

AI-Enhanced Dementia Care Coordination: Empowering Caregivers and Students

Alzheimer's disease (AD) currently affects over 6.2 million Americans aged 65 and older and is the 6th leading cause of death in the US. Caregivers may be initially self-reliant, utilizing the internet as a tool to locate resources and navigate the healthcare system (Kokorelias, 2021). However, as the care recipient's ability to perform both independent activities of daily living (IADLs) and basic activities of daily living (ADL) diminishes, caregivers find themselves in need of more guided direction and navigational support to identify and access services that are often uncoordinated and not tailored to the unique needs of the care recipient or caregiver (Brown et al., 2019; Kokorelias, 2021; Possin et al., 2017; Ruggiano et al., 2019).

Our project aims to address these challenges by proposing a robust solution leveraging Large Language Models (LLMs) to enhance resource accessibility and deliver personalized recommendations for caregivers and care recipients. At the core of our program is an AI-assisted dementia care coordination system comprising three key components. Firstly, Large Language Models (LLMs) trained on an extensive dataset of dementia care services will analyze vast amounts of complex data. The trained LLM will empower caregivers to efficiently pinpoint the most relevant resources based on their loved one's disease stage, location, financial constraints, and other important factors. Secondly, the LLMs will leverage a curated dataset of historical suggestions provided to caregivers at our AD Center in North Carolina A&T. This allows the system to integrate caregiver and professional's insights, and adapt to the patient's evolving condition. Finally, the system will extend support to both caregivers and student care coordinators, acting as a virtual mentor, enhancing their knowledge base. Our LLM will be trained on student and caregiver feedback to constantly refine the recommendations, thus improving the overall caregiving experience and well-being of those involved.

Our methodological approach synergizes human-centered principles with advanced AI techniques to achieve these goals:

- **LLM Foundation:** We'll leverage a cutting-edge LLM (e.g., LLaMA-3) and meticulously curate a specialized dataset focused on dementia care resources, stage-specific needs, and the latest evidence-based practices. This precisely fine-tuned LLM will serve as the intelligent backbone of our system.
- **Prompt Engineering:** We'll design carefully constructed prompts with locally curated dataset to guide the LLM's output, ensuring consistently insightful and actionable recommendations, professionally approved.
- **Human-AI Collaboration for care Plans:** LLMs, in conjunction with reinforcement learning and direct caregiver and student feedbacks, will be optimized to generate care plans and resource recommendations that dynamically adapt to individual needs and disease progression. This ensures the LLM's recommendations maintain real-world relevance and value.
- **Retrieval-Augmented Generation (RAG):** This technique integrates retrieval-based methods into Large Language Models (LLMs) to improve the generation of updated responses, which are informed by changes in guidelines, online resources, or new instructions. By doing so, it avoids the need for extensive model retraining while introducing innovative approaches to response generation.
- **Proactive Bias Mitigation:** We recognize the importance of representativeness in dataset curation, and we plan to address the current existing biases in model prediction. We'll proactively analyze feedback and outcomes to detect potential biases and employ fairness-aware training techniques to promote equitable results.
- **Longitudinal Data Analysis:** LLMs will power longitudinal data analysis, rigorously evaluating the program's impact on caregiver burden, patient outcomes, and resource utilization over time.