From the Editor's Desk:

Peiran Han, 2025 Public Relations Officer INFORMS RAS, Beijing Jiaotong University

2025 INFORMS ANNUAL MEETING
October 26–29, 2025 | Atlanta, Georgia

The Railway Applications Section (RAS) of INFORMS, founded in 1994, has spent the past three decades serving as a bridge between industry and academia. RAS brings together industry experts, academic researchers, and OR/Analytics practitioners to develop innovative solutions for the challenges facing the railroad industry. Over the years, it has remained committed to fostering collaboration, sharing cutting-edge knowledge, and advancing the application of operations research and analytics in rail transportation.

Each year, the INFORMS Annual Meeting serves as a key gathering for the RAS community — an opportunity to connect, exchange ideas, and be inspired.

The RAS 2025 meetings will include:
- Eight sessions present interesting insights on a variety of topics.
- The Student Paper Competition finalists' presentations.
- The Problem-Solving Competition presentations of the finalists.
- One roundtable session on Railway Disruption Management.

The details of the session program can be found in the Session Schedule in this newsletter. We look forward to seeing you in Atlanta!

We sincerely thank everyone who contributed to this year's conference, especially our speakers. We encourage all members to take an active role in RAS next year — whether by serving as an officer, chairing a session, presenting your research, assisting with competitions, or sharing your insights in a webinar. RAS looks forward to your active participation and engagement!

Finally, a big thank you to the sponsors who have supported us all year long! We are truly grateful to BNSF Railway, TTX, Norfolk Southern Corporation, Optym, ProgressRail, Oliver Wyman, and CedarAI. We appreciate your continued support!

Year in Review: On Track with RAS 2025!

2025 RAS Officers: Xuesong (Simon) Zhou, Chair; Marty Schlenker, Vice Chair; Yili (Kelly) Tang, Secretary; Ketut Gita Ayu, Treasurer; Peiran Han, PR Officer

With more than 30 years on track, the INFORMS Railway Applications Section (RAS) continues to advance the global railway operations research community. Looking back at the past year, we are proud of the progress made in research, collaboration, and community impact.

RAS Member Profile in 2025

As of October 10, 2025, the Railway Applications Section (RAS) has grown to **153** members, the second-highest level since 2012, showing the continued attraction and influence of RAS throughout the year.

We invite you to join or renew your RAS membership. Please remember that you can do so [here](#). By becoming or renewing your membership, you will gain direct access to the latest insights, cutting-edge research, and the opportunity to engage with a vibrant community of scholars and practitioners. You will also be able to participate in our wide range of events, workshops, and special sessions that drive forward the future of railway operations.
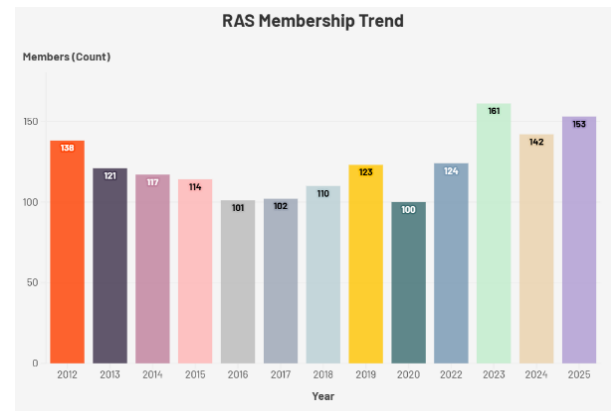
RAS Webinar

This year, we successfully hosted 4 webinars, covering topics such as passenger behavior studies, the application of quantum computing in railway systems, the announcement presentation for the RAS problem-solving competition, and innovation initiatives of JR East. These events have attracted a wide range of participants and received considerable attention.

We would like to extend special thanks to this year's Secretary, **Dr. Yili (Kelly) Tang**. For years, she has been consistently dedicated to organizing this webinar series, providing solid support for the implementation of events.

Please stay tuned for our webinars—we're continuously curating more engaging and insightful topics to bring you an enriching experience. Webinar schedule link: [Webinar Schedule - Railway Applications Section](#)

RAS LinkedIn Group

In 2025, the RAS LinkedIn Group continued to grow and stay active. We published **20** posts covering surveys, announcements, webinars, and news updates, and welcomed **36** new members who joined our expanding community. Join the LinkedIn Group: [RAS LinkedIn Group](#)

The Track Ahead for RAS

The resilience of railway, urban transport, and supply chain systems is becoming increasingly crucial nowadays. With the growing impact of climate change, pandemics, and geopolitical conflicts, the ability of transport systems to adapt, recover, and maintain functionality under disruptions has become a central topic in both research and practice. More and more, the concept of resilience is being integrated into the early stages of planning and design, shifting the focus from efficiency alone to adaptability, flexibility, and long-term sustainability. Understanding

the dynamics and inherent imbalance between demand and supply is key to developing resilient railway systems that can withstand future uncertainties. If you are interested in learning more about this topic, we warmly invite you to join our Round Table Session on Disruption Management.

In recent years, artificial intelligence (AI) has been reshaping operations research and analytical approaches at an unstoppable pace. As a result, the optimization of railway operations is no longer just about defining objectives and constraints. It now requires an awareness of dynamics, context, and human intentions. With the growing abundance of data, many traditional methods can be revisited and reformulated through the lens of AI. In this new era, we encourage every RAS member to embrace the power of AI and make it a powerful assistant in both practice and research. We are also pleased to host a dedicated AI & OR session at this year's meeting, and we look forward to hearing your insights and experiences.

As we move forward, RAS looks forward to working together with all members to advance the field of railway applications. Leveraging the rich resources of INFORMS, RAS will continue to contribute to academic and industrial collaborations, fostering innovation, sharing knowledge, and addressing the pressing challenges faced by the railway sector worldwide.

Together, we can shape the future of resilient, efficient, and sustainable railway systems.

