

TRANSPORT FINDINGS

How does ChatGPT Introduce Transport Problems and Solutions in North America?

Junghwan Kim , Jinhyung Lee 

Keywords: Artificial Intelligence, Bias, ChatGPT, Large Language Model

<https://doi.org/10.32866/001c.72634>

Findings

How does ChatGPT introduce transport problems and solutions in North America? By analyzing ChatGPT's answers to four prompts related to transport issues and solutions in the United States and Canada, our results reveal that ChatGPT's answers generally align well with transport researchers' expectations. However, ChatGPT's capability may be limited in providing trustworthy or sound solutions because of the potential issues (e.g., geographic biases, inaccuracy) in its training data. ChatGPT might be a decent starting point for discussing transport issues and solutions, but one should be aware of its limitations.

1. Questions

ChatGPT, a generative artificial intelligence (AI) chatting machine developed by OpenAI (OpenAI 2023a), has been explosively stimulating worldwide discussion about its capabilities and limitations since its launch in November 2022 (Thorp 2023). A prominent discussion centers around ChatGPT's impacts on higher education and science (van Dis et al. 2023). To initiate such conversation within transport practice and research communities, we rapidly undertook an exploratory study motivated by a simple question: How does ChatGPT introduce transport problems and solutions in North America?

2. Methods

We asked four questions (prompts) about identifying and tackling transport challenges in the United States and Canada to ChatGPT:

- **Q1:** What are the important transportation issues of the United States?
- **Q2:** What are the solutions to transportation issues in the United States?
- **Q3:** What are the important transportation issues of Canada?
- **Q4:** What are the solutions to transportation issues in Canada?

Figure 1 shows one of the answers we obtained from ChatGPT. We utilized the most updated version of ChatGPT (January 30, 2023) at the time of writing, using a default setting for the analysis. We independently repeated each inquiry five times using the "Regenerate Response" feature to obtain multiple answers to see the reliability of ChatGPT.

J What are the solutions to transportation issues in the United States?

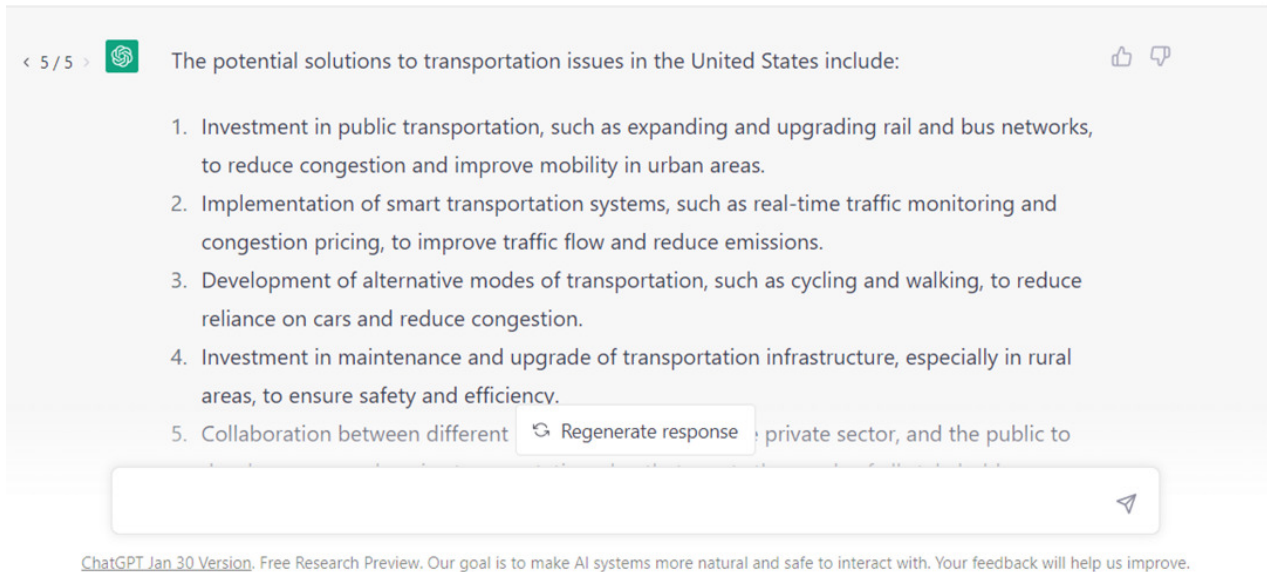


Figure 1. A screenshot of a sample response from ChatGPT

Using the answers for each question as a basis, we created a word cloud to summarize the ChatGPT's responses using R after removing trivial stop words. We assumed that words appearing more frequently are relatively more important than other words in ChatGPT's answers (Green et al. 2020; Kim, Wang, and Rapuri 2022). More frequent words are visualized in a bigger size in word clouds. Additionally, we qualitatively assessed the ChatGPT answers to see if they aligned with our general expectations based on the domain knowledge.

