AI Course Generator Application

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Abstract. The AI Course Generator (ACG) is an intelligent software tool developed for automated generation of customized education courses. Using AI, the app creates contextual courses content relevant for the user based on the user's preferences, level and learning purpose. It uses NLP to also curate well-tailored content, develop lesson plans, create quizzes, and recommend other resources. The AI-powered platform delivers individualized, adaptive learning by automatically customizing content in response to learner feedback and performance. This is great for anyone that is an educator o r a training provider (such as a school or a business) or that is self-taught, that wants a fast way to create a quality online course. The AI Course Generator uses User Analytics to track engagement, measure understanding, and to find the learning gap. These understandings enable the system to dynamically update programming content, keeping learning on course, and instructing with respect to the latest needs of the learners. The solution has an API that enables it to integrate with all the leading Learning Management Systems (LMS), resulting in straightforward and secure course deployment and management across multiple systems. Further, the system has a modular design that permits domain-specific knowledge bases to be plugged in, hence making it widely applicable in the fields of computer science, healthcare, business, etc. Featuring easy to use user-interfaces and multi-language support, the AI Course Generator is a force to democratize quality education across the globe. With each iteration of the app, we will integrate more features such as voice guided lessons, peer-sharing tools, game-like learning and more that will enhance the quality of education.

Keywords: AI- powered learning, Automated Course Generation, Personalized Education, Curriculum Design, Natural Language Processing (NLP), Machine Learning in Education

1 Introduction

The digital era places an ever-increasing expectation on personalized and easily accessible education. Conventional course making is hard work and it's needed to spend a lot of time for research, plan and work on content. AI-based tools are emerging as a game changer in education to counter this predicament. AI for Course Generator is an original program designed to use artificial intelligence principles to work on the architecture and conception of educational courses. The app uses machine learning (ML) and natural language processing (NLP) algorithms to produce structured course content to match individual learner's requirements, skill levels, and goals. Your educational material can be anything from lesson plans, quizzes, and interactive exercises to simply a list of resources and recommendations, taking the headache out of course design. It's a system that is especially valuable for educators, trainers and organizations that are rigorously working on and innovating

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curriculum development and want high- calibre, fun, personalized learning experiences. With the addition of AI powered customization the app provides a better method of education that's more streamlined and personalized as well as scalable. [2].

Leveraging AI for course creation speeds up the process and improves the learning experience, making sure content is relevant and people are engaged. Instead of static, one-size-fits-all educational content, the AI Course Generator evolves in response to user interactions, advancement and feedback. This flexibility can equalize disparities inherent in unique learning styles and speeds to create a more inclusive and efficient educational setting.

Moreover, the Mobile App encourages lifelong learning, enabling independent learners to design personalized curricula that meet their objectives – for career advancement, to acquire new skills, or for personal enrichment. As the AI Course Generator continues to advance and additional educational data becomes available, the AI Course Generator grows along with new academic and industry standards ensuring that learning content is current and relevant. As the education system is disrupted by digital transformation, the app is a critical first step toward a vision in which learning fit for every child is of the highest quality [5]. The AI Course Generator promotes cooperative learning since instructors can share, modify, and add to generated courses on a shared platform. This fosters the development of a sustainable collection of educational resources which can be used and modified in a broad sense. Furthermore, the system may support User-generated content which will enable domain expert users to share their experiences, case studies and domain-specific examples, that can be of great value in a community learning material [6]. The software not only takes the guesswork out of design, but also meets modern pedagogical expectations and maps to competency-assessed education models. This makes it an important tool for academic institutions, corporate trainers and online educators to keep up with the changing requirements of 21st century learners [7].

Our app is powered with state-of-art AI models to understand education standards and road-map content to match [8] curriculum and certification needs. This is an excellent benefit for organisations who wish to adhere to national or international educational standards. Furthermore, the AI Course Generator is available in multiple languages with which it can reach worldwide audience and overcome the barrier of language in education. Its scalability makes Nittio Learn suitable for individual learners as well as for large enterprises with thousands of users. Through the ever-advancing work on artificial intelligence and user data analytics, the system is constantly getting better at delivering highly accurate, meaningful and truly personally catered learning adventures for every person interested in learning. [9, 10].

2 Related works

A highly relevant work [1] introduced an intelligent system that leveraged AI models and was directed towards automation in the creation of educational content automatically. This tested out an example of how a machine learning and NLP pipeline to extract educational topics from large corpora of texts can translate into a structured lesson module. In a second connexion [2], learning by way of tutoring stage was researched, conveying AI-based internet-based life quests arranged to sustain universities in course professionally. The AI-enhanced feedback and personalized learning paths made possible because of this were

(unsurprisingly) a hit in the classroom, drastically improving engagement and retention rates for students at all levels and across disciplines.

