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Student Registration Chatbot: A Large Language Model Approach - A Case Study of Adekunle Ajasin University Akungba Akoko, Nigeria

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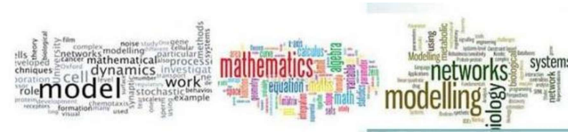
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ABSTRACT

Many educational institutions struggle with inefficient student registration processes, often involving manual intervention due to issues like long waiting time, burden of repetitive registration, forgotten passwords or login difficulties. The study aims to refine the registration processes at Adekunle Ajasin University by developing an automated student registration chatbot. Using large language model (LLM) and prompt engineering technique, the bot simplifies the registration processes and eliminates the over-reliance and direct dependent on administrative support. The student registration bot, built with JavaScript and Next.js framework, interacts with the OpenAI GPT-3.5 model and leverages Retrieval-Augmented Generation (RAG) with a Pinecone database to retrieve relevant information for responses. Also, the Postman facilitates the translation of students' text queries into structured queries for database interactions with the backend. The waiting time and waiting costs of five major parameters were used as our performance metrics. These are login issues, password reset, fee payment status, result visibility and course registration errors. Comparative analysis is done with the existing model. Experimental results demonstrate that the bot's waiting time and costs have a better performance over the existing model on all the metrics thereby leading to improved administrative efficiency and better student experience.

Keywords: Generative Pretrained Model, Retrieval-Augmented Generation, Pinecone Database, Postman and Prompt Engineering.

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1. INTRODUCTION

Student registration process in higher institution of learning is a crucial administrative process that serves multiple interconnected purposes for both the student and the institution. However, the issues of long waiting times, the burden of repetitive registration issues and over-reliance on Information and Communication Technology (ICT) staff in Adekunle Ajasin University, Akungba-Akoko (AAUA) need to be addressed. This concern undermines the student experience, morale and academic performance. As technology increases, taking away some mundane tasks become more necessary to leverage automation and improve the efficiency of administrative operations. To address this, most scholars use the chatbot system. In (Lalwani et al., 2018 ; Pinxteren et al., 2020), The authors define Chatbot system as a computer program designed to simulate conversation with human users, typically through text, speech, facial expression and gestures. According to the authors, it consists of three categories: chatbots without embodiment, chatbots with embodiment and physically embodied robots.

Heryandi, (2020) proposes a chatbot solution to simplify academic record monitoring for students and parents at higher education institutions using a Telegram chatbot to provide easy access to information like attendance, grades, and financial records unlike web-based systems that require complex authentication processes, especially for parents. Also, Algabri et al., (2023) explores chatbots to enhance personalized learning that adapt its teaching strategies to meet individual needs. Modran et al., (2025) developed an intelligent chatbot tutoring system to enhance university student learning. Their system combines Retrieval-Augmented Generation (RAG) with a custom Large Language Model (LLM), specifically addressing the limitations of traditional tutoring and the accuracy issues of using generic LLMs like ChatGPT for course-specific help.

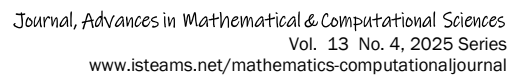
While the authors have contributed to the body of knowledge, certain challenges are still observed especially in AAUA. Among these are:

- Delays that disproportionately impact underserved students. Despite the availability of web-based student portals system currently in use in AAUA.
- Unable to fully exploit the Retrieval-Augmented Generation (RAG), making them unable to reason over institution-specific, frequently updated documents such as fee schedules, course correction procedures or portal usage guidelines. Consequently, students experience long queues, delayed issue resolution and inconsistent information, especially during peak registration periods.

The remainder of this paper is organized as follows. Section II discusses the related work. Section III is on Methodology. In Section IV, we present our results and discussions. We provide a conclusion in Section V.

2. RELATED WORKS

Many works have been done in the area of students' registration,. For example, Wang et al., (2024) discusses the exciting potential of large language models (LLMs) in education. The paper surveys how LLMs can be used in various educational settings, including helping students and teachers, personalizing learning experiences, and through commercially available tools.



In preliminary trials on our AAUA registration prompts, GPT-3.5-Turbo produced grammatically correct and contextually appropriate responses while keeping average response times within acceptable interactive bounds (on the order of a few seconds per query on a standard cloud deployment). The model is accessed through the official OpenAI API using stateless chat-completion interface.

• Experimental setup

To represent registration-related documents an example question-answer pairs, ‘the text-embedding-ada-002’ model from OpenAI, which outputs 1536-dimensional vectors for each input text segment was used. All collected knowledge items (instructions from ICT, portal usage guidelines, common registration scenarios and curated few-shot examples) are segmented into semantically coherent chunks (typically 1–3 paragraphs or a single questions and answers pair), then embedded and stored in a Pinecone vector database. We configure Pinecone with cosine similarity as the distance metric and use an approximate nearest neighbour (ANN) index (HNSW-based) to support efficient retrieval. Each record in Pinecone stores: (i) the 1536-dimensional embedding, (ii) the raw text chunk, and (iii) metadata such as source type (policy, frequently asked question, example dialogue) and timestamp. This setup allows us to retrieve the top-k most relevant chunks for a given student query in sub-second time on typical hardware, keeping total end-to-end latency dominated by the GPT-3.5 response generation.

