Technical Report: Chatbot for Transmilenio Public Transportation System

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This report presents the development and implementation of a chatbot designed to assist users of the Transmilenio public transportation system in Bogotá, Colombia. The chatbot utilizes a large language model (LLM) to provide real-time information about routes, schedules, and service disruptions, thereby enhancing the overall travel experience for commuters. The Transmilenio system, a crucial component of Bogotá's public transportation infrastructure, serves millions of passengers each month, making the need for accessible and accurate information essential. The chatbot integrates with the Transmilenio API, allowing it to access real-time data on bus routes, schedules, and potential service disruptions. This integration not only ensures that users receive timely updates but also enhances the reliability of the information provided. The design enables the chatbot to understand natural language queries, allowing users to ask questions in a conversational manner, which simplifies the user experience. The architecture of the system is illustrated in Figure 1, which shows the interactions between the user interface, the LLM, and the API.

Several critical technical decisions guide the development of the chatbot. The technology stack includes programming languages and tools that facilitate efficient processing of user inputs and simplify the deployment of the chatbot, ensuring that it can handle multiple simultaneous users without significant delays. The LLM is selected for its advanced capabilities in natural language understanding and generation, which are vital for providing users with accurate and contextually relevant responses. The model is trained on a diverse dataset, including transportation-related queries, frequently asked questions, and typical user interactions, improving its understanding of context-specific language. The integration with the Transmilenio API serves as a crucial component of the architecture, enabling the chatbot to fetch real-time data on routes and schedules, which is essential for providing accurate and timely information to users. Error handling mechanisms are implemented to manage situations where the API may be unavailable or return unexpected results, ensuring the chatbot maintains functionality even in less-than-ideal scenarios.

The user interface is designed to be intuitive and user-friendly, employing a minimalistic approach that focuses on ease of navigation. Users can input their queries directly into a chat window, with responses displayed clearly and concisely. Accessibility features are included to accommodate users with disabilities, ensuring that the chatbot is usable by the widest possible audience. Additionally, the chatbot is designed to handle various user intents, such as inquiries about specific bus routes, estimated arrival times, and general questions

about the Transmilenio system. This versatility is achieved through the implementation of a robust intent recognition system, which analyzes user input and determines the appropriate response based on the identified intent.

The chatbot is subjected to extensive testing to ensure its functionality and reliability. A comprehensive testing strategy includes unit tests, integration tests, and user acceptance tests. The unit tests verify individual components of the chatbot, ensuring that each part functions correctly in isolation. Integration tests assess the interaction between different components of the system, such as the chatbot, the LLM, and the Transmilenio API, ensuring that they work seamlessly together. User acceptance testing involves real users interacting with the chatbot to evaluate its performance in a real-world setting. The goal is to achieve a high satisfaction rate, with a significant percentage of users reporting that the chatbot effectively addresses their queries. Performance metrics are also established, aiming for an average response time of less than two seconds, which demonstrates efficiency compared to existing systems.

In addition to user feedback, performance analytics will be collected to monitor how well the chatbot performs under varying loads and to identify areas for improvement. These analytics include metrics on response accuracy, user engagement levels, and the types of queries most frequently posed to the chatbot. This data will help inform future iterations of the chatbot, guiding enhancements to its capabilities and user experience.

In conclusion, the development of the Transmilenio chatbot represents a significant advancement in how public transportation information is accessed. By leveraging a large language model and integrating real-time data from the Transmilenio API, this tool enhances the commuter experience, making it easier for users to navigate the Transmilenio system. The project's ongoing nature allows for continuous improvement based on user feedback and performance metrics, ultimately aiming to provide a reliable and efficient service for all users of Bogotá's public transportation system.

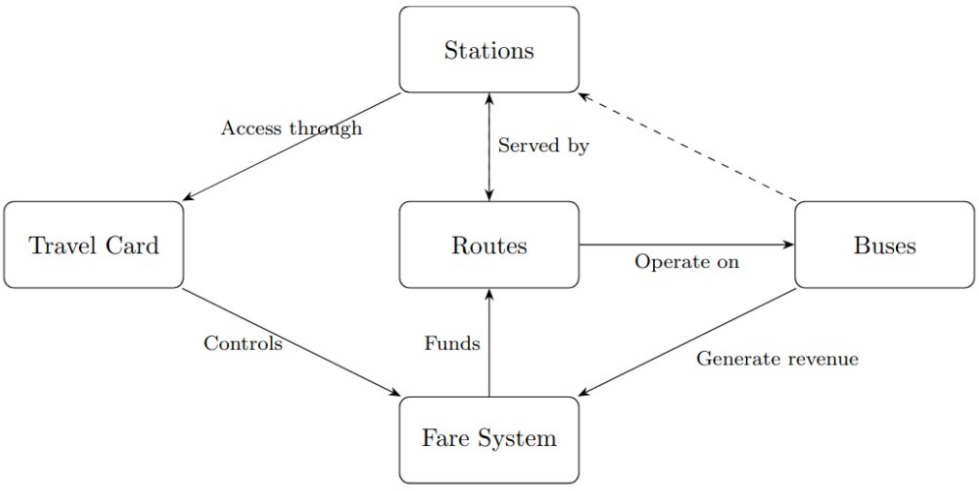

Figure 1: System Architecture of the Transmilenio Chatbot