

LLM-Based Long-Term Life Task Planning to Reduce Human Uncertainty

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Abstract

In long-term life tasks, people often face challenges from uncertainty in tasks and information-seeking, which can create difficulties in decision-making and task completion. Recent advancements in Artificial Intelligence (AI), especially in Large Language Models (LLMs), offer transformative capabilities in domain-specific task planning and problem-solving. Despite these innovations, there is limited understanding of how such technologies can be applied to assist humans in long-term life tasks. This dissertation work seeks to address this gap by exploring how human-AI collaboration, mediated through LLM-based agents, can improve long-term life task planning and uncertainty management. To achieve this, this dissertation first proposes the long-term life task type and investigates how people may use AI tools to assist them in planning long-term life tasks and cope with uncertainty. Secondly, it proposes the Goal Oriented Long-term liFe planning (GOLF) framework that integrates LLMs to emulate human-AI collaboration in diverse long-term life task domains. The framework facilitates task decomposition and iterative planning while evaluating uncertainties throughout the process. Thirdly, the study introduces a GOLF benchmark to evaluate and generalize the effectiveness of LLMs in long-term planning scenarios. This study operates at the intersection of cognitive science, information science, and human-AI interaction, and makes multifaceted contributions. Theoretically, by introducing the concept of long-term life tasks and proposing the GOLF framework, it explores the potential of human-AI collaborations for long-term planning and uncertainty management. Methodologically, through a simulation-based approach and the LLM benchmark, it enables systematic evaluation of LLMs in long-term planning scenarios across domains. This work bridges the gap between human cognitive strategies and AI planning capabilities, providing a robust foundation for future advancements in AI-assisted task management and goal achievement.

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Selected Publications

- Ben Wang. Golf: Goal-oriented long-term life tasks supported by human-ai collaboration. In *Proceedings of the 47th International ACM SIGIR Conference on Research and Development in Information Retrieval*, pages 3072–3072, 2024a.
- Ben Wang. A proactive system for supporting users in interactions with large language models. In *Proceedings of the 2024 Conference on Human Information Interaction and Retrieval*, pages 441–444, 2024b.
- Ben Wang and Jiqun Liu. Investigating the role of in-situ user expectations in Web search. *Information Processing & Management*, 60(3):103300, 2023.
- Ben Wang and Jiqun Liu. Understanding users’ dynamic perceptions of search gain and cost in sessions: An expectation confirmation model. *Journal of the Association for Information Science and Technology*, 75(9):937–956, 2024.
- Ben Wang, Jiqun Liu, Jamshed Karimnazarov, and Nicolas Thompson. Task supportive and personalized human-large language model interaction: A user study. In *Proceedings of the 2024 Conference on Human Information Interaction and Retrieval*, pages 370–375, 2024.