The few-shot dataset consists of 30 question-answer (Q&A) pairs covering the most frequent registration issues at AAUA such as password reset, course correction, incomplete result display, fee payment anomalies and department transfer. 1022 samples were gathered from students for our model and for the current AAUA model. These examples were obtained through a semi-structured interview with a senior system analyst at the ICT unit and reviewing historical registration support logs. Each raw example was cleaned to remove personally identifiable information and to standardize terminology (for instance, “Avers”, “school café”, “ICTAC”).

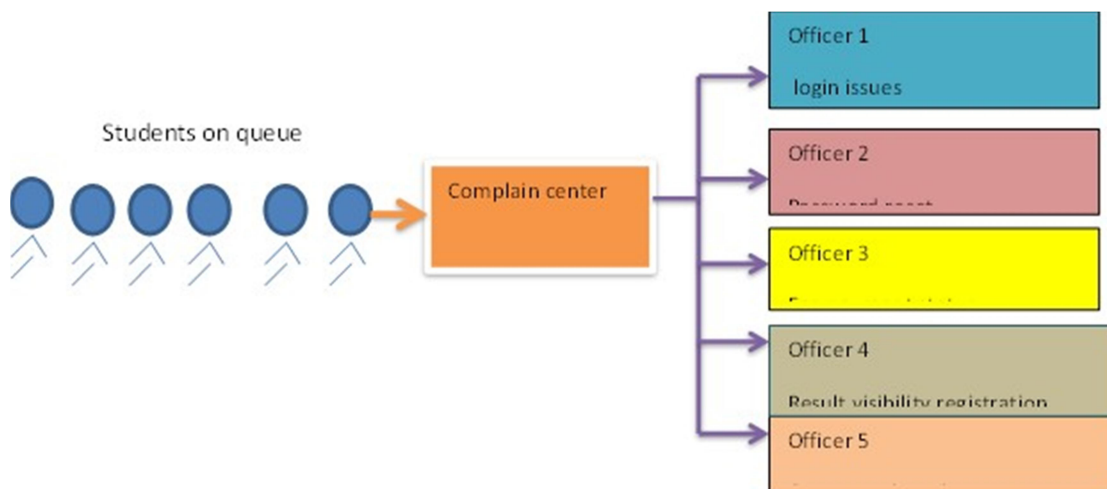
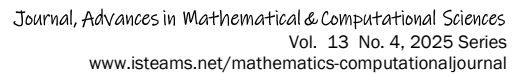


