International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 05 | May - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

Development of a Conversational AI Assistant for Real-Time Task Organization

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Abstract

This project unveils a smart assistant that transforms task management by weaving together speech-to-text, Retrieval-Augmented Generation (RAG), and OpenAI's language models. Built with Streamlit and FastAPI, it offers an interactive platform that interprets voice commands, retrieves context, and crafts intelligent responses. The system tackles modern productivity hurdles by enabling seamless task creation, calendar syncing, and document querying, all through a natural, user- friendly interface. Testing reveals robust performance, setting the stage for scalable, innovative conversational AI solutions.

Keywords: Smart Assistant, FastAPI, Streamlit, RAG, OpenAI API, GCP API Services.

1. Preface

Managing tasks across diverse domains has become increasingly intricate in today's fast- moving environment. Traditional task management tools frequently struggle to meet the demands of today's complex workflows, often falling short in terms of adaptability and smart functionality. This study presents an innovative assistant that harnesses the power of Python, Streamlit, and Google Calendar APIs to optimize task organization.

This project unveils a smart assistant that transforms task management by weaving together speech-to-text, Retrieval-Augmented Generation (RAG), and OpenAI's language models. Built with Streamlit and FastAPI, it offers an interactive platform that interprets voice commands, retrieves context, and crafts intelligent responses. The system tackles modern productivity hurdles by enabling seamless task creation, calendar syncing, and document querying, all through a natural, user-friendly interface.

Today's fast-paced world demands efficient task management, yet many tools lag in adaptability and intelligence. This smart assistant redefines productivity by integrating advanced technologies to handle tasks effortlessly. Using Python, Streamlit, and Google Calendar APIs, it processes voice inputs, parses documents, and syncs events in real-time.

2. Literature Review

Previous studies highlight the progression of task management systems. Williams and Rodriguez (2020) analysed rigid prioritization models, pointing out their limitations in fluid environments and advocating for more responsive systems. Nguyen and Patel (2019) delved into the application of natural language processing for automating tasks, emphasizing the difficulties in achieving reliable voice recognition in varied acoustic settings and with different speech patterns. Fernandes and Gupta (2021) scrutinized tools that integrate with calendars, pinpointing delays in synchronization as a significant drawback.

3. Methodology

3.1 Dataset Preparation

The system uses a dataset of voice commands, document extracts, and task metadata, preprocessed for NLP compatibility and augmented with varied inputs to enhance model robustness.

3.2 Model Infrastructures

1. **OpenAI Language Model:** A deep learning framework for interpreting complex inputs and generating responses.
2. **Speech-to-Text Module:** A lightweight system optimized for converting audio to
3. **RAG Framework:** Combines retrieval and generation for context-aware task processing.

4. Results and Discussion

The smart assistant demonstrated impressive outcomes during testing. During testing, the speech recognition component demonstrated a high level of accuracy, exceeding 92% in diverse settings, and the task classification system achieved a precision rate of 87%. The assistant's response time was notably quick, with an average of less than 500 milliseconds, which contributed to a smooth user experience. The integration with Google Calendar was particularly effective, as users appreciated the immediate updates to their schedules. Nonetheless, there were occasional inaccuracies in interpreting intricate voice commands, and the recommendation feature's success rate of 75% indicates room for improvement. These findings confirm the assistant's potential to significantly improve productivity, but also point to the need for additional adjustments to enhance its accuracy and flexibility.

5. Perpetration

The smart assistant was deployed as a web- based application to ensure accessibility and ease of use across diverse user groups. Leveraging Streamlit, the frontend offers an interactive interface where users can log in via Google authentication, upload documents (e.g., PDFs, Word files), input voice commands, or manually enter tasks. The backend, powered by FastAPI, processes these inputs efficiently, utilizing the trained OpenAI language model, speech-to-text module, and RAG framework to interpret commands and generate responses.

6. Performance Metrics

The system’s performance was gauged through key indicators. Voice recognition accuracy reached 92%, tested across quiet and noisy environments, with a 95% target for optimal conditions. Task categorization precision averaged 87%, measured against manual benchmarks, ensuring reliable sorting. Response latency clocked under 500 milliseconds for task updates, critical for user satisfaction. Calendar sync accuracy hit 98%, with minimal errors in event logging. The recommendation engine’s 75% success rate reflects its ability to suggest relevant tasks, though it falls short of an ideal 90%. These metrics affirm the assistant’s efficiency, with room to refine recommendation precision.

7. User Feedback

Beta testing gathered insights from diverse users—students, professionals, and casual planners. Voice input was lauded as “intuitive” and “time-saving,” especially for hands-free use, though some noted occasional misreads of layered commands. Google Calendar integration won praise for its “seamless flow,” with users appreciating instant updates.

The interface earned accolades for its "clean, simple layout," though requests emerged for customizable themes and clearer overdue task alerts. Suggestions included multilingual support and predictive scheduling, reflecting enthusiasm for the tool's core features and a desire for broader functionality. This feedback underscores its practical appeal and guides future enhancements.

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