Where are those trucks going? Using a Bayesian framework to synthesize freight origin-destination data in the Canadian Prairie Region

Abstract
Planning and designing road networks suitable for truck operations require a comprehensive knowledge of their spatial and temporal patterns between freight origins and destinations (ODs). However, efficient road transportation planning and logistics are constrained by the limited availability of truck OD data. This issue stems from the competitive nature and privacy concerns of the trucking industry, making the process of collecting and labelling truck trips a time-consuming and resource-intensive task. Given these challenges, this study focuses on generating synthetic truck OD trip data through Bayesian analysis, with the goal of enhancing predictive accuracy in transportation planning of heavy vehicles. The reliability of the synthesized data is evaluated by comparing with simulation-based data generated from TFlowFuzzy method in PTV Visum. Utilizing the Canadian Freight Analysis Framework (CFAF) database, which provides estimates of Canadian freight flows, we conduct a comparative analysis of the results obtained from these two approaches.

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Keywords: Freight Origin-Destination (OD) Data, Synthetic Freight Flow Data, Bayesian Inference Method, TFlowFuzzy Model