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COURSE COMPASS: AN AI-POWERED COURSE RECOMMENDER AND EXPLORER PLATFORM

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ABSTRACT

The Course Compass system is an AI-powered platform to assist incoming students at Pangasinan State University (PSU) in selecting academic programs aligned with their MBTI personality types. The study aimed to create an AI algorithm for personalized course recommendations, integrate data analytics to monitor student-course matches, and assess the platform's acceptability using ISO 25010 standards. By employing Rapid Application Development (RAD) methodology, the project prioritized iterative prototyping and user feedback to address limitations of traditional models like the waterfall approach. System testing revealed positive feedback, demonstrating the platform's effectiveness in improving course retention, educational satisfaction, and alignment of students' career aspirations with their chosen majors. Findings from the acceptability survey based on the ISO 25010 Standards highlight the platform's potential to be successful by enhancing decision-making in academic pathways and improve student outcomes.

Keywords: ai-powered systems, data analytics, ISO25010 standards, rapid application development

INTRODUCTION

The rapid evolution of education underscores the need for innovative solutions to address persistent challenges, such as low course retention rates and misalignment between students' academic paths and career goals. The United Nations' Sustainable Development Goal 4 (SDG 4) emphasizes inclusive, equitable, and quality education to promote lifelong learning opportunities. However, many students still face uncertainty in selecting college courses that align with their interests and aspirations. Studies reveal that factors such as personality, social influences, and personal preferences significantly impact course selection, yet traditional tools like career counseling often fall short in addressing these complexities due to demand. This gap highlights the necessity for advanced, efficient, data-driven approaches to guide students in making informed decisions about their academic futures.

Emerging technologies, particularly Artificial Intelligence (AI), offer potential in personalized education. AI-powered systems can analyze vast datasets to provide tailored recommendations based on individual characteristics, such as academic performance and personality traits. Tools like the Myers-Briggs Type Indicator (MBTI) have proven effective in understanding personality-driven preferences, making them valuable for course selection frameworks. Despite these advancements, challenges remain, including limited access to effective tools and the overwhelming demands placed on students during critical decision-making periods. These issues can lead to disengagement, mismatched career paths, and societal inefficiencies.

To address these challenges, the Course Compass project was developed as an AI-powered platform designed to assist incoming Pangasinan State University (PSU) students in selecting courses aligned with their MBTI personality profiles and interests. To achieve this, the study aimed to: create an AI algorithm that can receive the data from the user and live information in the system to generate personalized course recommendations, to develop and create data analytics features that can collect the number of students that have been matched with a course, and evaluate the acceptability of the system using the ISO 25010 software quality assurance assessment (Bluemke, 2020). By integrating AI technology with MBTI assessments, Course Compass aims to enhance educational satisfaction and retention while aligning academic pursuits with career aspirations. This project not only contributes to improving individual student outcomes but also supports PSU’s mission of fostering quality education and has broader implications for the application of AI in personalized learning systems.

METHODS

This study employed a mixed-methods research design, combining qualitative and quantitative approaches to gather comprehensive insights into the course selection challenges faced by students. Data collection involved interviews, surveys, archival research, and observations. Interviews provided qualitative insights into students' experiences with course selection, while surveys gathered quantitative data, such as MBTI personality types and career preferences. Archival research reviewed existing studies on MBTI and career alignment, and observations allowed researchers to analyze peer behaviors during course selection. The study's population included 30 end-users (students) and 2 IT experts from North Luzon, Philippines.

The Rapid Application Development (RAD) methodology guided the software development process for the Course Compass system. RAD emphasized iterative prototyping and user feedback, enabling the researchers to refine the system across four phases: Analysis and Quick Design, where user needs were identified through surveys and interviews; Prototype Cycles, involving iterative development, demonstration, and refinement based on user feedback; Testing, where the final prototype was evaluated for functionality, usability, and quality; and Implementation, which is planned to be integrated the system into PSU's website with minimal disruption. This approach ensured that the platform catered directly to user needs while maintaining flexibility for improvements.

