An increasingly attractive solution is the concept of intermodal mobility, i.e., the combination of different modes of transport in a single trip, leveraging the strengths of each mode to provide a more sustainable and efficient transport option.

Despite its potential, research on intermodal mobility remains limited, with studies focusing on the travel behaviour of intermodal users being especially rare. However, to gain a comprehensive understanding of intermodality and its potential role in promoting sustainable mobility, it is crucial to explore the intermodal travel behaviour from the user's point of view, including their patterns and motivations.

Accordingly, the goal of this study was to analyse the travel behaviour of intermodal users, focusing particularly on those that combine public transport (PT). Using a representative mobility survey conducted by the Portuguese National Statistics Institute to the Porto Metropolitan Area (IMob17), we have identified and characterized distinct profiles of intermodal PT users through marketing segmentation.

The market segmentation analyses have revealed two profiles of intermodal PT users based on their motivations and perceptions of using PT (i.e., psychometric segmentation) and four profiles based on their main modes of intermodal travel (i.e., behavioural segmentation). Notably, a connection between the psychometric and behavioural segments has been found: choice riders are significantly more likely to use rail options such as metro and train, while captive riders are much more dependent on buses. These findings hold significant policy implications for the promotion of intermodal PT systems, including by highlighting the competitiveness of rail against the private car and the reliance of the most socially disadvantaged groups on the bus.

Acknowledgments

OC 9. Evaluating Systematic Literature Reviews by DSAıVE - Dynamic Systematic Artificial Intelligence Vector Engine

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Abstract

The rapid expansion of information production presents a growing challenge in identifying high-quality, relevant studies necessary for a solid research foundation of Systematic Literature Reviews (SLR). In 2021, "Pathways to Net Zero: The Impact of Clean Energy Research" from Elsevier's Analytical Services, publications in Lithium Alloys | Secondary Batteries | Electric Batteries accounted for over 7% of the total, the largest report topic cluster [1]. Recently, former CEO of Stellantis Carlos Tavares questioned the Internal Combustion regulation imposed on electric vehicles, claiming that it did not consider the social dimensions and impacts [2]. Paradoxically, in an era that proposes endless data and powerful AI, making well-informed decisions are yet extremely complex, including transparency concerns. Artificial Intelligence (AI) offers significant potential in streamlining literature reviews through advanced analytical techniques, namely semantic search, where keywords may become vector representations that contain contextual meaning. Transport Systems is a particularly rich multidisciplinary area. The search for alternatives to fossil fuels is a particularly challenging theme. DSAıVE framework is as a Dynamic Systematic Artificial Intelligence Vector Engine, proposing AI Retrieval Augmented Generation (RAG) to Improve Literature Review in Multidisciplinary Context. First, the study explores how segmented data ingestion and structured outputs bring relevant granular insights about the studies that are selected for the literature review. Secondly, the study proposes a methodology to create a Ground Truth dataset, which is necessary for the evaluation of the model's output. The results make an important contribution to gaining control and transparency in a highly challenging context of selection of new transport fuels, as it simultaneously calls for holistic and domain-specific knowledge of chemistry, climate change, techno-economic, and behavioral impacts.

Acknowledgments

References

[1] B. Candemir, J. Hellwig, E. Vignola-Gagné, J.-M. van Schalkwijk, and C. Sealy, "Pathways to Net Zero: The Impact of Clean Energy Research," Public Reports, Jan. 2021
[2] "Carlos Tavares: 'beco sem saída' na UE nos veículos elétricos pela 'dimensão social' - CNN Portugal."

OC 10. Optimizing Truck Scheduling at Container Terminals: a Heuristic-Based Approach

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Abstract

The continuous growth of maritime trade has increased the pressure on container terminals, requiring a more efficient management of land operations [1]. A critical challenge that these systems have to face is the variability of truck arrival times, which gives rise to periods of congestion alternating with times of underutilization of resources [2]. Current scheduling systems still rely heavily on carrier preferences, with limited coordination with the actual availability of terminal resources. This causes operational inefficiencies and tends to result in lengthy waiting periods.

In this work we have developed a heuristic-based optimization model aimed at improving the scheduling of container collection operations by coordinating both, the carriers and the terminal preferences. The proposed approach is based on a joint consideration of carrier appointments, container locations in the yard, and the dynamic terminal capacity.

