

IDENTIFYING OF GPT-4'S ABILITIES IN THE CONTEXT OF TRANSPORTATION PLANNING IN SRI LANKA

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ABSTRACT - The study aims to investigate the capabilities of GPT-4, a cutting-edge large language model developed by OpenAI, in the context of transportation planning in Sri Lanka. This research delves into three main sectors: transport planning knowledge, concepts, and strategies; technical-oriented data, methodologies, and tools; and stakeholders' opinions. The study examines GPT-4's ability to articulate transport planning concepts and methods, providing creative policies adapted to Sri Lanka's specific challenges using a thorough approach. The model's capacity to provide methods for data analysis using Geographic Information Systems (GIS) applications is also investigated. The findings reveal that GPT-4 demonstrates outstanding capabilities in proposing practical transportation strategies and policies, akin to those presented by experienced planners. Additionally, it shows a high level of proficiency in technical data processing, expediting the decision-making process. Despite acknowledging its drawbacks, the GPT-4 needs to be improved using Sri Lanka-specific domain information in order to improve contextual knowledge and provide accurate results. Understanding the influence of training data and sourcing relevant information is crucial for specialized applications like transportation planning. Planners must be aware of GPT-4's limitations, particularly in detecting hallucinations that simulate coherent responses. Human planners should maintain their role as critical decision-makers, leveraging AI tools like GPT-4 while continuing to invest in competencies, cross-domain knowledge, and data analysis proficiency. Striking this balance ensures effective collaboration in the transportation planning process.

Keywords: Large Language Models; GPT-4; Transport planning; Sri Lanka; planning competency

1. INTRODUCTION

GPT-4 is a state-of-the-art language model created by OpenAI and it uses deep learning techniques to learn from vast amounts of text data and generate human-like responses to a wide range of text-based prompts (WANG, LU, & FU, 2022). GPT -4 has been used in various applications, including chatbots, virtual assistants, and language translation systems (Rahman & Watanobe, 2023). It has also been used in natural language processing research and development. Planning transportation systems can be a complex and time-consuming process that requires analyzing various data sources and considering numerous factors (Ayeni, 2023). Advances in artificial intelligence (AI) technology have opened up new opportunities for urban transportation planners to improve transport systems using AI-based language models like GPT -4 (Radhakrishnan, Srinivasam, & Ananthanarayanan, 2021). GPT -4's AI platform is capable of processing large amounts of data quickly and accurately. The GPT -4 was officially launched in March 2023, and now it has become one of the main AI tools used in many sectors (Ching & CHUA, 2023). Therefore, this GPT -4 AI platform can be used as an effective tool in decision-making in transportation planning. The advantages of artificial intelligence in transportation planning have been stressed in numerous studies. However, only a few research studies have explored GPT -4's potential for transport planning. The goal of this study is to investigate GPT -4's benefits as a tool for making decisions in Sri Lankan transportation planning. As a result, the research makes use of GPT -4 to provide information based on three main sectors. The paper then assesses the information gathered and discusses its findings regarding GPT -4's potential to enhance transportation systems in Sri Lanka.

2. MATERIALS AND METHODS

This research utilized GPT-4, an advanced large language model from OpenAI, as a pivotal tool to acquire knowledge relevant to transport planning in the context of Sri Lanka. To ensure comprehensive coverage, three major criteria were selected following an extensive literature analysis on the application of AI platforms in diverse sectors:

- I. Transport Planning Knowledge, Concepts, and Strategies
- II. Technical-Oriented Data, Methodologies, and Tools
- III. Stakeholders' Opinions

During the initial stage, this study gathered insights for each criterion using different prompts tailored to extract relevant information specific to transport planning in Sri Lanka. Each category consisted of 30 prompts, focusing on aspects such as the applicability of various concepts and strategies to the Sri Lankan context, technical approaches to address transport planning challenges, and steps to effectively use different Geographic Information System (GIS) tools.