Invited Article: Reflections on INFORMS RAS

David Hunt, OliverWyman, 2025 INFORMS President

As I look back on the RAS[1] Newsletter Volume 1, Number 1 from the Fall of 1994, I am struck by the ongoing relevance of the topics addressed—perhaps even more significant today than they were 31 years ago. The objectives of our community, articulated in the newsletter by the first Chair, Ajith Wijeratne of NS, remain pivotal:

- Promote interaction and exchange of ideas

- Explore ways of enhancing railway productivity through operations research (OR)

- Disseminate information on current OR applications in the rail industry

The first RAS objective on exchanging ideas is a topic I addressed in a recent OR/MS Today President's Desk article called "The Power of Collaboration."[2] The article talked about the important role INFORMS plays in facilitating collaboration and the tremendous opportunity – and indeed, the necessity – for INFORMS to enhance its efforts to support collaborations since many governments are increasingly prioritizing domestic interests over global cooperation. The worldwide community that RAS has built among freight and passenger railway experts is commendable. Together, we aim to improve rail operations worldwide.

The second objective, enhancing railway productivity through OR, holds even greater importance today. Railways have increasingly relied on systems developed by our community over the past three decades. While advancements in technology—faster computers, more powerful algorithms, and abundant data—suggest a simpler path to solutions, the reality is that the scale and complexity of the challenges have expanded just as quickly. For instance, North America now boasts a railroad network that crosses three countries, and the first U.S. transcontinental rail merger has become a real possibility. There is never a shortage of new, challenging railway problems to solve.

Finally, the third objective—disseminating information about current OR applications—remains one of RAS's greatest strengths. Through INFORMS meetings, RAS conferences, webinars, and awards recognizing emerging leaders in railway technology, RAS consistently promotes an environment that advances the rail sector.

The contributions of RAS to the global railway industry are more vital today than they were in 1994, especially as innovations like artificial intelligence and quantum computing offer new tools that could revolutionize railway operations. I'm glad the members of RAS will be there to help implement these new tools correctly to drive smarter decisions for a better rail industry!

David Hunt

2025 INFORMS President and former RAS Chair

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[1] Volume 1, Number 1 of the newsletter was by the Rail Applications Special Interest Group (RASIG) of the Operations Research Society of American (ORSA). Of course RASIG became RAS and ORSA merged with TIMS to become INFORMS. For simplicity, I will use RAS.

[2] Hunt, David, "The Power of Collaboration," OR/MS Today, June 16, 2025.
https://pubsonline.informs.org/do/10.1287/orms.2025.02.05/full/.

Invited Article: Perspectives on Trip Planning

Erick Wikum, Analytics Consultant, Wikalytics, LLC

My first assignment upon joining the Industrial Engineering/Operations Research Department at Norfolk Southern was to create string diagrams using Excel in support of a siding study. The exercise got me to thinking about the classic physics problem involving determining where two trains—one departing at time T from location A traveling at a fixed speed of S1 mph towards location B, and the other departing at time T from location B traveling at a fixed speed of S2 mph towards location A—will meet (collide!) and when. Thinking of that problem caused me to ponder where and when the two trains would meet if their speeds were stochastic and not deterministic. I began writing a yet-and-never-to-be-published paper for the stochastic problem. Whereas the solution to the classic problem can easily be solved using a string diagram or underlying linear equations, the stochastic version requires combining (convolving) two amenable probability distributions or solving the static problem repeatedly with random sampling of speeds.

Imagine that you have been hired as an engineer for the Better Ladder company. Your boss asks you to design a 17kg straight ladder capable of accommodating a person up to 75kg. You realize that this design problem is a classic static equilibrium problem that can be solved by setting the sum of forces in the X and Y directions and the sum of torques to zero, as illustrated in the below figure. You incorporate the company's standard safety factor, select materials, and prepare a final design document.
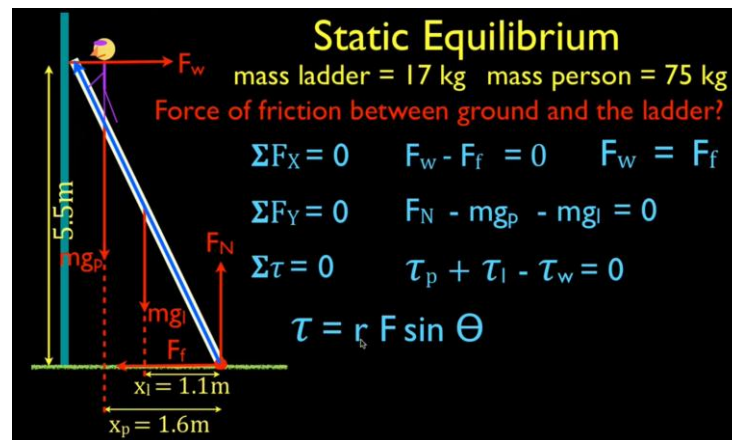
Ladder problem set-up and equations
(Step by Step Science, "Physics, Torque (12 of 13) Static Equilibrium, Ladder Problem,"
https://www.youtube.com/watch?v=Uq0nTwqDnrI)

You are excited to share your design with your boss, thinking that she will be so very pleased to have hired you. Your boss listens intently to your pitch. Only after you have presented your entire solution does your boss ask, "what would happen if a person on your ladder grabbed the side rails and shook the ladder?" You suddenly realize that a ladder must be designed to hold up not only under static, but also under dynamic forces. It's back to the drawing board for you!

Relying on a ladder that has been designed considering only static forces is risky. So too is relying on plans or decisions that have been analyzed without considering uncertainty (stochasticity). Dr. Sam Savage, founder of Probability Management, coined a term, the Flaw of Averages, "to describe the systematic errors that occur when single numbers, usually averages, are substituted for uncertainties." The Flaw of Averages holds that "plans based on "average" assumptions are wrong on average. (See https://www.probabilitymanagement.org/ for materials pertaining to the Flaw of Averages and its cure.)

