



Agentic AI-Powered Workflow Automation System

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The majority of organizations and universities in Sri Lanka still use traditional manual workflows, which cause scheduling problems, inefficiencies, and difficulties in retrieving important information in a timely manner. To overcome these problems, this research introduces a conversational agent-based Agentic AI-Powered Workflow Automation System (APWAS), a Multi-Agent System implemented at the Faculty of Engineering, University of Ruhuna. APWAS integrates three specialized agents: a Guidance-Agent (GA) using a privacy-preserving Retrieval-Augmented Generation (RAG) pipeline with locally-hosted LLMs. The GA offers instant and accurate access to the institution's policies through its two specialized sub-agents: the University-Agent, which retrieves information from internal resources such as university documents and websites; and the Governance-Agent, which deals specifically with regulatory materials by accessing UGC circulars, procurement guidelines, and establishment codes. A Hall-Booking-Agent (HBA) features a novel hybrid recommendation engine backed by a dual-database architecture, and a Planner-Agent (PA) employs a unified constraint optimization model for integrated academic and examination timetabling. APWAS ensures data sovereignty. Evaluation shows the GA achieved 0.95 context recall and 100% autonomous tool accuracy. The HBA demonstrated perfect intent recognition, and the PA generated conflict-free schedules. User Acceptance Testing yielded a 4.9/5 satisfaction score. Agents are integrated into a single interface, and role-based access control is implemented for students, staff, and administrators. The system is deployed in a VPS environment with 2GB RAM, 2 CPU cores, and 25GB of storage space. Only free open-source models and tools are used, which are cost-effective and provide data sovereignty, thereby addressing institutional privacy concerns. Central authentication is used for agent coordination, while plans are in place for direct negotiation protocols. This integrated, agentic architecture provides a scalable blueprint for modernizing administrative workflows, demonstrating a practical, secure model for universities and public and private sector institutions where data privacy and operational autonomy are critical.

Keywords: Agentic AI, Workflow automation, Privacy-preserving RAG, Hall booking, Dual database