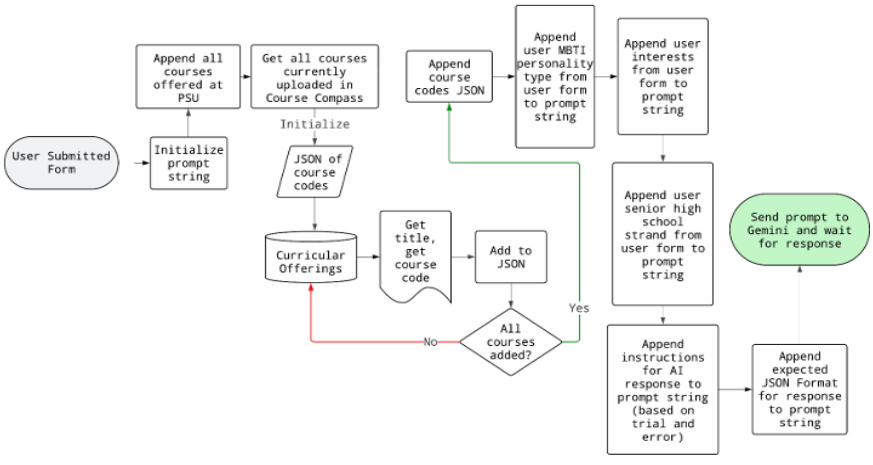
Data analysis employed thematic analysis for qualitative data and statistical methods for quantitative data. A 5-point Likert scale measured system acceptability based on ISO 25010 standards, assessing criteria such as functionality, efficiency, and compatibility. Weighted mean calculations incorporated feedback from both end-users (50%) and IT experts (50%) to evaluate the system's performance comprehensively. Ethical considerations, such as informed consent and confidentiality, were observed throughout the research process to ensure integrity and reliability in data collection and analysis (Bluemke, 2020).

RESULTS

Difficulties that the two target end-users who were interviewed are as follows: For the students, the number of course options is overwhelming, making them struggle to match their skills, interests, and career goals to their academic path; for the PSU Admission Office, they are facing difficulties in predicting demand in each course accurately, leading to overcrowded classes or wasted resources.