The standard rail industry approach for generating trip plans (aka car schedules or itineraries) involves generating a block sequence and then simulating forward to select a series of trains carrying those blocks. The process is based on two assumptions. First, trains run on time. Second, each yard has a fixed handling time (perhaps based on traffic characteristics). A car connecting at a yard will make the connection between two trains with certainty if the (on-time) arrival time of the first train plus the fixed handling time is less than or equal to the (on-time) departure time of the second train.

One might refer to a trip plan generated in this manner, with single numbers substituted for uncertainties, as a "sunny day" trip plan, not unlike a ladder that has been designed while considering only static forces. What will happen if one "shakes" a trip plan? What does it even mean to shake a trip plan? What is a practical way to leverage "trip plan shaking" to improve the design and execution of the railroad operating plan?

To hear my further perspective on these questions, join me and other members of the Railway Applications Section (RAS) during the RAS business meeting, beginning at 6:45pm on Monday, October 27, during the 2025 INFORMS annual meeting in Atlanta. During the conference, which runs from October 25th to 29th, RAS is sponsoring numerous sessions as described elsewhere in this newsletter. I hope to see you in Atlanta.

2025 INFORMS RAS Distinguished Member Award

Clark Cheng, Distinguished Member Award Committee Chair

The RAS Distinguished Member (DM) Award recognizes individuals whose contributions have profoundly influenced the direction of RAS and continue to inspire the railway operations research community. The award honors exceptional leadership, innovation, and dedication to advancing the field.

This year's award committee, comprising past award winners Carl Van Dyke, Mike Gorman, Roger Baugher, Marc Meketon, and Clark Cheng, together with Yili Tang, who represents the current RAS officers, reviewed all nominations submitted by the August 1 deadline, evaluating eligibility, qualifications, and contributions. Following the review, the committee selected one outstanding individual as the recipient of the 2025 DM Award.

The awardee will be announced at the **RAS Business Meeting on Monday, October 27, from 6:45 – 7:30 PM in Room B314.** We warmly invite you to attend and join us in celebrating this achievement.

INFORMS Annual Meeting 2025: Session Schedule
RAS Cluster Co-chairs: Clark Cheng and Carl Van Dyke

The RAS program at this year's Annual Meeting features three days of technical sessions, student paper and problem-solving competitions, and a roundtable, highlighting innovations in rail and intermodal transportation. Topics include rail operations optimization, intermodal logistics, emerging technologies such as AI, machine learning, and quantum computing, disruption management, and sustainable transportation networks. Industry leaders, academics, and practitioners will present advances in scheduling, maintenance, intermodal logistics, and sustainable transportation.

Together, these sessions showcase RAS's strong focus on bridging theory and practice to address current and future challenges in the rail industry. We sincerely thank all the session chairs for their dedication and contributions.

In addition to the RAS technical sessions, we are pleased to highlight a few featured events. Please find the details below.

- RAS Business Meeting will be held on **Monday, October 27, 6:45 – 7:30 PM in Room B314**.

- RAS Dinner will take place right after the business meeting, from **7:45 to 9:30 PM.**

Please note that the dinner is by RSVP only, and the attendance is nearly full. If you would like to join, please contact the PR officer, Peiran Han, at peiranhan7@gmail.com to check the availability.

Thanks to the Cluster Chairs, **Clark Cheng** and **Carl Van Dyke,** for the effort and work they have put in place to give us such an amazing schedule.

RAS Session and Schedule Details

Sunday, October 26

	RAS Student Paper Competition Co-Chairs: Nikola Markovic, Marcella Samà, Pengling Wang
Session SE20 4:15 PM – 5:30 PM	Optimal routing and scheduling in railway marshalling station yards: A novel model and a branch-and-cut Benders decomposition algorithm **Jianghai Xiang**, Southwest Jiaotong University A Line Planning Approach with Passenger Assignment Considering Cross-Line Operations and Flexible Train Composition for a Metro Network **Zhikai Wang**, Beijing Jiaotong University A comparison of macroscopic, mesoscopic and microscopic railway infrastructure modeling for timetable robustness optimization **Inneke Van Hoeck**, KU Leuven

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Monday, October 27	
Session MA20 8:00 AM – 9:15 AM	**RAS Problem Solving Competition** **Chair: Marty Schlenker**
	Presenters/finalists will be announced later
Session MB20 11:00 AM – 12:15 PM	**Optimizing Passenger and Freight Rail with Energy and Automation Perspectives** **Chair: Xuesong (Simon) Zhou**
	Beyond the Horizon: Valuing Flexibility in Urban Rail Extension Decisions under Political Cycles and Present Bias **Qianwen (Vivian) Guo**, Florida State University Implementation and Analysis of Long-Haul Rail and Intermodal Operations using POLARIS Transportation Framework **Hyunseop Uhm**, Argonne National Laboratory Intermodal Freight Optimization through Integrated Railway, Waterway, and Highway Network Modeling **Xuesong Zhou**, ITE ASU Train Rescheduling with Considering the Breakdown of the Power Supply System in Metro **Shuai Su**, Beijing Jiaotong University
Session MC20 1:15 PM – 2:30 PM	**Operations Research and Analytics at Norfolk Southern Chair: Yudi Pranoto**
	Synchronize Train Schedules for Freight Rail **Peiheng Li**, Norfolk Southern OR application at NS Operations Center **Zahed Shahmoradi**, Norfolk Southern OR Applications in Intermodal Operations **Gita Ayu**, Norfolk Southern Operating Plan Optimization **Gunnar Feldmann**, Norfolk Southern