The model is expected to be tested on a real use-case, with multiple sources data on the truck appointment preferred time-windows, the storage yard layout, the containers locations, and the terminal available resources. The developed approach will support more informed and faster decision-making regarding the assignment of trucks to time-windows and the pick-up sequence within each time window.

A key contribution of this study lies in the design and deployment of a practical, data-driven optimization tool that enhances the synchronization between external and internal terminal operations, enhancing the scheduling of trucks in containers collection. This model is expected to reduce the waiting times for trucks and congestion periods, to optimize the utilization of terminal resources, and to promote more sustainable and responsive operations.

Acknowledgments

References

[1] A. Tallat et al. (2023). Adv. Transdiscip. Eng. 35, 805–814.
[2] M. Hrušovský et al. (2018). Flex Serv Manuf J 30, 486–516.

OC 11. Qualitative decision-support approaches for sustainable urban mobility planning: insights from metropolitan case studies

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Abstract

This study aims at advancing qualitative decision-support approaches in transport systems research by developing a conceptual framework for collaborative design of sustainable urban mobility transition roadmaps. Through purposeful sampling, the research examines metropolitan governance practices across six international cases: Greater Manchester, Nantes Metropole, Metropolitan City of Bologna, Greater Montreal, Greater Santiago, and Greater Christchurch. The research integrates state-of-practice approaches with theoretical advancements, to create a decision-support tool specifically designed for intermunicipal planning processes that foster meaningful stakeholder and citizen engagement. Grounded in institutionalist constructivism [1] and communicative planning theories [2–4], the research employs qualitative methodologies including semi-structured interviews, document analysis of planning instruments, and qualitative decision-support approaches. This interdisciplinary framework acknowledges the strategic nature of metropolitan mobility planning, focused on establishing action priorities and participatory mechanisms. The developed framework is currently being tested with the Metropolitan Area of Porto, where an intermunicipal workshop conducted in late 2024 is providing valuable insights for refining the approach. As policy-oriented applied research, this study embraces an iterative process of development in this stage, incorporating lessons from research-practice exchanges to enhance the framework's utility for policymakers navigating complex intermunicipal sustainable mobility transitions.

Acknowledgments

References

[1] Hay C. Constructivist Institutionalism. The Oxford Handbook of Political Institutions, Oxford University Press; 2008. https://doi.org/10.1093/oxfordhb/9780199548460.003.0004.
[2] Macharis C, Geurs KT. The future of European communication and transportation research: A research agenda. Region 2019;6:D1–21. https://doi.org/10.18335/region.v6i3.281.
[3] Healey P. Collaborative Planning. Collaborative Planning 1997. https://doi.org/10.1007/978-1-349-25538-2.
[4] Bertolini L. Planning the Mobile Metropolis: Transport for People, Places and the Planet. Palgrave Macmillan UK; 2017. https://doi.org/10.1057/978-1-137-31925-8_1.

OC 12. A Conceptual Framework to Guide Horizontal Collaborative Initiatives in Logistics

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Abstract

Horizontal collaboration involves strategic alliances between companies that share common activities within the same business sector, aimed at generating benefits for participants and stakeholders. In logistics, companies form alliances by sharing routes, infrastructure, assets, information systems, technologies or human resources, seeking to foster more efficient activities. Logistics companies engaged in horizontal collaborative initiatives pursue multiple objectives, including cost reduction, market expansion, increased load factors, reduced greenhouse gas emissions and enhanced customer service [1]. The literature emphasizes that the success of these partnerships is strongly dependent on careful and accurate planning before operations take place, mainly when participating companies are competitors (a scenario referred to as co-opetition). In such cases, increased complexity arises from challenges related to trust management among rivals, equitable distribution of costs and benefits, information sharing protocols, and compliance with antitrust regulations. This work aims to develop a conceptual framework to define and organize patterns of horizontal collaboration in logistics. The research methodology adopted is based on semi-structured interviews with experts in urban logistics, from both academia and the business sector. These interviews served to deepen concepts, revisit assumptions and add new insights to the research. Moreover, real cases of these partnerships are studied to examine the partnerships in a practical context, comparing partnership management models with the reality of the logistics sector. The proposed framework seeks to structure the needs, expectations and limitations of participants by identifying the necessary inputs for designing a collaborative initiative and is organized as follows: Initially, an analysis of the involved stakeholders is conducted, and participants steer the strategic alignment within the collaboration, emphasizing their objectives, the competitive environment, and the governance model. Next, the strategic planning of the partnership is defined, including the identification of resources to be shared, information-exchange rules, contractual terms, and cost-and-benefit sharing agreements. In practice, the framework will be used to support the development of a detailed business model [2] for partnerships and the identification of the key controllable and uncontrollable variables within horizontal collaboration in logistics.