Figure 2: Students On Queue Being Attended To By ICTAC Staff



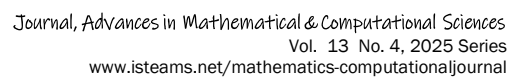
- WAITING COST MODEL

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let  $x = \text{ave charge per min}$ 
Let  $f = \text{waiting time}$ 
let  $y = \text{waiting time} \leq 4$ 
for  $i = 1$  to  $n(\text{No of table})$ 
  for  $j = 1$  to  $k(\text{No of metrics})$ 
    If  $f > y$  then
       $A(i, j) = f * x$ 
    else
       $A(i, j) = 0$ 
    Endif
  Next  $j$ 
Next  $i$ 

```

The measurement of our waiting time and the conventional AAUA model are shown in Table 2 and 3 respectively. Under our Chatbot Registration Model, we recorded 5, 4, 7, 5 and 7 minutes waiting on login issues, password reset, fee payment status, result visibility and course registration errors, However, in the Conventional AAUA model, 40, 14.20, 15 and 26 were recorded for the same metric. The comparative analysis of the two models based on waiting time and waiting costs are depicted in Figure 3 and 4 respectively. In Figure 3, the result shows that the Chatbot registration model recorded less waiting time in all the performance metrics used. For example, under login issues, we recorded 5minutes which outperformed 40minutes recorded under The AAUA model. On the issue of waiting costs, the Chatbot performed better than the current AAUA model. For example, under the password reset, we recorded no waiting cost as against the #150.00 recorded by AAUA.



Parameter	Online Average waiting Time (Minute)
login issues	5
password reset	4
fee payment status	7
result visibility	5
course registration errors.	7

Parameter	Arrival Time	Departure Time	Average waiting Time (Minute)
login issues	12:30 pm	1:10 am	40
password reset	12:30 pm	1.04am	34
fee payment status	12:30 pm	12.45	15
result visibility	12:30 pm	12:50am	20
course registration errors.	12:30 pm	12:56am	26

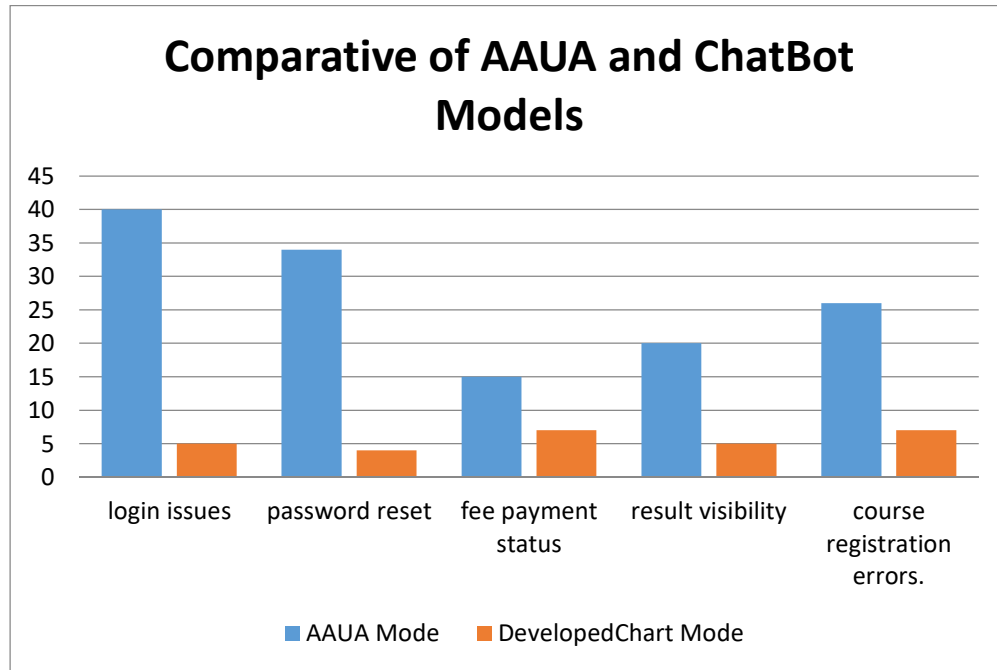


Figure 3: Comparative of AAUA and the Developed Chatbot Model

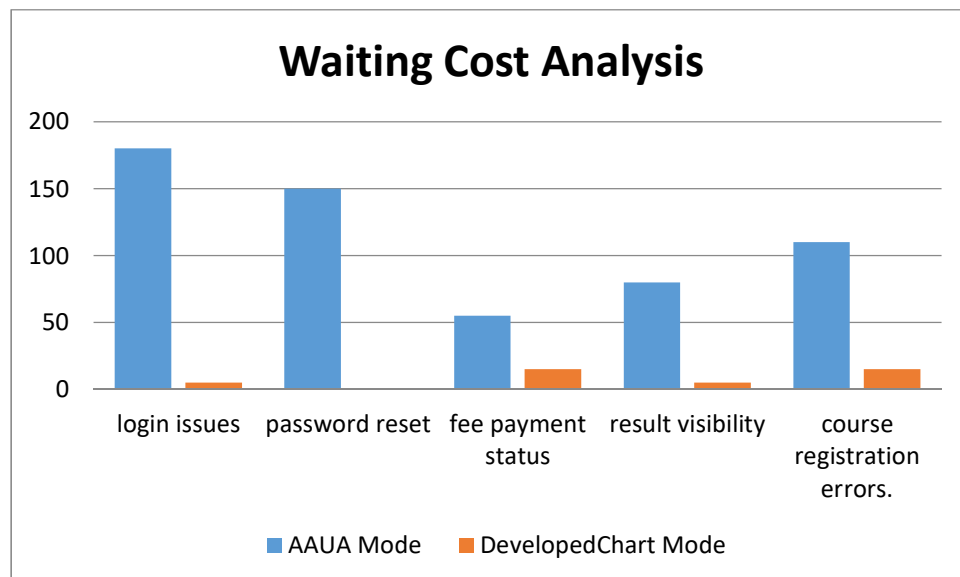
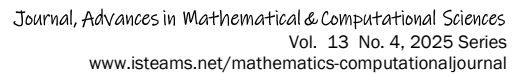


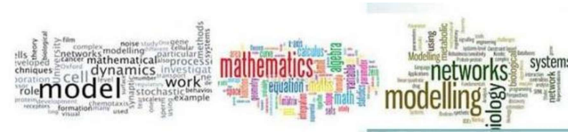
Figure 4: Waiting Cost analysis of AAUA and our Chatbot models



The issue of students' registration process in higher institution of learning has been a great challenge especially in AAUA. In fact, many students collapsed in the queue while making corrections during registration in AAUA ICTAC. Many institutions and scholars have proposed and adopted various techniques. However, literature reveals that the issue of long waiting time and the cost on these students are still challenges. This paper addresses these issues by developing an automated student registration chatbot. This is done by adopting the large language model (LLM) and prompt engineering technique, the bot simplifies the registration processes and eliminates over-reliance and direct dependent on administrative support.

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