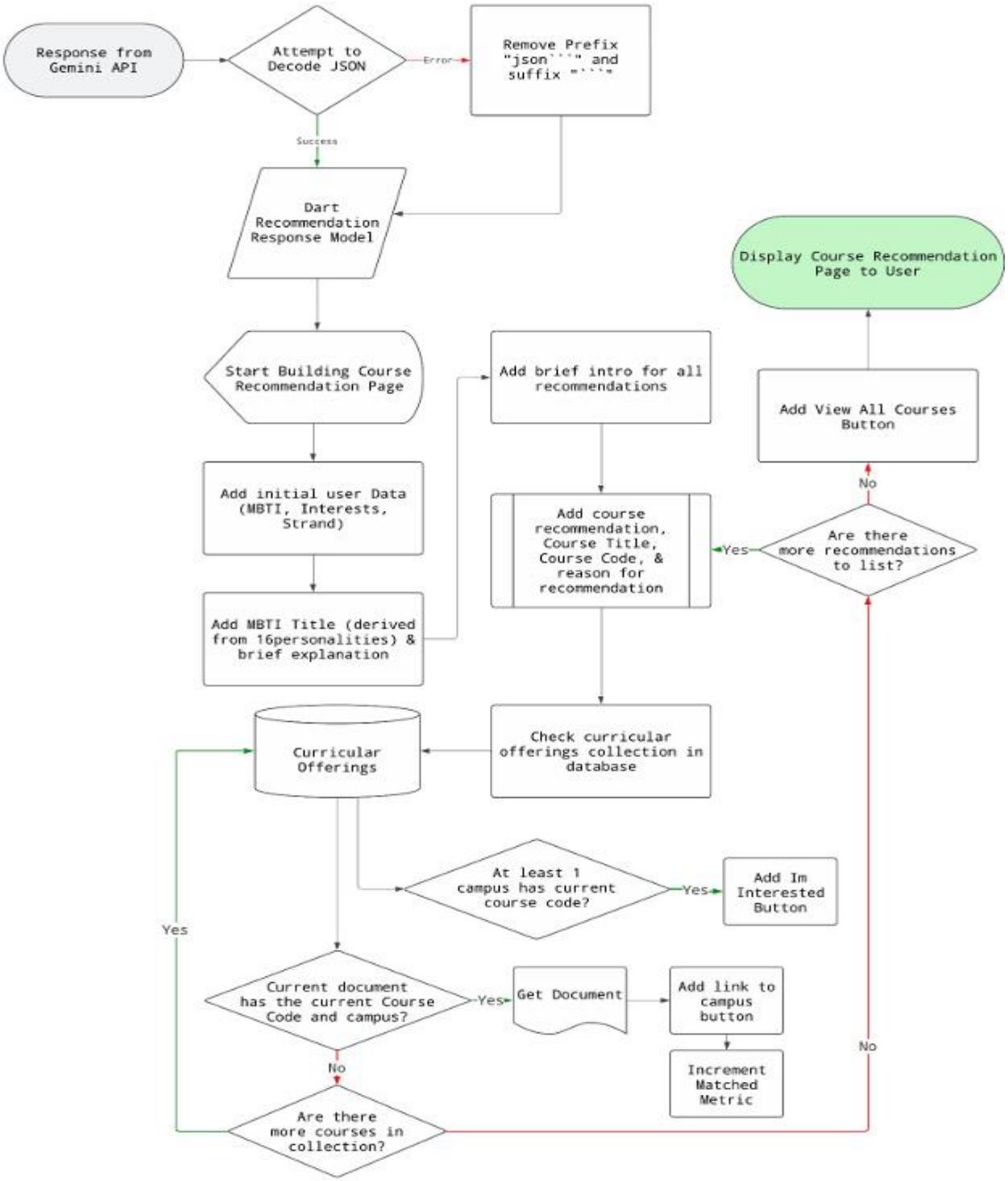
Figure 1

Dynamic Prompt Engineering Algorithm



The Figure above shows the algorithm in the creation of the prompt that will be passed to the Gemini API

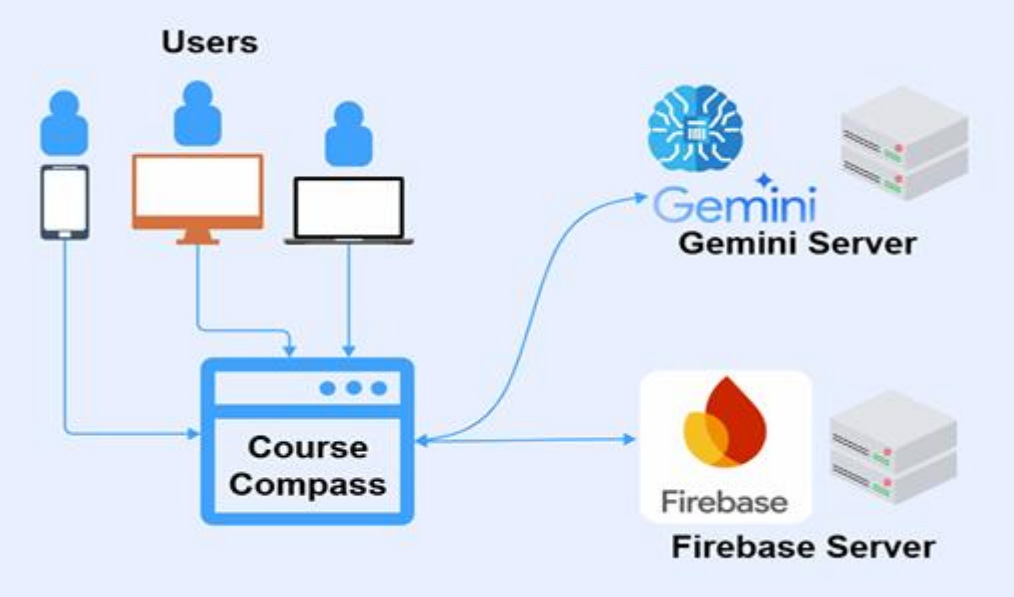
Figure 2
Response Processing & Page Building Algorithm



The figure above shows the response processing and the page building algorithm of the course recommender feature of Course Compass

The Course Compass system uses 2 algorithms for its main course recommender feature, Dynamic Prompt Engineering and Response Processing & Page Building: the Dynamic Prompt Engineering algorithm allows the course recommender to receive the data of the prospective students and to send it to the Gemini API, this algorithm ensures that the prompt is correctly structured and updated real time to allow the newly uploaded courses to be included in the parameters of the prompt, allowing for great scalability of the responses; the Response Processing & Page Building algorithm receives the response of the Gemini API and checks it for errors in the data structure and allows for the system to process it and show it to the user in an easily digestible page layout for maximum readability and understandability of the users.