Session MD20 **2:45 PM – 4:00 PM**	**Emerging Technologies for Railway Transportation** **Chair: Clark Cheng** Assessing the capacity of railway network control points with Monte Carlo Simulation **Jiaxi Zhao**, DB E.C.O. North America An Outer-Inner Approximation Method for the Generic Choice-based Optimization Problem **Haoye Chen**, KTH Royal Institute of Technology OneBOM: Accelerating Railcar Quoting and Improving Supply Chain Accuracy with AI and Analytics **Garrett Mucha**, Trinity Industries, Inc. Comparative Analysis of Machine Learning and Traditional Methods in Predicting Railroad Operational Metrics **Muhannad Ramahi**, TTX Company Dynamic Routing for Intermodal Container Transportation **Qianqian Tong**, University of Texas at Austin
Session ME20 **4:15 PM – 5:30 PM**	**Round Table: Disruption Management** **Chair: Marc Meketon** Disruption Management at UPS **Robert Santilli**, UPS Disruption Management at Delta Airlines **Ruhollah Heydari**, Delta Air Lines Disruption Management at Norfolk Southern **Yannik Thomas**, Norfolk Southern

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Tuesday, October 28

Session TA20 **8:00 AM – 9:15 AM**	**Transportation Network Optimization** **Chair: Krishna Jha** Train Movement Optimization **Krishna Jha**, Optym Rail-Centric Multi-Objective Network Optimization for Sustainable Logistics of Mineral Tailings in Construction Supply Chains **Claudio Cunha**, University of Sao Paulo Optimizing Maintenance Intervals Using Monte Carlo Simulation **Masood Kang**, TTX Company A backtracking-based heuristic for train to fuel pad assignments **Ashutosh Shukla**, BNSF Railway
Session TB20 **11:00 AM – 12:15 PM**	**AI and OR Applications in Freight Railroad** **Co-Chairs: Nikola Besinovic, Daniel Haalboom** Optimizing Railroad Flat Yard Switching with Reward-Driven Integer Programming: A Sequential Decision Framework Using Branch-and-Bound and Remember Algorithm **Peiran Han**, Beijing Jiaotong University Optimize data-driven and time-varying predictive maintenance in railway networks **Yili Tang**, University of Western Ontario Railcar Shunting Optimization via an Adaptive Railcar Grouping Dynamic Programming Heuristic **Ruonan Zhao**, Texas A&M University Strategic Planning of Classification Yard Operations under Infrastructure and Service Constraints **Daniel Haalboom**,Technical University of Dresden

2025 INFORMS RAS
Freight Rail Planning & Operations Conference

Carl Van Dyke, Stefano Rieppi, Trevor C. Daycock, Gita Ayu

The **2025 INFORMS RAS Freight Rail Planning & Operations Conference** was held on May 19–20, 2025, at Norfolk Southern's headquarters in Atlanta, GA. The conference provided an unparalleled opportunity for knowledge exchange and networking across the rail industry. The event brought together approximately

- **70** industry attendees,**20** Speakers, **2** Keynote speeches
- **30** representatives from railways & related organizations:
  - **5** Class I railroads, **2** passenger operators
  - **4** shortlines and other rail operators
  - **10** suppliers, **4** universities

Topics: Conference speakers discussed topics like shipper perspectives, fleet forecasting, service and capital planning, passenger rail planning, and ways the industry can work together to foster long term growth. Above all, many speakers noted that service quality and consistency are key to the success of railroads, shippers and operating partners, and that recent advancements in technology, combined with developments in the way railroads forecast, model and plan, are creating more opportunities than ever before.

Highlights & Feedback:

- Amtrak and Brightline illustrated how operations research is leveraged to enhance customer experience, equipment maintenance, and on-time performance.
- Adrienne Bailey's presentation captivated the audience with compelling narrative and clear, accessible visuals on the imperative for freight railways to grow their business.
- Mabby Amouie showcased Norfolk Southern's Digital Train Inspection Portals, which use high-speed, high-resolution imaging combined with AI to detect rail equipment defects efficiently.

Mike Swain (Director Service Planning Systems, CSX Transportation):

"It was an energizing and insightful exchange of ideas across the industry—exactly the kind of collaboration that drives innovation in rail operations. From optimizing train scheduling to shaping the next generation of planning platforms, it's clear there's a shared momentum toward smarter, more agile railroads delivering a better service product to our customers."

Attendee feedback was overwhelmingly positive, with many endorsing the continuation of the conference in its current format and expressing interest in future editions. Financial proceeds from the conference were significant and will support RAS competitions, as well as the annual RAS dinner.

A special acknowledgment goes to Norfolk Southern, the key sponsor, for hosting the conference and covering nearly all associated costs. Additional support came from BNSF, TTX, OptymRail, Oliver Wyman, and Cedar AI. Their contributions were instrumental in making this event a success. We would like to thank the excellent organization of the conference chairs **Carl Van Dyke** and **Stefano Rieppi**, and the fantastic on-the-ground support provided by **Trevor Daycock** and **Gita Ayu**.

2025 INFORMS Railway Application Section (RAS) Student Paper Competition

Marcella Samà: Roma Tre University, Italy, Competition Chair
Pengling Wang: Tongji University, China, Competition Co-Chair
Nikola Marković: University of Utah, USA, Competition Co-Chair

RAS annually sponsors and organizes the student paper competition to promote research on the application of operations research and analytics in passenger and freight railway systems. This competition also aims to acknowledge students who produce exceptional research papers.

The 2025 RAS student paper award competition was announced in April and received a strong number of excellent submissions by the extended deadline of June 20. The **8** papers were carefully evaluated by a panel of **16** distinguished judges.

