RideWise: LLM-Enhanced Bicycle Navigation

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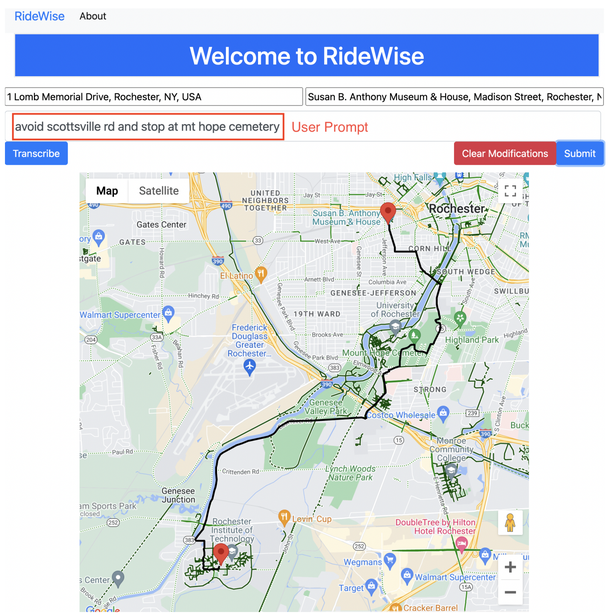
Introduction

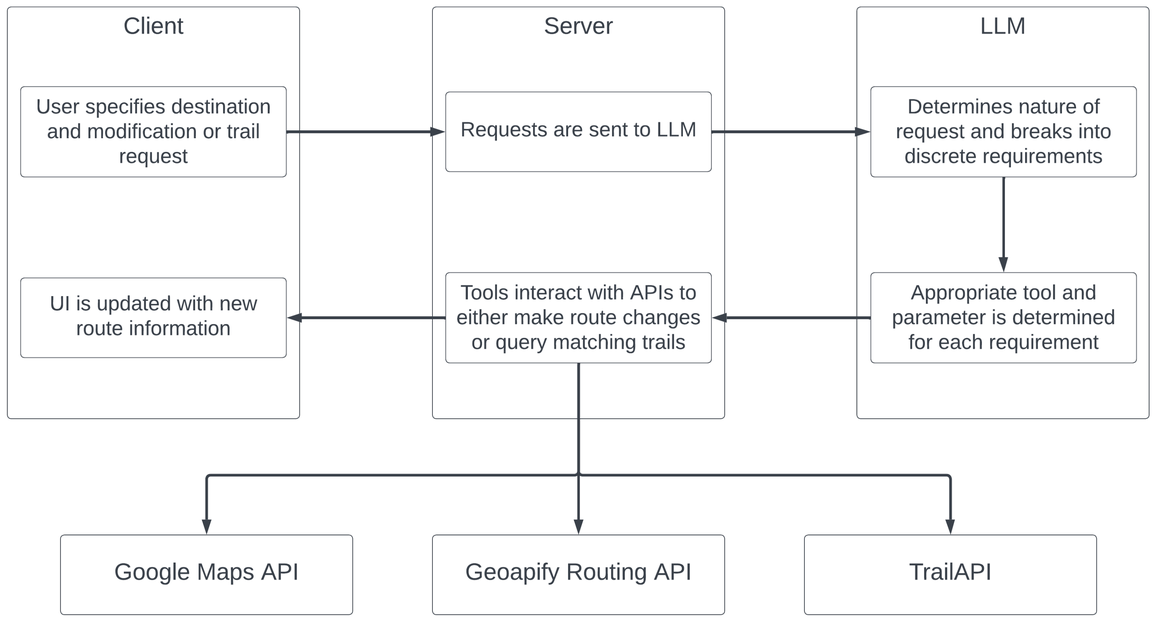
Modern navigation apps are extremely effective for cars, but are missing the adaptability necessary for bicycling. In this work, I have attempted to address these shortcomings by incorporating a *Large Language Model* (LLM) into the standard navigation app structure.

Objectives

- Develop a solution for more effective bicycle navigation.
- Learn about LLM prompting techniques and system design strategies.
- Compare effectiveness of open-source LLMs vs. commercial models (ChatGPT), as well as single models vs. ensemble.



System Architecture



Client

- Handles user interaction and displays generated routes and trails.
- Speech-to-text capability is included for hands-free modification.

Server

- Routes communication between client, LLM, and APIs.
- Employs extensive error-checking logic to safeguard against LLM errors and ensure user requests are reflected in service.

LLM

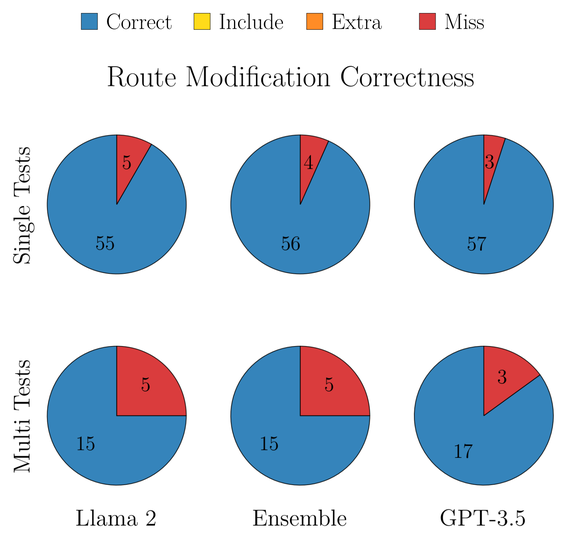
The LLM component in this work is used as a sophisticated parser that extracts relevant information from the user prompt. No fine-tuning is performed; instead relying on few-shot prompting.

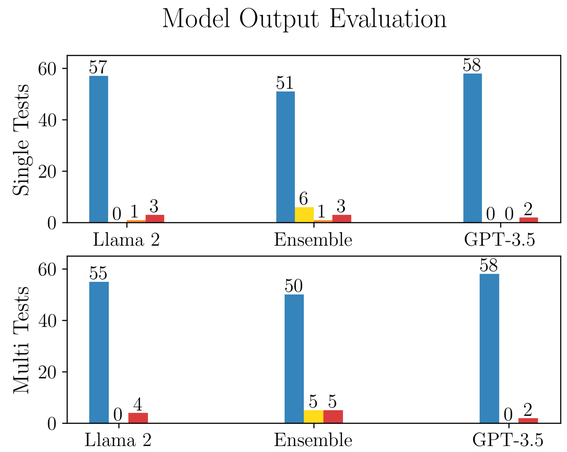
- **Modification or Trail?**: Determines if request is related to a route modification ❶ or an informational request about local trails ❷.
- **Splitting Input**: Splits input into discrete requests.

❶ **Choosing Change**: Decides which type of change is being requested as part of each request.

❷ **Extracting Trail Information**: Extracts relevant details about trail information request.

Results





Conclusion

A functional LLM component was successfully integrated that achieves over 90% accuracy on single objective tests. Some improvement was gained from using a commercial model or an ensemble, but not enough to justify their respective costs.