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Aleksander Sładkowski *Editor*

Using Artificial Intelligence to Solve Transportation Problems

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Improvement of Freight Routes: Innovative Digital Solutions for Long-Term Planning in Kazakh Rail Transport

Madiyar Sultanbek, Nazdana Adilova, and Aleksander Sladkowski

Abstract The present chapter delves into the strategic planning process of railway companies, focusing specifically on freight train routing optimization within Kazakhstan's railway network. It highlights the integration of digital solutions by Kazakhstan Temir Zholy (KTZ), the national railway company, to enhance operational efficiency and decision-making capabilities. Emphasizing the significance of accurate demand forecasting and innovative methodologies for route optimization, the chapter discusses the methodology for cost computation and route optimization within KTZ's railway network. It proposes a comprehensive framework for estimating variable costs associated with different train flow routing options. Additionally, the chapter reviews relevant literature on train flow route optimization, identifying primary cost categories and models. Unlike previous works, this chapter introduces a Kazakhstan-specific approach considering main railway network characteristics. It underscores the importance of combining demand forecasting techniques with advanced route optimization methodologies to improve competitiveness and sustainability in the dynamic transportation industry landscape. By leveraging modern software tools and integrating data from internal systems and external sources, KTZ aims to streamline the planning process, visualize optimal routing options, and enhance decision-making capabilities. Overall, the chapter provides valuable insights for researchers and practitioners interested in the intersection of technology and transportation management, emphasizing the importance of innovative digital solutions in improving long-term planning and operational efficiency within Kazakhstan's rail transport sector.

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