Acknowledgments

References

[1] F. Cruijssen et al. (2007). Horizontal cooperation in logistics: Opportunities and impediments. Transport. Res. Part E. 129-142.
[2] A. Osterwalder et al. (2005). Clarifying business models: Origins, present, and future of the concept. Commun. Assoc. for Inform. Systems 1-40.

OC 13. Synchronization Applications in Public Transport Timetabling: Insights from a Systematic Literature Review

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Abstract

Public transport planning comprises a series of sequential tasks carried out at strategic, tactical, and operational levels. At the tactical level, key activities include setting service frequencies and generating timetables. This review focuses on the latter problem. Various methods address the timetabling problem, where synchronization plays a crucial role. Synchronization considers the interconnection of multiple routes within a transport network, aiming to facilitate smooth transfers and support seamless travel experiences. Ultimately, effective timetable synchronization enhances the overall quality of public transport, contributing to a more efficient system and reducing the negative impacts of transfers. This literature review integrates findings and perspectives of synchronization to obtain timetables in public transport. Given the increasing volume of research in this area, the objective is to highlight recent developments and advances in the field. A systematic review is presented, following the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) methodology, which includes studies published over the past five years. This review compares key findings and synthesizes insights from the literature, culminating in a critical analysis of central themes that reveal emerging trends and identify directions for future research.

Acknowledgments

OC 14. Equity and Efficiency Perspectives in Public Transport Design

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Abstract

Addressing longstanding criticisms regarding the neglect of disadvantaged populations in transit planning, the research aims to develop public transit (PuT) systems that balance efficiency with equitable service distribution. Conventional PuT network design (PTND) approaches often fall short in incorporating social equity, despite its critical role in shaping mobility and access to opportunities. To address this, the study leverages demographic and socioeconomic data, identifying transportation needs based on adjusted demand derived from population characteristics and travel behavior patterns. These insights are foundational to designing inclusive rail and bus networks that align with local needs. This study explores the integration of equity considerations into PTND, using the Metropolitan Area of Porto (AMP) in Portugal as a case study. The methodology employs a two-step network design strategy. First, new rail stops are proposed in areas with high captive potential demand, prioritizing regions where transport needs are unmet. In the second step, an integrated bus network is developed under constraints such as population thresholds and distance requirements between stops, ensuring that even sparsely populated or underserved areas receive adequate service. Both networks are integrated to form a cohesive multimodal system. To evaluate the outcomes, the study applies two key assessment tools. Equity is measured using the GINI coefficient, reflecting the fairness of service distribution across the population, meeting their needs. While service adequacy coverage evaluates how well the system serves the population. The study uses Data Envelopment Analysis (DEA) to assess the efficiency of each proposed network design. This involves analyzing the relationship between system inputs (such as infrastructure characteristics and operational frequencies) and outputs (namely equity and service coverage outcomes). The analysis reveals trade-offs inherent in PuT design: while expanding services to marginalized groups enhances equity, it often increases costs or reduces operational efficiency. Findings demonstrate that strategic integration of equity into transit planning can lead to systems that are both inclusive and functionally efficient. By prioritizing accessibility as a social good, the study shows that PTND can better align with broader societal goals, such as reducing transport-related social exclusion and encouraging sustainable mobility. This research contributes actionable insights for transportation planners and policymakers. Ultimately, the framework presented can serve as a reference for future transit developments, highlighting how socially responsive infrastructure planning can transform PuT into a tool for promoting justice and inclusion.