Figure 3
Architectural Diagram



The figure shows the connection between Course Compass, Firebase, and Gemini.

Course Compass is based on the Client-Server Architecture allowing for its external APIs and services to be tightly knitted with the system ensuring maximum performance.

The system also has other features that support its main course recommender feature, Data Analytics and other supporting features allow for the second type of end-user who is the PSU Admission Office to view the corresponding analytics for the users of the course recommender, and to manage the entirety of the system. Data analytics collect the matched students with each course and campus, showing metrics of matched students, interested students for each course and campus and can be viewed in each school year; Curricular Offerings feature is a feature that contains the list of all available courses categorized into each campus, these courses will be uploaded and maintained by the PSU Admission Office, once a course has been uploaded into the system, it is allowed to be indexed and recommended by the course recommender; the Admission News feature allows for the PSU Admission Office to create announcements regarding anything

related to course enrollment and admission for the students to view; the Guides feature allows for the students to explore the various guidebooks and instructions that the PSU Admission Office can provide and upload for the prospective and current students of PSU.

Hardware and Software Requirements show that any device that supports a modern browser can run the Course Compass system without any issues.

Table 1
Summary of Acceptability Level of the System by the End-Users

Category	Weighted Mean	Descriptive Equivalent	Descriptive Interpretation
Functional Suitability	4.07	Highly Acceptable	Exceeds ISO 25010 standards effectively
Performance Efficiency	3.94	Highly Acceptable	Exceeds ISO 25010 standards effectively
Usability	4.02	Highly Acceptable	Exceeds ISO 25010 standards effectively
Overall Weighted Mean	4.01	Highly Acceptable	Exceeds ISO 25010 standards effectively

Table 2
Summary of Acceptability Level of the System by the IT Experts

Category	Weighted Mean	Descriptive Equivalent	Descriptive Interpretation
Functional Suitability	5.00	Very Highly Acceptable	Greatly exceeds ISO 25010 standards
Performance Efficiency	4.67	Very Highly Acceptable	Greatly exceeds ISO 25010 standards
Compatibility	4.75	Very Highly Acceptable	Greatly exceeds ISO 25010 standards
Usability	4.58	Very Highly Acceptable	Greatly exceeds ISO 25010 standards
Reliability	5.00	Very Highly Acceptable	Greatly exceeds ISO 25010 standards
Security	4.80	Very Highly Acceptable	Greatly exceeds ISO 25010 standards
Maintainability	4.50	Highly Acceptable	Exceeds ISO 25010 standards effectively
Portability	4.50	Highly Acceptable	Exceeds ISO 25010 standards effectively
Overall Weighted Mean	4.73	Very Highly Acceptable	Greatly exceeds ISO 25010 standards

The researchers conducted an acceptability survey of the Course Compass system that is based on ISO 25010. Results show that for the End Users (students), an Overall Weighted Mean of 4.01 is shown which is highly acceptable and exceeds ISO 25010 standards effectively. And for the IT

Experts, an Overall Weighted Mean of 4.73 which is very highly acceptable and greatly exceeds ISO 25010 standards.

CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of this capstone project these conclusions for each objective were made: the developed prompt creation algorithm utilizing the Gemini API to process the data and output to the user was proved to be successful and reliable based on the feedback received from the users; the Data Analytics and supporting features of the system is effective in assisting the university to collect and analyze data on the students preferences and course popularity for preparation on future academic planning and decision making; the findings of the ISO 25010 acceptability survey shows that the system was well-received by both end-users and IT experts.

Recommendations for the future researchers to further improve this study are: the expansion or addition of additional data points can be conducted to further refine the AI algorithm; the study has a cold-start period meaning long-term impact assessment is recommended to assess the implications on student retention, academic performance, and the outcomes of their careers; exploration of hybrid approaches can be conducted, for example, the integration of human expertise into the system; automated prediction can be explored that allow the utilization of the analytics data for assistance in the admission office decision making.

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DECLARATION ON THE USE OF AI TOOLS

Artificial Intelligence tools such as Gemini LLM and Perplexity AI were only utilized for assistance in ensuring the proper flow and structure for various sections of the study, and for finding related literature. The suggested literature was carefully examined by the researchers to ensure validity and similarity of context in relation to the study and ensure that it can be used as related literature. The contents of all sections were fully realized and/or computed by the researchers.

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