

C-Pilot: Accelerating Administrative Workflows in Schools through a Multi-Agent System

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Abstract—School administrative workflows often involve complex navigation, repetitive tasks, and system issues, leading to inefficiencies and productivity challenges. Existing solutions, such as Robotic Process Automation (RPA) and Large Language Model (LLM), offer limited assistance but struggle with adaptability and real-time responsiveness. To address these limitations, this paper proposes a C-pilot, a Multi-Agent System (MAS) integrated with LLMs to enhance school administration by automating tasks, offering intelligent guidance, and delivering real-time troubleshooting. C-pilot utilizes autonomous agents within its Application Service Module (ASM) and Pipeline Creation Module (PCM) to streamline information retrieval and facilitate customizable automated workflows. Experimental results indicate that C-pilot significantly shortens task execution time, enhances operational precision, and increases system adaptability. These findings highlight the scalability and flexibility of C-pilot, improving efficiency and user experience in modern educational institutions.

Index Terms—Large language model, AI agent, multi-agent system

I. INTRODUCTION

In school administration, students and staff often struggle with complex websites, repetitive tasks, and system failures, leading to inefficiencies like slow navigation, redundant forms, and delayed troubleshooting.

To address this, researchers explored automation approaches. Robotic Process Automation (RPA) handled repetitive, rule-based tasks but struggled with unstructured data and dynamic environments, requiring frequent reconfiguration when systems changed [1].

Fine-tuned LLMs handled more complex decisions. For instance, region-specific datasets helped businesses adapt to cultural and regulatory differences [2], but frequent retraining was costly.

LLM agents used real-time retrieval and tool integration to reduce retraining, excelling in language understanding and decision support, yet lacked adaptability and task coordination [3], [4].

To overcome this, researchers proposed LLM-based Multi-Agent Systems (MAS), which automate tasks via coordinated agents [4], [5]. SMART-LLM for multi-robot coordination [6] shows the power of collaborative intelligence.

This paper presents C-pilot, an LLM-based MAS for streamlining school workflows. It automates tasks, provides intelligent guidance, and supports real-time troubleshooting. Experiments show it reduces task time and improves accuracy, offering a scalable solution for education.

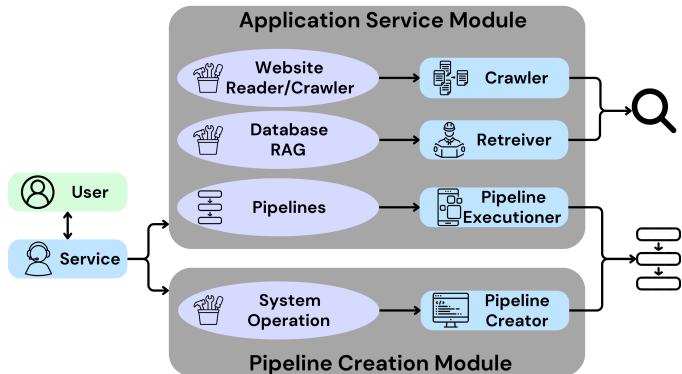


Fig. 1. System architecture.

II. METHODS

The system architecture is shown in Fig. 1. Our system consists of the Application Service Module (ASM) and the Pipeline Creation Module (PCM). ASM provides intelligent retrieval and pipeline execution, while PCM allows users to design and manage automated pipelines. Unlike traditional RPA or single-agent systems, C-pilot leverages multiple specialized agents across ASM and PCM that collaboratively handle retrieval, planning, execution, and self-correction, enabling flexible and adaptive task automation.

A. Application Service Module

The ASM provides two functions: intelligent retrieval and pipeline execution. In intelligent retrieval, the system uses a retriever agent to search school website data through a predefined database, built via a two-layer web crawling process on the school website. A crawler agent also employs web crawling and semantic analysis to extract and present precise information concisely. In pipeline execution, users create pipelines through iterative interactions with PCM, then execute them in ASM via the pipeline execution agent. This ensures accuracy with real-time feedback so users can track progress. Through these functions, ASM effectively reduces the time cost of retrieving information and handling repetitive tasks.

B. Pipeline Creation Module

The PCM enables users to create custom automated pipelines through intelligent pipeline creation. The pipeline

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Service (to chat_manager):
Hello! Based on the information provided, as a first-year undergraduate student, you currently do not meet the qualifications for applying for a second specialization. According to the "Regulations for Students of National Central University to Pursue a Second Specialization," students must start from their second year to be eligible to apply. Please consider applying for a second specialization when you begin your second academic year.

If you have any further questions or need additional assistance, feel free to ask!

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Fig. 2. Contextualized Eligibility Retrieval.

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===== Ai Message =====
Tool Calls:
click_input_with_id (call_WF10Fvqlt6009zLbgW1aRms3)
Call ID: call_WF10Fvqlt6009zLbgW1aRms3
Args:
user_id: 101112
id: leave_reason
Failed to click input with ID leave reason for user id 101112
===== Tool Message =====
Name: click_input_with_id
Failed to click input with ID leave reason for user id 101112
===== Ai Message =====
Tool Calls:
input_text_with_name (call_ZhCP8ifDmd0HewG9VY485CsJ)
Call ID: call_ZhCP8ifDmd0HewG9VY485CsJ
Args:
user_id: 101112
name: leave_reason
text: sick
Text input 'sick' for input with Name leave reason for user id 101112

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Fig. 3. Self-Correcting Mechanism.

creation agent interacts with users via natural language, gradually learning to construct automated pipelines based on user instructions. The agent utilizes predefined web operation tools to execute actions such as button clicks and form submissions while providing real-time feedback, including webpage screenshots and system response messages. This allows the system to self-correct potential school system errors and further communicate with users to ensure that each step's execution meets their expectations. Once the pipeline design is complete, the system packages it into an automated process for users to reuse.

III. EXPERIMENT

This experiment uses a chat-based interface to interact with C-pilot, restricting school website and system requests while excluding external queries or workflows. C-pilot performs web operations within a Docker-packaged Python environment to process each request.

A. Contextualized Eligibility Retrieval

We provide the student's basic information and submit a request for a second specialization. Then, we instruct the system to review regulations to assess if the student meets the eligibility criteria. The system first browses web pages and documents for the required information and searches further if needed. Once the system finds relevant information, it compares it to user-provided conditions, as shown in Fig 2. This experiment shows that the system's Contextualized Eligibility Retrieval significantly reduces data retrieval and comparison

time. Compared to RPA and single-agent systems, our multi-agent approach offers more flexible and contextual retrieval for complex queries.

B. Self-Correcting Mechanism

We input the command “Fill in the reason for leave” into the system. As shown in Fig 3, the system attempts to match potential input fields; however, since the command does not explicitly specify the target field, it makes errors in its first few attempts. Through internal discussions among system agents, the system analyzes the returned error messages and systematically retries different fields. Eventually, it identifies the correct field and successfully enters the data. This experiment demonstrates that the system’s self-correcting mechanism enhances both flexibility and efficiency of pipeline execution. Unlike RPA or single agents, our system can handle errors autonomously through agent collaboration and adaptive retries.

IV. CONCLUSION

This study proposed C-pilot, an LLM-based MAS to streamline school administrative workflows. C-pilot automated tasks, provided intelligent guidance, and offered real-time troubleshooting through autonomous agents. Experimental results demonstrated that C-pilot significantly reduced task execution time, improved accuracy, and enhanced system adaptability. Feedback from test users further validated the system’s practicality in real-world administrative tasks, particularly in improving usability and reducing repetitive workloads. These findings highlight its potential as a scalable solution for contemporary educational institutions.

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