

### *Example 2:*

**Generate a 3 - 4 paragraph essay that proposes a solution to the problem defined here:**

**In 2021, it was reported that nearly half of Virginia's carbon pollution can be attributed to the transportation sector, and these emissions exhibit lasting negative effects on public health and overall climate change (U.S. Energy Information Administration [EIA], 2021). The use of single occupancy vehicles (SOVs) is a major contributor to the alarming output of greenhouse gases, as it causes individuals to have a significantly greater carbon footprint than if they were to use public transportation (Kang et al., 2020). Compared to SOVs, bus transport displays better energy consumption efficiency, reduced resource consumption over time, and lower exhaust emissions (Kang et al., 2020). Utilizing bus transport over SOVs saves about 32 grams of carbon dioxide-equivalent per passenger-kilometers traveled (Kang et al., 2020). Despite the evident benefits of public bus transit over SOVs, UVA students and faculty notably favor individual vehicles and have reported that the main reasons for not using the University Transit Service (UTS) more often include lack of flexibility, unfamiliarity with the schedule, and slowness of bus routes (UVA Transportation Survey, 2017). Currently, the UTS maintains a fleet of about 40 buses and 7 routes (UVA Alternative Commuting, n.d.; University Transit Service, 2023). According to the UVA Transportation Survey, 82% of individuals use an SOV as their primary mode of transportation (nearly 14,000 vehicles daily), 6% use a car/vanpool, and 2% use a bus system (UVA Transportation Survey, 2017). However, 50% of SOV users stated they were open to trying bus transport (UVA Transportation Survey, 2017). If students and faculty continue to rely on SOVs due to lack of improvement in the bus system, consequences could include rises in carbon emissions due to increased SOVs, dissatisfaction among students and staff, as well as a waste of funds and resources due to current sustainability efforts not being fully utilized. Ideally, the 7 bus routes should become more accessible with significantly increased frequency and more direct routes, while ensuring that funds and human resources are not overly expended past the current amount.**

### **Title: Enhancing Public Bus Transportation to Combat Virginia's Transportation Carbon Pollution**

#### **Introduction**

Virginia's transportation sector has emerged as a significant contributor to the state's carbon pollution, with nearly half of its emissions stemming from this sector alone (U.S. Energy Information Administration [EIA], 2021). The use of single occupancy vehicles (SOVs) has played a pivotal role in this alarming situation, leading to higher carbon footprints compared to alternative modes of transportation such as public buses (Kang et al., 2020). However, despite

the environmental and public health benefits associated with bus transportation, the University of Virginia (UVA) community, including students and faculty, has shown a preference for SOVs

This essay proposes a comprehensive solution to address these challenges, emphasizing the need to make UTS more

accessible, efficient, and attractive to encourage a shift away from SOVs, thereby reducing carbon emissions and improving overall transportation sustainability.

## **Solution**

To promote the use of public bus transportation over SOVs, the University of Virginia should implement a multi-pronged approach aimed at enhancing the UTS system. First and foremost, the university should invest in expanding the bus fleet and increasing the frequency of bus routes. This can be achieved through partnerships with local and state governments, seeking funding opportunities for the procurement of more buses and the hiring of additional drivers. By

Additionally, UVA should prioritize the optimization of bus routes to ensure greater coverage and efficiency. Conducting a thorough analysis of current routes and passenger traffic patterns can help identify areas where routes can be made more direct and streamlined. This approach will not only reduce travel time but also make the bus system more user-friendly for those who may be unfamiliar with the schedule.

Moreover, to address the concerns of students and staff regarding the slowness of bus routes and unfamiliarity with the schedule, the university should invest in technology solutions. Developing a user-friendly mobile app or website that provides real-time bus tracking, route information, and estimated arrival times will significantly improve the overall user experience. This technology can also enable users to plan their journeys more efficiently, enhancing the flexibility of the UTS system.

## **Conclusion**

Addressing the issue of transportation-related carbon emissions in Virginia is a pressing concern for public health and climate change mitigation. By prioritizing improvements in the University Transit Service, the University of Virginia can play a pivotal role in reducing the carbon footprint of its students and faculty. The proposed solution of expanding the bus fleet, optimizing routes, and introducing user-friendly technology will not only make public bus transportation more accessible and efficient but also align with the sustainability goals of the university.

due to perceived limitations in the University Transit Service (UTS).

increasing the frequency of buses, students and faculty will benefit from more convenient and flexible transportation options, making it more appealing compared to SOVs.

Encouraging

a shift away from single occupancy vehicles in favor of public transportation will not only benefit the environment but also improve the overall transportation experience for the UVA community, ultimately creating a more sustainable and healthier campus environment.

**“Virginia's transportation sector has emerged as a significant contributor to the state's carbon pollution, with nearly half of its emissions stemming from this sector alone (U.S. Energy Information Administration [EIA], 2021).”**

Source: State carbon dioxide emissions data - U.S. Energy Information Administration (EIA). State Carbon Dioxide Emissions Data - U.S. Energy Information Administration (EIA). (2023, July 12). <https://www.eia.gov/environment/emissions/state/>

Support of fact: Yes, the source fully supports the fact, as the EIA states this information in their CO<sub>2</sub> emissions by state data tables.