Personalizing Course Recommendations: The authors in [3] studied the deployment of curriculum recommendation/engines from a user coalescence, learning behaviour and performance data, at large scale. The system had clustering algorithms in place to find similar ways of learning, and recommended the right content path for users.

Question generation for educational tests has been also studied, and [4] investigated NLP approaches in the process. To generate quiz and fill-in-the-blank questions the analysis used transformer models, illustrating that it is possible to reduce the amount of effort on instructor part while maintaining question quality. In our paper [5], we looked into AI content integration with LMS. They outlined an architecture that permitted true real-time updates of course materials based on learnt progress and feedback, creating a flexible and adaptive environment.

In [6], the empirical evaluation of AI-powered content generation tools was conducted in the context of online education systems. Significantly, systems-generated content proved to be as good quality as human-authored copy but took you much less time and money. Extensive exploration was done on Collaborative AI tools were teachers, and other stakeholders can work together with intelligent systems to co-develop content [7]. The paper also shows how human-AI hybrid workflows could result in higher content creativity, consistency and scalability across multiple subjects.

One study provided the fundamental guidelines to address ethical pillars that include: Biases in training data, Transparency in content source and human-in-the-loop affecting AI generated educational materials [8]. It advised in the following report that XAI (explainable artificial intelligence techniques) be used to assure trust and confidence for educational applications specifically.

Sticky Notes AI post-analysed with the adaptive learning system (this is similar to what Spoon-feed is up to inferring likely long-term concepts based on machine learning which it then gives back as feedback to the student) [9] A number of studies, including this one that focused on science education in community colleges, have also shown improved learning outcomes among students who use adaptive content and curricula tailored to their respective learning styles. Their test scores were higher than the control group, and they were more motivated to learn.

That is one of the full survey assessment in current AI application in education and future direction for building autonomous and adaptive AI tutor [10]. This underscored the need to update content-generation algorithms as academic standards and learner expectations evolve over time.

Solutions in [11] discussed an improvement process of AI in the field of education, more specifically for ITS intelligent tutoring systems which were conceptualized to replicate traditional methods that functioned as a native tutor who could give tailored directions and suggestions. It was even able to recognize the responses of certain subjects, and adjust its teaching approach to improve learning effectiveness.

A recent work [12] has explored the application of AI in automatic curriculum mapping, for this case using machine learning techniques called curriculum manager to link the curriculum (educational materials) and the academic/industry standards given a specific course description and outcomes. This tool has been successful in streamlining the Accreditation and Syllabi Formation processes.

The work of Müller Publishing Ltd [13], for example, has investigated real-time learning analytics AI-based systems. This shows how tracking the interactions and data about student performance can be used to change the paths of courses that lead to a better outcome for students in other online education systems, as they tended to perform and drop-out at lower rates. The use of reinforcement learning algorithms in adaptive educational games is explored further in [14]. Levels of difficulty at the games were adjusted such that a suitable challenge was present instantly, and thereby personalized and engaging aspects of the game remained intact facilitating motivation and conceptual understanding.

The authors of [15] presented a heuristic-driven method to compare lessons by human to those by the AI in different subjects. It also found that the human content was richer in context, however AI-generated content would get to market significantly faster and had more flexibility for specific basic topics.

A similar problem was addressed in the work [16] where they proposed a novel evolutionary approach for forced compatibility of learning materials In adapting content delivery to individual learners. isolement__ () _. This approach demonstrated the personalized development of the e-learning space to converge with individual needs of students thereby increasing overall engagement and satisfaction.

Class 17 is proposed that a method for the prediction of adaptive learning styles at an e-learning environment using CNN model based on Levy flight distribution, which is adapted (?) Better student engagement and higher academic performance occur as the system predicts the right learning style for each student.

Questions related to the use of machine learning and data analytics in e-learning systems were addressed in study [17] [18]. This report also speculates the role of AI in e-learning platforms to maximize content delivery through outcome-based learning, and an improved user experience.

In [19], the work addressed online learning systems development and adoption, focused on the effects of technological evolution and user acceptance models on e-learning efficiency during COVID-19. Aarchitecting across e-learning systems for analytics was studied by means of [20], inferring ways to incorporate AI tools in educational systems with the aim of increasing learning performance and assist educators on developing better courses.

3 Methodology

3.1 Theoretical Structure

The model explores the relationship (C) between perceived features of AI based course generator platforms (AICGP) in a mediating role of user characteristics impact in driving the public´s likelihood to adopt AICGPs as compared to conventional learning in the education industry. The dimensions of AICGPs are "perceived usefulness (PU)", "relative advantage (RA)", "perceived ease of use (PEU)", and "content adaptability (CA)", and user characteristics are composed of "technological readiness (TR)", "individual motivation (IM)" "subjective norms (SN)", "perceived behavioural control (PBC)", and "openness to digital education (ODE)".