Furthermore, the study gathered opinions from various stakeholders, including urban planners, transportation engineers, public transportation users, and private vehicle users, using GPT-4 to explore their perspectives on different transport planning topics.

To ensure the accuracy and reliability of the collected information, a thorough verification process was implemented. The insights obtained through GPT-4 were meticulously examined to assess their relevance and suitability in enhancing transportation systems in Sri Lanka.

3. RESULTS AND DISCUSSION

The assessment of GPT-4's capabilities in the field of transportation planning revealed important strengths. GPT-4 demonstrated competence in developing and conceiving transportation policies and strategies. It showed adaptability by reformulating certain strategies when provided with inaccurate information.

Table 1. Prompt Sample form 2 Criteria

Prompt	Respond	Remarks
Generate R Script to run a basic TIA Analysis.	<pre># Load required libraries library(readr) # For reading data from CSV library(dplyr) # For data manipulation and filtering library(ggplot2) # For data visualization # Read traffic count data from CSV file traffic_data <- read_csv("traffic_data.csv") # Explore the structure of the data (Rest of the code)</pre>	The code is working, although there were some mistakes for the first time. However, after setting them to GPT-4. Improved code was provided.
How transport planners can apply Micro-Mobility concept in Colombo Sri Lanka.	<p>Transport planners can apply the Micro-Mobility concept in Colombo, Sri Lanka, to improve transportation options and address urban mobility challenges. Here are some strategies for implementing Micro-Mobility in the city:</p> <p>Bike-Sharing and E-Scooter Programs: Introduce bike-sharing and electric scooter (e-scooter) rental programs in key areas of Colombo. Designate bike lanes and e-scooter parking zones to encourage their use and ensure safe integration with existing traffic.</p> <p>(Last-Mile Connectivity, Safe Infrastructure, Public Awareness Campaigns, Regulations and Licensing, Integration with Public Transit, Micro-Mobility Hubs, Pilot Projects, and Data Collection, Inclusive Design, Collaboration with Private Sector)</p> <p>By applying the Micro-Mobility concept in Colombo, transportation planners can offer residents and visitors more flexible and sustainable transportation choices while also reducing traffic congestion and improving overall urban mobility.</p>	The output when compared to the studies on "Micro Mobility" is accurate. However, it is not specified to the context of Colombo or Sri Lanka.

Reference: compiled by author

In addition, GPT-4 provided valuable insights for conducting technical analyses, offering detailed steps and approaches for GIS software utilisation, including ArcGIS and QGIS. Additionally, it demonstrated how other programming languages, including Python and R, can be used for analysis. However, limitations were identified in its responsiveness concerning the extraction of spatial data relevant to Sri Lankan transportation planning, particularly concerning land use, traffic census, and zoning information.

Regarding stakeholder perspectives, GPT-4 offered substantial insights, although they were not always tailored to the specifics of Sri Lankan transportation planning. Nevertheless, several findings showed that they could be used to the situation and the advancement of Sri Lankan transport planning.

4. CONCLUSION

In conclusion, this research underscores the potential of GPT-4 as a valuable tool for transportation planners to gather insights into transport planning in Sri Lanka. However, it is important to note that GPT-4's training data is prior to 2021, thus not reflecting the most up-to-date information. Immediate opportunities arise for deploying GPT-4 to assist planners in areas where it succeeds, such as articulating concepts and strategies and outlining technical methodologies. Planners can conduct more thorough assessments and increase efficiency in their daily responsibilities by introducing GPT-4 into their planning processes and workflows.

Nonetheless, planners must remain aware of GPT-4's limitations, particularly in detecting well-phrased hallucinations, which may pose challenges in certain scenarios. The responsibility for fact-checking, evaluating logical flows, applying critical reasoning, and applying domain knowledge continues to lie with human planners, who must collaborate with these tools to ensure optimal outcomes in transportation planning endeavors.

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