3. Findings

Table 1 presents the word counts for the ChatGPT's answers, demonstrating that ChatGPT gives responses having a similar number of words for each question. Moreover, by qualitatively observing responses obtained from five attempts, we conclude that responses (in terms of their contents and topics) are reasonably similar.

For both the United States and Canada, the average word counts are greater in the solution prompts (Q2 and Q4) than in the issue prompts (Q1 and Q3). Moreover, ChatGPT provides a longer answer to questions related to the United States than those related to Canada. One possible explanation can be the potential geographic biases in the quantity and quality of the ChatGPT training data (Graham et al. 2014; Mandal, Leavy, and Little 2021) between the United States and Canada. However, future studies are needed to investigate this issue more deeply.

Table 1. Word counts of the ChatGPT's answer in terms of questions and requests.

		Requests					
		1 st	2 nd	3 rd	4 th	5 th	Average
Questions	Q1	171*	170	187	176	181	177.0
	Q2	219	218	220	224	220	220.2
	Q3	143	134	128	169	131	141.0
	Q4	168	179	191	140	189	173.4

* Note: This indicates there are 171 words in ChatGPT's answer to Q1 in the first request.



Q1	<i>What are the important transportation issues of the United States?</i>
Chat GPT's Answer 	<p>There are several important transportation issues in the United States, including: Congestion and traffic delays in major cities, resulting in increased travel times and reduced productivity. Aging infrastructure, particularly in rural areas, leading to increased maintenance costs and reduced safety. Climate change and its impacts on transportation infrastructure, such as rising sea levels and increased frequency of extreme weather events. Shortage of funding for transportation infrastructure projects, leading to delays and reducing the ability to address the needs of growing populations and changing transportation patterns. The need to balance the interests of different modes of transportation, such as cars, buses, trains, and cyclists, to ensure safe and efficient mobility for all. The need to enhance intercity and international trade by improving transportation connections, particularly between the US and other countries. Growing demand for alternative modes of transportation, such as electric vehicles and ridesharing services, and the need to adapt infrastructure and regulations to accommodate these changes. The need to reduce greenhouse gas emissions from the transportation sector to address climate change.</p>
Q2	<i>What are the solutions to transportation issues in the United States?</i>
Chat GPT's Answer 	<p>Potential solutions to the transportation issues in the United States include: Investment in public transportation, such as expanding and upgrading rail and bus networks, to reduce congestion and improve mobility in urban areas. Implementation of smart transportation systems, such as real-time traffic monitoring and congestion pricing, to improve traffic flow and reduce emissions. Development of alternative modes of transportation, such as cycling and walking, to reduce reliance on cars and reduce congestion. Investment in maintenance and upgrade of transportation infrastructure, especially in rural areas, to ensure safety and efficiency. Collaboration between different levels of government, the private sector, and the public to develop a comprehensive transportation plan that meets the needs of all stakeholders. Incorporating sustainability and resiliency in transportation planning, such as reducing greenhouse gas emissions and building infrastructure that can withstand the impacts of climate change. Encouraging private investment in transportation infrastructure, such as through public-private partnerships, to complement government funding. Enhancing intercity and international trade by improving transportation connections and reducing trade barriers, such as by expanding the use of electronic documentation and enhancing the efficiency of customs processes. Investment in low-carbon transportation options, such as electric vehicles, to reduce greenhouse gas emissions and improve air quality. Increasing access to affordable transportation options, such as car sharing and public transportation, to improve mobility for low-income households.</p>

Figure 2. ChatGPT's answers to Q1 and Q2 (Selected).

Figure 2 shows ChatGPT's answers to Q1 and Q2 at one attempt. **Figure 3** illustrates the word clouds of the ChatGPT's responses. ChatGPT identified eight major transport issues in the US, including 1) congestion, 2) aging infrastructure, 3) climate change, 4) funding shortage, 5) the need to balance the interests of different transport modes, 6) the need to enhance intermodal connectivity, 7) the growing demand for alternative modes of transport, and 8) the need to reduce greenhouse gas emissions. Overall, the transport issues suggested by ChatGPT are in line with what transport researchers have discussed (NASEM, 2018).

ChatGPT also suggested ten solutions to solve the transport issues in the United States. These solutions include 1) investment in public transit, 2) implementation of smart transport systems, 3) development of alternative modes of transport, 4) improving infrastructure, 5) collaboration between different levels of government, the private sectors, and the public, 6)

frequency of the word “congestion” is higher in ChatGPT’s answers to Canada’s transport issues ([Figure 3\[c\]](#)) when compared to its frequency in ChatGPT’s answers on the United States ([Figure 3\[a\]](#)) despite the fact that traffic congestion is typically more severe in United States cities than in Canadian cities (INRIX 2022). However, we acknowledge that the higher frequency of a specific word does not necessarily mean its higher importance as a transport issue. Thus, advanced text mining techniques (e.g., semantic analysis) can be leveraged to draw a more definite and robust conclusion.