The winners of the 2025 Railway Applications Section Student Paper Award are as follows:

First Prize: Inneke Van Hoeck, KU Leuven

"A comparison of macroscopic, mesoscopic and microscopic railway infrastructure modeling for timetable robustness optimization"

Co-authors: Carl Henrik Häll (Linköping University), Anders Peterson (Linköping University), Pieter Vansteenwegen (KU Leuven)

Inneke Van Hoeck, together with her co-authors, investigates the impact of different network representations on railway timetable optimization. By formulating macroscopic, mesoscopic, and microscopic models to improve timetable robustness, their research provides new insights into how the level of detail influences both solution quality and computation time, showing that more detailed models can yield better results without necessarily increasing computational effort.

Second Prize: Zhikai Wang, Beijing Jiaotong University

"A Line Planning Approach with Passenger Assignment Considering Cross-Line Operations and Flexible Train Composition for a Metro Network "

Co-authors: Shuai Su (Beijing Jiaotong University), Andrea D'Ariano (Roma Tre University), Tao Tang (Beijing Jiaotong University), Boyi Su (Beijing Jiaotong University) and Zhikai Wang explore innovative operational strategies for metro systems by integrating cross-line services and flexible train composition into the line planning problem. Using a tailored mathematical model and an advanced branch-and-Benders cut framework, his study on the Beijing metro demonstrates clear gains in efficiency, reducing both costs and passenger transfers compared to conventional approaches.

Third Prize: Jianghai Xiang, Southwest Jiaotong University

"Optimal routing and scheduling in railway marshalling station yards: A novel model and a branch-and-cut Benders decomposition algorithm"

Co-authors: Jun Zhao (Southwest Jiaotong University), Andrea D'Ariano (Roma Tre University), Qiyuan Peng (Southwest Jiaotong University)

Jianghai Xiang addresses the complex challenge of managing train and engine movements in marshalling station yards by formulating the train and engine routing and scheduling problem (TERSP) as a novel mixed-integer linear program. Incorporating practical operational requirements and introducing compact key-section constraints, their study further develops a customized branch-and-cut Benders decomposition algorithm. Tested on real-world data from a major Chinese station, the approach delivers near-optimal solutions within seconds, clearly outperforming benchmark models and solver in both quality and efficiency.

Honorable Mention: Florian Fuchs, ETH Zurich

"Solving Integrated Periodic Railway Timetabling with Satisfiability Modulo Theories: A Scalable Approach to Routing and Vehicle Circulation"

Co-authors: Bernardo Martin-Iradi (ETH Zurich), Francesco Corman (ETH Zurich)

Florian Fuchs proposes a novel integrated approach for solving periodic train timetabling, train routing, and vehicle circulation through a unified optimization model (VCR-PESP). By introducing the first SMT-based solution method, their work handles continuous time without discretization, avoiding rounding artifacts and scaling effectively to large instances. Experiments on the Swiss network show that this integrated method significantly reduces fleet needs and produces high-resolution, implementable timetables compared to traditional sequential approaches.
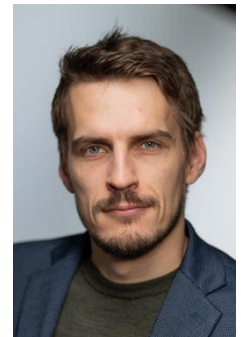
Congratulations to the winners! The first, second, and third prize winners will receive cash prizes of $800, $400, and $200, respectively. The Honorable Mention awardee will receive special recognition. The three winners will present their papers at the 2025 INFORMS Annual Meeting in Atlanta on **Sunday, October 26 from 16:15 to 17:30 in Room A406.**

The chairs sincerely thank the judges for their dedicated and thorough evaluation. Submissions were assessed rigorously based on practical significance, methodological innovation, theoretical contribution, and overall impact on the railway field. Following individual reviews, the panel convened in September to select the winners.

2025 Rail Problem Solving Competition

*Marty Schlenker, Masood J. Kang: Competition chairs.*

The 2025 Railway Application Section Problem Solving Competition invites researchers and practitioners to develop innovative solutions for predictive maintenance in rail operations. The problem statement is oriented toward failure prediction for wheels using wheel profile data, wheel mileage, a railcar's features, as well as other detector data (WILD and truck hunting data). This competition aims to enhance the maintenance and safety of railway operations by leveraging advanced analytics and machine learning techniques.

Problem owner

TTX Company has generously volunteered to sponsor the prizes and provide the problem, including data drawn from its operations. TTX Company was formed in 1955 and has grown to provide 175,000 railcars to North American railroads, investing $13 billion since 2000 and spending $800 million annually to maintain its fleet.

Competition highlights

- For the first time, the RAS problem solving competition was launched on Kaggle (INFORMS RAS 2025 Problem Solving Competition | Kaggle), which significantly attracted some from machine learning society.

- The competition was also promoted to other INFORMS sections, such as the College on Artificial Intelligence (CAI). Special thanks to Prof. Feng Mai (CAI Publicity Chair, University of Iowa) for helping distribute the competition information to the CAI community.

- On June 11, we organized a featured webinar introducing the 2025 RAS Problem Solving Competition.
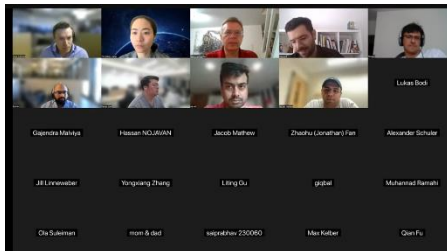
- Key numbers: **124** entrants, **51** active participants, **23** teams, and **584** submissions.

- **Five** teams have been selected as finalists. The finalists will present their work at the 2025 INFORMS Annual Meeting during a special session scheduled for **Monday, 8:00–9:15 AM**. We warmly invite you to join us at this event.

We sincerely thank the competition chairs for their successful organization of this event, as well as Dr. Han Zheng (Beijing Jiaotong University) for his support in launching the problem on Kaggle.
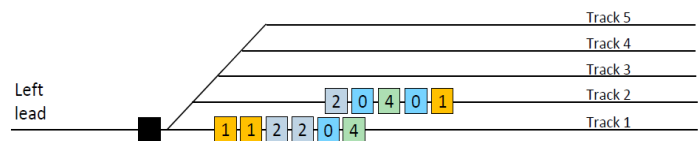
2024 Rail Problem Solving Competition
Optimize Switching in a Flat Rail Yard

Marc Meketon, Xuesong (Simon) Zhou: Competition chairs.