Acknowledgements

OC 15. Planning road infrastructure interventions using crash prediction models

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Abstract

This work presents a methodology for supporting road infrastructure management by identifying road segments in need of safety interventions. By mapping high-risk locations, the proposed methodology enables Ascendi, a Portuguese road concessionaire, to work towards Vision Zero framework by reducing road crashes, namely the ones causing serious injuries or death. The approach reinforces proactive safety management and aligns with best practices adopted in the European Union for road safety evaluation. The methodology combines historical crash data from 9-year records with road crash predictive models, using count data models (Poisson or Negative binomial regressions) to estimate expected road crashes. These models encompass a set of explanatory variables collected through Ascendi's integrated information systems, including Annual Average Daily Traffic (AADT), cross section, maximum speed limit, tolls, etc. The proposed work considers a set of safety indicators and maps hotspots by combining different methods for the identification of hazardous sites, namely the crash frequency (CF) method and the potential for improvement using predicted crashes (PI). While the CF maps hotspots by solely using the absolute frequency of crashes, the PI compares the actual number of crashes recorded over the last three years with the predicted values generated by the models. The segments where the real number of crashes significantly exceeds the predicted values are flagged as high risk and categorized as a crash accumulation zone. These high-risk segments are further analysed using data-driven safety indicators, including total and injury crash counts, crash severity index, and traffic-adjusted crash rates. This identification process is supported by an interactive dashboard, which enables stakeholders to explore and compare both historical and forecast data from both methods. The resulting tool allows for both aggregated and disaggregated analyses, by filtering by concession, motorway, section (between interchanges) and segment. The system not only identifies high-risk segments but also supports crash forecasting by allowing users to input expected traffic growth for future scenarios. This dual capability provides support for the planning and implementation of Road Safety Action Plans.

Acknowledgments

OC 16. Explainable Blackboard Architecture for User-Centered Route Recommendations in Active Mobility

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Abstract

The Blackboard Architecture (BBA) is a modular, opportunistic AI framework that coordinates multiple knowledge sources (KSs) to solve complex problems [3,5]. Though versatile in fields such as medicine, urban planning, and cybersecurity, BBA lacks inherent explainability, unlike traditional expert systems that have built-in justification modules [1]. This limitation impairs user trust and transparency. This work proposes the integration of an Explainable Artificial Intelligence (XAI) module within the BBA to generate interpretable and personalized route recommendations for active mobility users. The approach leverages domain-specific ontologies to model relationships between urban features (e.g., lighting, noise, green areas) and user-centered indicators of comfort and safety [2,4]. The XAI module translates logical inferences and feature attributions into natural language using NLP techniques. Explanations are generated using dynamically populated rule-based templates with SHAP values, SPARQL-based ontology queries for contextual definitions, and counterfactual reasoning (e.g., "This route would be safer with better lighting"). These transparent explanations allow users to compare routes based on their needs and better understand the system's reasoning. The current version of our work is still in an early stage of implementation. However, as we progress in the development of the system, we test each module and validate the effectiveness of the framework. We further refine its capacity to deliver transparent, user-centered route recommendations based on perceived comfort and safety. The explainability of the system goes side by side with the developments made.

Acknowledgments

References

[1] Alonso, F., M.L.M.C., 1997. SACM: Semantic agenda control model. doi:10.1016/S0957-4174(96)00104-2.

[2] Campos Ferreira, M., Dias Costa, P., Abrantes, D., Hora, J., Felício, S., Coimbra, M., Galvão Dias, T., 2022. Identifying the determinants and understanding their effect on the perception of safety, security, and comfort by pedestrians and cyclists: A systematic review. Transportation Research Part F: Traffic Psychology and Behaviour 91, 136–163. doi: 10.1016/j.trf.2022.10.004.

[3] Erman, L.D., Hayes-Roth, F., Lesser, V.R., Reddy, D.R., 1980. The Hearsay-II Speech-Understanding System: Integrating Knowledge to Resolve Uncertainty. ACM Comput. Surv. 12, 213–253. doi:10.1145/356810.356816.

[4] Felicio, S., Hora, J., Ferreira, M., D'Angelo, C., Dias Costa, P., Abrantes, D., Silva, J., Coimbra, M., Dias, T., 2021. Characterizing soft modes' traveling in urban areas though indicators and simulated scenarios. doi: 10.54941/ahfe1001121

[5] Straub, J., 2022. A modern blackboard architecture implementation with external command execution capability. Software Impacts. 11, 100183. doi:10.1016/j.simpa.2021.100183.