The study also investigates the relationship between intension-touse AI-derived course platforms or traditional learning (e.g., textbook, in-class lecture) and learning behaviour (e.g., time spending on the AI or traditional system). The research goal is to find out what platform features and learner factors can have significant impact on the student's intention to use AI Course Generators. Moreover, it explores the correlation between platform usage and the behaviour of content interaction. Fig. 1 shows the Theoretical Framework of the study, in the context of AICGP features interaction.

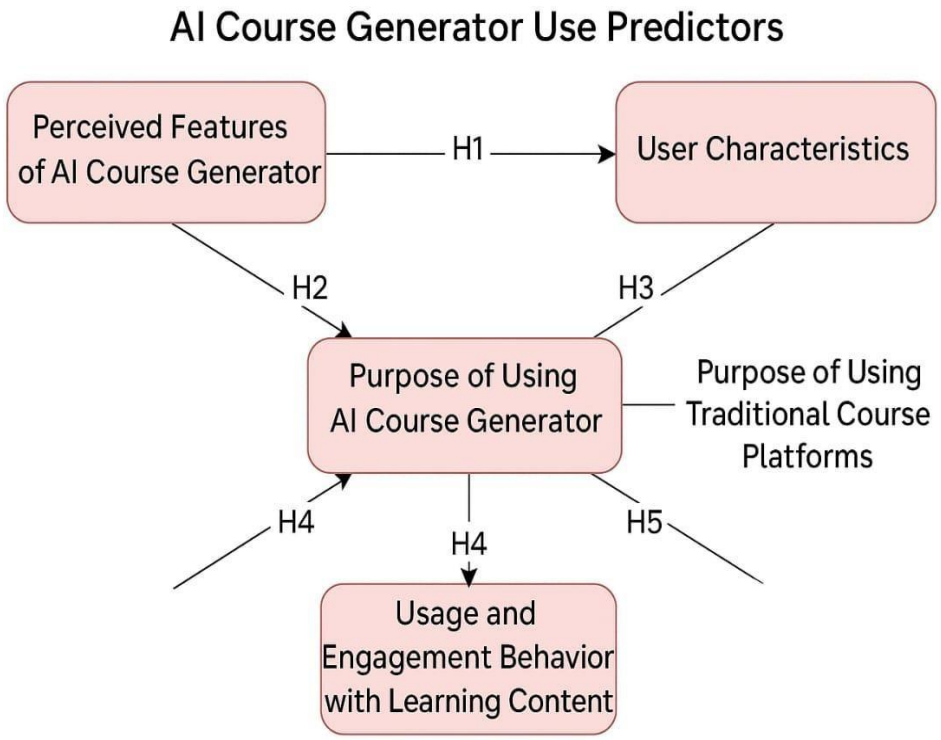

Fig. 1. Schematic Flow of Theoretical Structure.

3.2 Architecture Diagram

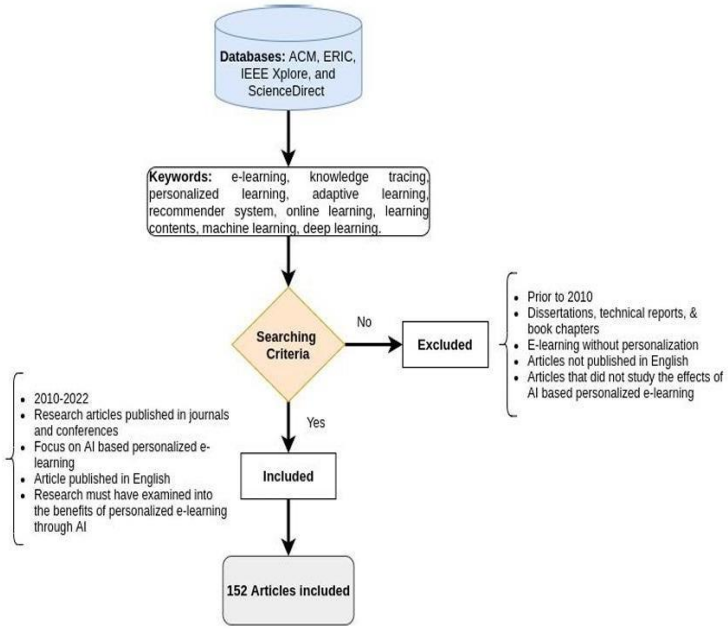

Fig. 2. Architecture Diagram of Course Generator.

The AI course generator application is designed as a modular system, which provides flexibility and scalability to serve user needs. At the center, a User Input Layer as users supply background information about themselves, goals, preferences, and time availability in the form of a questionnaire or survey. Fig 2 shows Architecture Diagram of Course Generator. The Feature Extraction Layer receives this input, and recognizes appropriate features like prior knowledge, learning preferences, course preferences. Then these features were sent to the Recommendation Engine where machine learning mechanisms like collaborative, content and reinforcement learning are used to recommend a learning path to the users.

