Using Large Language Models and Generative AI for MND Assistive Devices

Problem Statement

The project centers on Rolls-Royce's initiative to enhance communication for individuals with MND, a condition that often impairs speech. This is achieved through a system that provides response suggestions for MND patients' queries. To ensure accurate responses tailored to MND patients' unique language patterns, we utilized GPT and other pre-trained language models. This innovative approach aims to streamline interactions and reduce the reliance on manual responses, ultimately improving communication for those affected by MND.

Acknowledgement

We thank Dr Jan Rock (Citibank) and Dragomir Kovacevic (Rolls-Royce) for valuable suggestions and feedback on our research.

Objective

This research explores the transformative capabilities of advanced language models, including GPT3.5 without memory, GPT3.5, HuggingChat (LlaMa 30B SFT 6), Alpaca 7B, PaLM-2, and Google Bard, in enhancing communication and the quality of life for MND patients. We evaluate the performance of each model based on criteria such as response time, user-friendliness, overall satisfaction, and customer feedback through a user survey.

- Memory and context are added to the models using a framework called LangChain.
- LangChain is a language-processing framework to build a wide range of large language model powered applications.

Model Evaluation

(surveys accessed: 10am 07/09/2023)

		User ratings between 1-5			
	Name of the models	Overall satisfaction	User-friendliness	Accuracy	Response time
	GPT3.5 without memory	4.14	4.71	3.8	4.28
With Langchain	GPT3.5	4.14	4.71	4.28	4.14
With Langchain	Hugging Chat	4.0	4.25	4.25	4.0
With Langchain	Alpaca 7B	3.5	3.83	3.5	2.17
With Langchain	Google BARD	3.5	4.0	4.0	4.0

Personalization

- **GPT 3.5 + Langchain:** Added personalization for user profile-based recommendations.
- **PaLM-2 + Langchain:** Introduced personalization layer for tailored recommendations based on MND users' relationships and emotions.
- Performed **tone analysis** on the models' responses using AI-based sentiment analysis.
- Preliminary **fine-tuning** of GPT3.5 with memory using the recently released OpenAI API on a sample dataset showed potential for improvement.

Recommendation

GPT3.5 with memory performed the best and is the recommended model to use.

Future directions

- **Reinforcement Learning through Human Feedback:** A method for training AI models using RL, incorporating feedback from human interactions to enhance their performance.
- **Curated Datasets:** Datasets are carefully curated to capture conversations specific to MND and include sentiment, enabling models to respond better.
- **Response Classification for Retraining:** Continuous evaluation and classification of responses help in the iterative retraining of adaptive models.
- **Customizable User Responses:** Users have the option to personalize or customize AI responses, enhancing the user experience.