

Singapore’s transportation system is already efficient but can be further enhanced leveraging LLMs

As one of the most developed and technologically advanced city-states in Asia, Singapore stands at the forefront of innovation and urban planning and is renowned for its commitment to sustainability, digital transformation, and high quality of life. Despite these achievements, transportation remains a critical improvement area to meet the growing demand of its population and align with environmental goals. Singapore's transportation system, although efficient, faces challenges in terms of scalability, congestion management, sustainability, and the integration of smart technologies. Also taking into account the Singapore Green Plan 2030, aiming to achieve a greener and cleaner land transport system, our goal was to create an innovative chatbot (TransportGPT) that can not only generate short term efficient solutions to motorist’s and commuter’s enquiries but also encourage transportation routines that will help achieve the long term goals set by the Singaporean Ministry of Transport.

Taking Singapore’s urban mobility to the next level with TransportGPT

Large Language Models (LLMs) like GPT (Generative Pre-trained Transformer) represent the cutting edge of artificial intelligence and machine learning due to their ability to understand, generate, and interpret human-like text and images based on vast amounts of data they've been trained on. This capability makes them exceptionally versatile and powerful tools for complex problem-solving scenarios such as enhancing urban mobility. Hence, our ambitious objective is to innovate a TransportGPT to solve Singapore’s transportation infrastructure challenges.

TransportGPT’s tech stack and flowchart is designed to enable fast, reliable and accurate responses to users

TransportGPT employs a streamlined flow to efficiently gather real-time data from databases through APIs for user queries, simultaneously encouraging sustainable travel through engaging conversations. OpenAI is chosen for its compatibility with LangChain, enhancing dialogue with a memory buffer that retains user interactions for natural communication. Competent for human language comprehension with extensive expertise in transportation, it can process users' inquiries and assign complex computational tasks to custom tools to provide relevant route suggestions and traffic conditions. On top of automated data analysis, the BLIP (Bootstrapping Language-Image Pre-training) model from Hugging Face uses image processing to analyse live road condition images to determine road crowdedness levels, helping TransportGPT provide suggestions to prevent traffic congestion for the user at any given time. Additionally, Python’s SpeechRecognition package broadens accessibility, offering voice-to-text features for users with diverse needs or disabilities.

The prototype is trained to function as route planning and traffic and road management assistant

The TransportGPT prototype currently focuses on enhancing two primary business scenarios: optimising route selection for both drivers and public transit users, and assisting transportation entities with traffic and infrastructure management. In terms of route optimization, TransportGPT calculates the most efficient and convenient paths by analysing real-time traffic conditions, road incidents, and traffic density, utilising data from the Google Maps API, LTA Datamall API, and Data.Gov.SG API. It assesses a broad spectrum of information, including traffic updates and live camera feeds, to deliver precise and useful guidance to users. For drivers, TransportGPT suggests eco-friendlier travel options by evaluating factors such as limited parking, route congestion, or faster travel times with alternative transport methods, thereby encouraging more sustainable commuting choices. In addressing traffic and road management inquiries, TransportGPT evaluates specific requests related to public transportation services (such as particular MRT lines or bus routes) and provides insightful feedback. It leverages both real-time and historical data from relevant APIs to present findings in easy-to-understand graphical formats, aiding transportation authorities and organisations in their decision-making processes.

TransportGPT unlocks more customer satisfaction and business value compared to current alternatives on the market

TransportGPT distinguishes itself in enhancing customer satisfaction and delivering greater business value compared to existing market solutions. When compared with alternatives such as ChatGPT 3.5, Google Maps, and CityMapper across various benchmarks including quality of data sources, accuracy and relevance of responses, technical performance metrics like latency and availability, commitment to responsible and sustainable AI practices, and overall business impact, TransportGPT demonstrates a notable competitive advantage. Its unique access to Singapore's real-time traffic data ensures unparalleled accuracy and relevance in its responses to users in Singapore, positioning TransportGPT as the most effective tool for identifying traffic and public transportation patterns and suggesting strategies to alleviate congestion. The only area where TransportGPT marginally falls short against its competitors is in technical performance, attributed to its current deployment on local servers with comparatively lower computational power. However, this is anticipated to improve significantly with a professional rollout.

TransportGPT innovates and enhances Singapore’s urban mobility as well as opens door to future tech builds

TransportGPT represents a significant advancement in enhancing Singapore's urban transport landscape and paves the way for future, more advanced features. Beyond its current capabilities, we envision incorporating more sophisticated functionalities. These enhancements include expanding TransportGPT's integration into automotive systems and other urban environments in order to collect even more real-time data for analyses and best-practices, conducting more detailed analyses of public transit systems to offer targeted solutions for congestion, enabling adaptive scheduling for public transportation like express trains and buses, implementing synchronised traffic signals for smoother traffic flow, and planning for electric vehicle (EV) charging infrastructure. The streamlined technology stack and architecture of TransportGPT facilitate the seamless addition and integration of these advanced features.