The 2024 RAS Problem Solving Competition challenged participants to develop algorithms to optimize switching operations in flat rail yards, offering a total cash prize of $3,750. Efficiently sorting wagons across a limited number of tracks of varying lengths, while assembling multiple train blocks, is one of the most complex daily operations in railways. Few tools currently assist engineers and conductors in determining the optimal sequence of moves.

All the submissions were evaluated on feasibility, optimality, scalability, computation time, and the quality of the report, online defense, and onsite presentation.

The first prize for the 2024 RAS Problem Solving Competition was won by **Peiran Han, Yun Hu, Yuwen Pan, Ranfei Zheng, Xiaojie Luan (RailSparksBJTU)** from Beijing Jiaotong University with a work titled *"A novel reward-driven integer programming approach for optimizing railroad flat yard switching: A sequential decision approach"*.

The RailsparksBJTU team introduced a novel framework for optimizing railroad flat yard switching, referred to as the Flat Yard Switching Optimization (FYSO) problem. They modeled the FYSO problem as a network, where each railcar is represented as a node and each potential shunting action as an arc, forming what is called the Shunting Action Network (SAN). The SAN is formulated as a 0-1 integer programming model that incorporates constraints reflecting the practical requirements of flat yard operations. To further refine this model, the team introduced symmetry-breaking constraints tailored to the specific characteristics of the problem. Their approach efficiently identified the necessary shunting activities to rearrange railcars into the desired sequence. Additionally, the team developed a sequential decision framework to iteratively update and optimize the switching process.

The second prize went to **Dian Wang, Shuguang Zhan, Jianhao Zhang, Ling Yao, Jingyan Yang** from Hefei University of Technology, with a work on *"Optimize switching in flat rail yards:Mixed integer linear models and greedy based local search algorithms"*.

The team introduced a mixed-integer linear programming model for both stub yards and through yards. The model can solve small instances to optimality and quickly verify the feasibility of a given solution for larger instances. The team also introduced a greedy-based local search algorithm to quickly find feasible solutions for both stub and through yards. The local search significantly improved the quality of the solutions compared to those initially obtained by greedy rules.

The third prize went to **Chongshuang Chen, Feng Xue (Railmen)** from Southwest Jiaotong University, with a work on *"Optimization switching wagons in at rail yards:A hybrid multi-stage and neighbourhood searchs salgorithm"*.

The Railmen team introduced an innovative approach that used a triple notation (departure track, arrival track, and number of wagons) to represent each movement step, interpreting shunter operations as a flow. They divided all blocks into three subsets based on their unique switching requirements.

The team developed a multi-stage algorithm that decomposes the original problem into three sequential subproblems. Additionally, they integrated a neighborhood search strategy that enumerates actions that are both feasible and beneficial, based on the current environmental state.

The honorable mentioned prize went to **Felix Rauscherta, Lukas Bodia, Maurice Krauth (Cargo Combinators)** from Technische Universitat Dresden, with a work on *"Optimizing Rail Shunting Operations through Multi-Stage AI Heuristics"*.

The Cargo Combinators team introduced a hybrid three-stage approach known as HEROS (Hybrid Evolutionary-Reinforcement Optimization for Shunting). This approach combined the strengths of reinforcement learning and evolutionary algorithms to converge on the objective value of minimal total time as the time budget increases.

The team carefully balanced the trade-off between depth and breadth in the exploration process. The AI-driven HEROS solution offers substantial benefits in terms of cost savings, reliability, and scalability, demonstrating its potential in optimizing shunting operations.

We would like to thank the judge panel:–Peiheng Li (Norfolk Southern), Marty Schlenker (Parallel Systems), Andrea Arias (BNSF Railway), Tyler Dick (University of Texas at Austin).

We thank all who participated in the challenge, and we congratulate the winners!
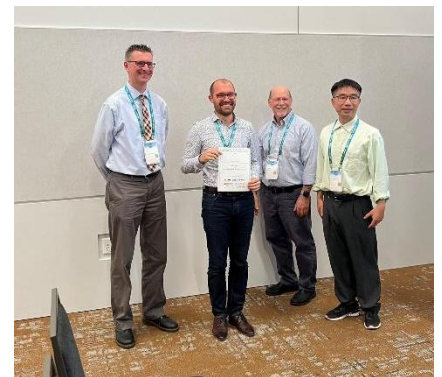
Linking Yards, Corridors, Multimodal Systems, and Energy Networks: A Shared Vision for Open-Science Rail Modeling

By Xuesong (Simon) Zhou, Arizona State University
Chair (2025), INFORMS Railway Applications Section (RAS)

In recent years, we have seen a quiet but fundamental shift in how rail and multimodal systems are discussed across agencies and research communities. The conversation is no longer just about train timetabling or yard throughput—it now connects energy systems, corridor connectivity, and national-scale data integration.

As RAS Chair in 2025 (and also in 2016), and after several years of organizing problem-solving competitions on train scheduling and yard operations, I have witnessed growing enthusiasm among students and early-career professionals eager to apply new analytical and AI methods to rail and multimodal problems.

Why Corridor Integration Matters

The Union Pacific–Norfolk Southern merger, announced July 29 2025, demonstrates how corridor and network design directly affect national supply-chain performance. At the same time, the U.S. Department of Energy (DOE) and labs such as Argonne National Laboratory (ANL) are advancing the INTERMODAL initiative on efficiency and resilience. The U.S. DOT Freight Analysis Framework (FAF) and the National Multimodal Freight Network now offer open data on commodity flows, ports, and corridors—essential resources that remain underused in transportation research and education

Building the Open-Science Ecosystem

Through the General Modeling Network Specification (GMNS) and tools like OSM2GMNS, we are building a shared foundation for multimodal and energy-linked networks—covering more than a million rail nodes, 300+ classification yards, and 90 major ports. These datasets allow students, researchers, and agencies to work from the same transparent base.