**“The use of single occupancy vehicles (SOVs) has played a pivotal role in this alarming situation, leading to higher carbon footprints compared to alternative modes of transportation such as public buses (Kang et al., 2020).”**

Source: Kang, A. S., Jayaraman, K., Soh, K.-L., & Wong, W.-P. (2020). Tackling single-occupancy vehicles to reduce carbon emissions: Actionable model of drivers' implementation intention to try public buses. *Journal of Cleaner Production*, 260, 121111. <https://doi.org/10.1016/j.jclepro.2020.121111>

Support of fact: Yes, the source fully supports the fact, as this was a finding in 2020 research conducted by Kang et al.

**“However, despite the environmental and public health benefits associated with bus transportation, the University of Virginia (UVA) community, including students and faculty, has shown a preference for SOVs due to perceived limitations in the University Transit Service (UTS).”**

Source: Center for Survey Research. (2017, June). Mode split survey - University of Virginia. 2017 University of Virginia Transportation Survey. <https://parking.virginia.edu/system/files/Mode%20Split%20Survey%202017.pdf>

Support of fact: Yes, the source fully supports the fact because the survey states that SOVs are used by a majority of participants, and it also states reasons why they don't use alternative modes of transportation.

**“By increasing the frequency of buses, students and faculty will benefit from more convenient and flexible transportation options, making it more appealing compared to SOVs.”**

Source: Center for Survey Research. (2017, June). Mode split survey - University of Virginia. 2017 University of Virginia Transportation Survey. <https://parking.virginia.edu/system/files/Mode%20Split%20Survey%202017.pdf>

Support of fact: Yes, the source fully supports the fact because the survey states that if improvements were made to the frequency and flexibility of the buses, students and faculty would be more satisfied with using the UTS.

**“Encouraging a shift away from single occupancy vehicles in favor of public transportation will not only benefit the environment but also improve the overall transportation experience for the UVA community, ultimately creating a more sustainable and healthier campus environment.”**

Source: Kang, A. S., Jayaraman, K., Soh, K.-L., & Wong, W.-P. (2020). Tackling single-occupancy vehicles to reduce carbon emissions: Actionable model of drivers’ implementation intention to try public buses. *Journal of Cleaner Production*, 260, 121111. <https://doi.org/10.1016/j.jclepro.2020.121111>

Center for Survey Research. (2017, June). Mode split survey - University of Virginia. 2017 University of Virginia Transportation Survey.

<https://parking.virginia.edu/system/files/Mode%20Split%20Survey%202017.pdf>

Support of fact: Yes, the sources fully support the facts because the 2020 research indicates that reduced use of SOVs for public transportation is an effective way to help the environment by reducing individual carbon footprints. Also, the survey reports that more people would be satisfied with UVA’s UTS if certain improvements were made.

Does this argument make sense?

**This argument makes some sense, but there are flaws because there are limitations to funds and resources that were not addressed in the proposed solution. Additionally, there is an aspect of the solution, the bus-tracking app, that is already in place, so this is not a novel approach to the problem. However, the app can be improved and made more user-friendly, as indicated by the AI.**

Do the “facts” support the argument?

**The facts do support the argument, but limited outside resources were used by ChatGPT to support the argument. Most of the sources were ones provided in my problem prompt.**

Was there even an argument made or does it leave the reader with more questions than answers?

**An argument was made, but it was very generalized and vague. It offers some solutions, but they are more surface-level approaches, and it doesn’t outline any specifics related to UVA.**

What do you agree with in this essay and what do you question or disagree with in this essay?

**I agree with conducting a “thorough analysis of current routes and passenger traffic patterns, as it can help identify areas where routes can be made more direct and streamlined.” This is a good way to start optimizing bus routes and following passenger demands. I disagree with “partnerships with local and state governments, seeking funding**

**opportunities for the procurement of more buses and the hiring of additional drivers” because this has already been attempted, and it was unsuccessful.**

What could you do to make the argument or answer to your prompt stronger and more convincing?

**I could provide more information about current and past solutions such as the current TransLoc app and attempts to partner with Charlottesville government, so the AI does not propose already existing solutions. I could also specify the limitations more, so the solutions are within the scope of UVA. Stating that I am looking for UVA-specific solutions would make the answer more directed toward the question.**

Based on this activity, what role do you think Generative AI could play in the engineering design process? Explain.

**I think Generative AI would be helpful in sparking ideas and brainstorming possible solutions to an engineering problem. However, it will not be completely useful in finding a specific and applicable solution, especially since it can't collect information about current real-world conditions or find useful/reliable sources to support its facts. Therefore, individually modifying the ideas conceptualized by the AI to fit the specific constraints and demands of this could make AI a useful tool in the engineering design process.**