OC 17. Reconciling safety, energy efficiency and operations towards the integration of truck platooning in the freight transport ecosystem

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Abstract

Truck platooning (TP) is a promising technology that enables the coordinated circulation of heavy vehicles in close proximity, supported by advanced automation and vehicle-to-vehicle communication systems. The anticipated benefits of TP include improved energy efficiency, enhanced road safety, and streamlined logistics operations. However, despite its technological maturity in controlled settings, several challenges remain regarding its real-world deployment, especially regarding human factors, operational integration, and stakeholder acceptance [1,2].

This doctoral research aims to address these challenges through a multi-phase, simulation-based study. The work will investigate the trade-offs between inter-vehicle distances, automation levels (L2–L5), and their combined effects on safety and energy efficiency. High-fidelity driving simulators will be used to replicate critical TP scenarios, such as control transitions and interactions with mixed traffic, to identify safe and efficient configurations. These findings will inform energy consumption models and support the development of a collaborative logistics framework that facilitates the adoption of TP among freight operators.

Building on previous work developed under the TRAIN project, this research extends the scope from technical simulation to operational impact and adoption strategies. A set of performance indicators will be developed to assess TP's implications for fleet coordination, infrastructure use, and benefit-sharing mechanisms [3]. The aim is to contribute practical guidance for the structured, scalable, and socially acceptable integration of TP into freight transport.

This approach delivers both scientific insights and applied outcomes, supporting a safer, more sustainable, and collaborative freight system in line with the European Green Deal, the Vision Zero strategy, and the broader digital and green transition in mobility.

References

[1] A. Simoes et al., 'Mapping Risks and Requirements for Truck Platooning: A Human-Centred Approach', presented at the Lecture Notes in Networks and Systems, 2022, pp. 514–522. doi: 10.1007/978-3-030-85540-6_65.

[2] T. C. Botelho, S. P. Duarte, M. C. Ferreira, S. Ferreira, and A. Lobo, 'Simulator and on-road testing of truck platooning: a systematic review', European Transport Research Review, vol. 17, no. 1, p. 4, Jan. 2025, doi: 10.1186/s12544-024-00705-6.

[3] N. Krüger and F. Teuteberg, 'Truck platooning: Towards future business models', presented at the MKWI 2018 - Multikonferenz Wirtschaftsinformatik, 2018, pp. 3–9.

OC 18. The Critical Factors for Collaboration in Last-Mile Logistics

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Abstract

The rapid growth of e-commerce has significantly intensified the demands on the logistics systems, especially in last-mile delivery. This has led to new challenges and environmental concerns that must be urgently addressed. In this context, collaboration in last-mile logistics has emerged as a potential solution, sparking cross-sector interest. However, collaboration in e-commerce-induced last-mile logistics remains largely unexplored in both research and practice. To address this issue, there is a need for a theoretical framework that consolidates existing knowledge and invites the development of new collaborative last-mile strategies. Accordingly, drawing on typologies on broad supply chain collaboration, typologies specific to collaboration in last-mile logistics, and insights from exploratory last-mile studies identified through a Systematic Literature Review, this study aims at a balance between the foundational collaboration principles and the specific conditions and needs of last-mile logistics. Therefore, this study identifies the critical factors necessary for effective and sustainable collaboration in last-mile logistics. By doing so, this study supports the development of different collaborative arrangements in last-mile logistics, ranging from inter-courier partnerships to consumer-based collaboration.

Acknowledgments

References

[1] F. Cruijssen (2020). Cross-Chain Collaboration in Logistics. ISBN: 978-3-030-57093-4. Springer.

[2] International Transportation Forum (2024). The Final Frontier of Urban Logistics: Tackling the Last Metres. 131, OECD Publishing, Paris.

[3] N. Martin et al. (2018). Horizontal collaboration in logistics: decision framework and typology. Operations Management Research 11, 32–50. doi:10.1007/s12063-018-0131-1.

[4] I. Badraoui et al. (2022). A typology of horizontal logistics collaboration concepts: an illustrative case study from agrifood supply chains. Benchmarking: An International Journal 29, 1214-1240. doi:10.1108/BIJ-02-2021-0082.

[5] G.P. Pisano & R. Verganti (2008). Which kind of collaboration is right for you? Harvard Business Review 86, 78–86.