OSM2GMNS Driving and OSM2Water

20M nodes and about 92 ports

OSM2Rail
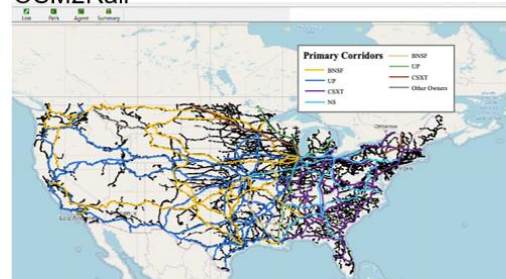
1M nodes and primary corridors of Class I

US DOT Interim National Multimodal Freight Network

The Missing Layer: Space–Time Data Awareness

A key missing layer in many studies is **space–time data awareness**—understanding how freight moves through both geography and time. Each train, block, and container has a trajectory shaped by schedules, yard dwell times, and disruptions. Seeing how these patterns evolve is vital for learning, planning, and improving energy efficiency.

Our ongoing **ANL–ASU** collaboration is developing open, reproducible visualizations and datasets that capture these dynamics across national networks.
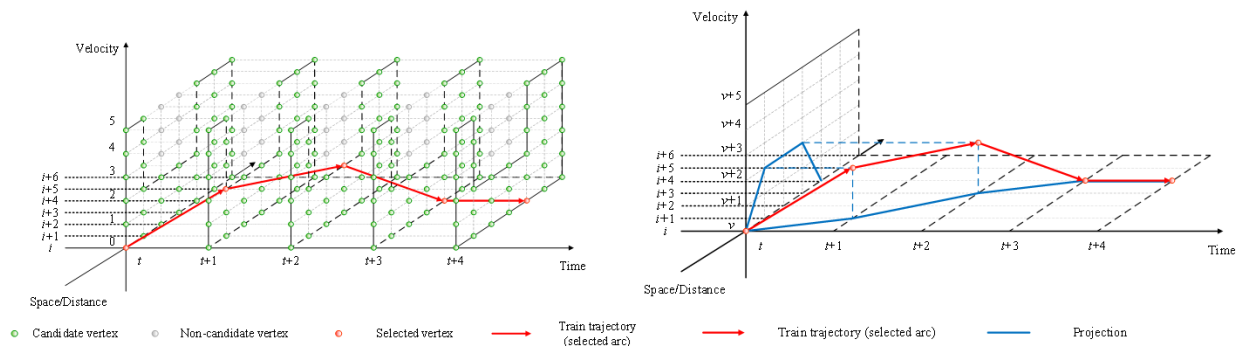
A Call to the RAS Community

Many transportation models are still published without reproducible data or results. Through the Zephyr Foundation's "Five Levels of Open-Science Readiness (Z5-OSR)", we are encouraging a culture where models and code can be run, verified, and improved collectively.

Open science is not the same as open data. We fully understand the need for data protection and confidentiality in industrial contexts. However, the RAS community already supports many well-defined benchmark problems that can form the basis for shared, verifiable research and education. By recognizing and contributing to more open-science projects, industry and academia together can reproduce, apply, and advance research outcomes across multimodal and energy-linked systems.

The future of U.S. rail research lies not only in better optimization, but in a better shared vision—where open data, open models, and open minds converge.

RailSanya 2027 Problem Solving Competition Announcement

Lingyun Meng (Beijing Jiaotong University)

In 2027, the Railway Problem Solving Competition of the International Association of Railway Operations Research (IAROR) will debut at the 12th International Conference on Railway Operations Modelling and Analysis (RailSanya 2027), to be held in Sanya, China. This marks the first time that a problem-solving competition will be featured at an ICROMA, offering an exciting platform for researchers and practitioners to present innovative solutions to pressing challenges in railway operations.

Competition Topic

The train dispatching problem continues to be a significant challenge in both research and practical applications, particularly in regions with dense rail networks. Traditional methods, often relying on manual judgment, heuristics, and operational logic, may not be sufficient to handle the complexities of real-time railway traffic management. Recent advancements in Operations Research (OR) and Artificial Intelligence (AI) have opened new avenues for addressing disturbances and improving the overall efficiency of railway systems. This competition aims to encourage the development of innovative solutions to these ongoing challenges.

About IAROR and ICROMA

The **IAROR** was founded on June 8, 2005. The association now has members across Europe, the Americas, Asia, and Australia, and is dedicated to advancing the field of railway operations through academic research and professional collaboration.

The **ICROMAs** are organized biennially by the IAROR in different countries around the world, starting with RailDelft 2005 in the Netherlands. The 12th edition of the ICROMA, RailSanya 2027, will be held in Sanya, China. In addition to the usual academic paper presentations and posters, this conference will also feature the Railway Problem Solving Competition session for the first time.

Competition Timeline and Participation Details

The details of the competition, including the problem instances, will be made available on the official IAROR website (https://www.iaror.org/) in the coming months. Finalists will be invited to present their results at RailSanya 2027 and invited to publish their approach in a special issue of the *Journal of Rail Transport Planning and Management*.

Timelines:
- Official Announcement: April 2026
- Registration Deadline: June 2026
- Instances Release: July - November 2026
- Solution Submission Deadline: February 2027

Competition chairs:
- Prof. Rob M.P. Goverde (TU Delft)
- Prof. Francesco Corman (ETH Zurich)
- Prof. Lingyun Meng (Beijing Jiaotong University)

For any inquiries regarding participation or serving as a judge of this competition, please contact Dr. Zhengwen Liao from Beijing Jiaotong University at zwliao2@bjtu.edu.cn.