How does ChatGPT introduce transport problems and solutions in North America? Our results revealed that transport issues and solutions introduced by ChatGPT generally align well with transport researchers’ expectations. We argue that ChatGPT might be a decent starting point for citizens and researchers to discuss transport issues and solutions. Specifically, thanks to the conversational format of ChatGPT, citizens could explore information in a more interactive way (e.g., asking follow-up questions) compared to when they use traditional web-based search engines. However, one should be aware that ChatGPT’s capability may be limited in providing trustworthy or sound solutions because of the potential issues (e.g., geographic biases, inaccuracy) in its training data.

As an early effort, our research contributes to the transport literature by conducting a rapid assessment of ChatGPT’s capabilities for introducing and summarizing transport issues and solutions in North America. Transport researchers are encouraged to expand our work by considering potential analytical pitfalls, such as the black box characteristics of ChatGPT, the impacts of prompt wording on its responses, and performance differences between a free and premium model that has been recently released (OpenAI 2023b). A more comprehensive fact-checking of ChatGPT’s responses based on academic articles or government reports can be another viable future research direction. As generative AI technologies will continue to evolve with great potential to revolutionize our society, we do call for transport researchers and practitioners to think collectively about whether and how to embrace this game changer.

Acknowledgement

Junghwan Kim is supported by the Institute for Society, Culture and Environment at Virginia Tech. Jinhyung Lee is supported by the Faculty of Social Science at Western University.

Submitted: February 05, 2023 AEDT, Accepted: February 27, 2023 AEDT



This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CCBY-SA-4.0). View this license’s legal deed at <https://creativecommons.org/licenses/by-sa/4.0> and legal code at <https://creativecommons.org/licenses/by-sa/4.0/legalcode> for more information.

REFERENCES

- Dis, Eva A. M. van, Johan Bollen, Willem Zuidema, Robert van Rooij, and Claudi L. Bockting. 2023. "ChatGPT: Five Priorities for Research." *Nature* 614 (7947): 224–26. <https://doi.org/10.1038/d41586-023-00288-7>.
- Graham, Mark, Bernie Hogan, Ralph K. Straumann, and Ahmed Medhat. 2014. "Uneven Geographies of User-Generated Information: Patterns of Increasing Informational Poverty." *Annals of the Association of American Geographers* 104 (4): 746–64. <https://doi.org/10.1080/00045608.2014.910087>.
- Green, Mark A., Michael Widener, Frances Darlington Pollock, and Jamie Pearce. 2020. "The Evolution of Health & Place: Text Mining Papers Published between 1995 and 2018." *Health & Place* 61 (January): 102207. <https://doi.org/10.1016/j.healthplace.2019.102207>.
- Hartmann, J., J. Schwenzow, and M. Witte. 2023. "The Political Ideology of Conversational AI: Converging Evidence on ChatGPT's pro-Environmental, Left-Libertarian Orientation." *arXiv Preprint*. <https://arxiv.org/abs/2301.01768>.
- INRIX. 2022. "Global Traffic Scorecard." 2022. <https://inrix.com/scorecard/>.
- Kim, Junghwan, Kevin Wang, and Sampath Rapuri. 2022. "Quantitative Geographical Approaches in COVID-19 Research: A Review on First- and Second-Order Impacts." *The Geographies of COVID-19*, 37–48. https://doi.org/10.1007/978-3-031-11775-6_4.
- Mandal, Abhishek, Susan Leavy, and Suzanne Little. 2021. "Dataset Diversity: Measuring and Mitigating Geographical Bias in Image Search and Retrieval." *Proceedings of the 1st International Workshop on Trustworthy AI for Multimedia Computing, Trustworthy AI 2021*, October. <https://doi.org/10.1145/3475731.3484956>.
- National Academies of Sciences, Engineering, and Medicine (NASEM). 2018. *Critical Issues in Transportation 2019*. Washington, DC: The National Academies Press.
- OpenAI. 2023a. "ChatGPT: Optimizing Language Models for Dialogue." 2023. <https://openai.com/blog/chatgpt>.
- . 2023b. "Introducing ChatGPT Plus." 2023. <https://openai.com/blog/chatgpt-plus/>.
- Thorp, H. Holden. 2023. "ChatGPT Is Fun, but Not an Author." *Science* 379 (6630): 313–313. <https://doi.org/10.1126/science.adg7879>.