Meet the 2025 RAS Officers!

Chair: Xuesong Zhou

Bio/Position Statement: Xuesong (Simon) Zhou is a Professor of Transportation Systems at the School of Sustainable Engineering and the Built Environment, Arizona State University (ASU), Tempe, Arizona. Dr. Zhou's research focuses on developing methodological advancements in multimodal transportation planning applications, including dynamic traffic assignment, traffic estimation and prediction, large-scale routing, and rail scheduling. Dr. Zhou serves as an Associate Editor of Transportation Research Part C, an Executive Editor-in-Chief of Urban Rail Transit, and an Editorial Board Member of Transportation Research Part B. Xuesong is the Director of the ASU Transportation+AI Lab, where he is the principal architect and programmer for several open-source packages, including DTALite, NEXTA, and OSM2GMNS, which have collectively received over 100,000 downloads. He has published over 100 papers in leading transportation journals, with an H-index of 65 and a total of 10K citations in Google Scholar.
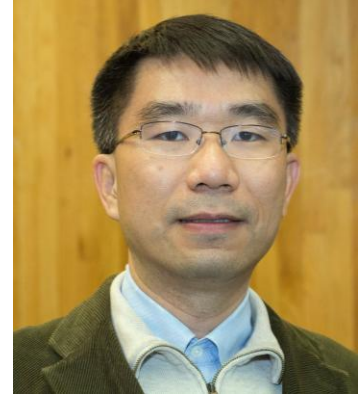
Vice Chair: Marty Schlenker

Bio/Position Statement: Marty Schlenker is a versatile supply chain and technology professional, with 25 years of leadership experience with Class I railroads, followed by roles at autonomous vehicle developer Parallel Systems and a consulting practice. At BNSF Railway, he led service planning for industrial commodities, overseeing the implementation of BNSF's first optimization-based DSS for service planning. He then led BNSF's Unified Data & Advanced Analytics team, with responsibility for AI- and optimization-based decision support, corporate performance metrics, GIS, and analytics based on BNSF's wayside detectors and track geometry measurement systems. He served as Head of Strategy at Parallel Systems in 2023 and 2024 and continues in a part time advisory capacity as Head of Analytics & Applications, helping Parallel develop its offering to the global rail and supply chain industries. He founded Schlenker LLC in 2021, advising railroads, ports, shippers, and transportation technology companies and initiatives worldwide. In addition to INFORMS, he is a member of the American Railway Engineering & Maintenance Association (AREMA), the Transportation Club of DFW, and the National Defense Transportation Association (NDTA).

Treasurer: Yili Tang

Bio/Position Statement: Yili (Kelly) Tang is currently serving as an Assistant Professor at the University of Western Ontario, Canada. With a diverse academic background, including a Ph.D. in Civil Engineering from The Hong Kong University of Science and Technology, and a BEng in Transportation Engineering from Central South University, she brings a wealth of expertise to her role. Dr. Tang has held key positions such as Algorithm Engineer II at Zhejiang Cainiao Co., Alibaba Group in China and Postdoctoral Scholar at the University of California, Berkeley. Dr. Tang's research contributions span a wide range of topics in the transportation sector, including behavioral studies, operation strategy design and optimization, and network-level simulations. Notably, her innovative work in integrating data insights, refining behavioral models, and developing a new framework for travel behavioral

modeling has garnered recognition with many national and international awards. Dr. Tang is an active member of various committees and boards, including the Standing Committee on Urban Transportation Data and Information Systems at the Transportation Research Board. Her commitment to advancing knowledge in transportation is further demonstrated by her editorial role as a Guest Editor for Travel Behavior and Society in 2023.

Treasurer: Ketut Gita Ayu

Bio/Position Statement: Ketut Gita Ayu is a senior operations research specialist at Norfolk Southern, bringing extensive expertise in industrial engineering and logistics. Prior to that, Gita served as Department Chair for the Industrial Engineering Department at BINUS University, Jakarta, Indonesia, where she led academic initiatives and supported faculty development during her tenure. She is a senior member of the Institute of Industrial and Systems Engineers (IISE) and actively contributes to the professional community as an ABET program evaluator and a reviewer for Industrial Engineering and Operations Management (IEOM) conferences since 2015. Gita has also held leadership roles such as IEOM Logistics Management Track Chair in 2016 to 2018, Program Committee member at the INFORMS Transportation Science and Logistics Conference in 2017, and Committee member for the Railway Planning Conference in 2025. In addition to her leadership and professional service, she was recognized with the Best Track Paper award at the IEOM conference in 2015. Gita earned her PhD in Industrial Engineering from Arizona State University, where her dissertation focused on stochastic dynamic networks for managing hurricane evacuation, under the guidance of Dr. Pitu Mirchandani. She holds both B.S. and M.S. degrees in Industrial Engineering from the Georgia Institute of Technology.

Public Relations Officer: Peiran Han

Bio/Position Statement: Peiran Han is a Ph.D. candidate at the School of Traffic and Transportation, Beijing Jiaotong University, China, under the supervision of Prof. Lingyun Meng. He also earned his bachelor's and master's degrees in Railroad Transportation Engineering from the same university. During 2024–2025, he is a visiting researcher at the Chair of Railway Operations, Technische Universität Dresden (TU Dresden), Germany, hosted by Prof. Nikola Bešinović. He serves as a reviewer for Transportation Research Part B and the International Conference on Railway Operations Modelling and Analysis (ICROMA). His research focuses on railroad yard operations, railroad system resilience, and train (re)scheduling. His work has been recognized with multiple awards, including first prize in both the INFORMS RAS Student Paper Competition and the Problem Solving Competition in 2024, as well as the Best Papers Award at the 11th International Conference on Railway Operations Modelling and Analysis (RailDresden 2025).

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