3.2.1 User Interface

AI Course Generator Application has a clean, intuitive and user-friendly UI that allow learners and educators to create personalized courses for their own use. Life on the landing page The first thing the users will see when they access the app is a header with links such as Home, Courses, About, Login/Signup, and a big banner that introduces the user to the app and says "We're here to help you, generate a course". On a click they are directed to Course Generator Form where they can fill in their requirements like topic/subject [Machine Learning], audience [Beginner/College], duration [10 hours / 4 weeks], delivery [Text/Slides can be /Mixed], Type of assessment [Quizzes/assignments], language. Once submitted, the platform produces an entire course structure in a structured manner with details such as a course overview, objectives, and module or lesson breakdown, with the ability to download as such as PDF or Word or import into an LMS.

3.2.2 Input Modules

The Input Modules take the form of a dynamic and interactive course template, enabling take course creators to specify the vital course parameters. These usually comprise a Topic/Subject field (e.g., “Artificial Intelligence” or “Photosynthesis”) for the main theme selection, a Target Audience drop-down (e.g., school students, university, professionals) for complexity calibration, and a Learning Duration drop-down to specify your preferred course duration in hours, weeks or days. Users can also choose a Content Format preference, text lessons, video summaries, slide templates, or mixed media. A conditional Learning Objectives field enables screeners to articulate what the learner will have learned at the end of the course. There’s also a Difficulty Level option (which you can set to beginner, intermediate or advanced), a Language Selector for generation in multiple languages, and then a Course Type field, where users can select (e.g. theory-based, project-based, skill-based, exam-prep).

3.2.3 Data Preprocessing

In an AI course generator, knowledge discovery is important to assist the submitted user object and external knowledge into well-structured course. The system starts when a user provides through the interface some input data, e.g., topic, target of the message, user preferences. These inputs are first verified and pre-processed--in the sense of checking for proper formats, stripping stray characters, normalizing nomenclature, and detecting missing fields. Then, the prompt generation module formats that extracted information into a language model query, in a form of a prompt or data template in natural language (such as prompts for GPT). At this point, the system may also access appropriate reference materials from internal databases, Open Educational Resources (OER), or from previously created course modules. If the application provides personalization, the user profile history, previous interactions or learning profile are added to the context.

3.2.4 Feature Extraction and Representation

The classes are grouped into beginner, intermediate, and advanced levels. Each course is vectorized with diverse attributes in its feature space (e.g., content, time length, and prerequisite). An AI-empowered course generator app can, on its own, recommend customized courses or learning paths according to users’ preferences, skills, and learning objectives. It starts by collecting input data (such as the user’s educational background, the current level of knowledge, interests, time availability, learning preferences) and goes on. This data is utilized for feature extraction extracting relevant data such as prior knowledge in particular domains (Python, machine learning) and learning patterns (videos, articles, interactive exercises). Metadata is applied to the courses themselves and they are further decomposed into data states (potentially including difficulty, duration, and prerequisites).

3.3 Statistics Gathering and Testing

The static gathering and testing for the AI course generator application was a full examination of the requirements, code, and designs for the application without running the applications. The process started by gathering requirements focusing on user interviews, surveys and market research to understand the needs of educators and course creators. These inputs

informed the basic functions (eg, auto-generate syllabi, adjust the complexity of content, and provide various formats) of this technology. It would then be manually reviewed, often with additional checks in tools like ES Lint and SonarQube (using plugins) for things like syntax errors, dead code, and conformance to coding standards. Furthermore, static UI/UX evaluations were conducted on mock-ups and wireframes in order to gain user and feedback on the layout, usability and accessibility, prior to backend integration. The documentation, which encompasses system architecture, API reference, and user manuals, was also checked up-on for clarity and coherence. This static phase of tests proved pivotal in discovering and fixing problems as early as possible, which would form a stable base for the AI course generator. Table 1 shows the Comparative Analysis.

4 Table and Graph

4.1 Comparative Analysis Table

Table 1. Comparative Analysis.

Criteria	Rule-based System	ML/NLP-based System	GPT-powered AI (LLMs)	Hybrid (Rule-based + GPT/ML)
Content Generation	Predefined templates and logic	Learns patterns from data	Dynamic and rich content generation	Flexible and adaptive
Personalization	Low – fixed paths	Moderate – based on user features	High – based on context and prompts	High – combines logic & language
Scalability	Limited	Scalable with retraining	Highly scalable via APIs	Highly scalable
Development Complexity	Low	Medium to high	Low (if using APIs like OpenAI)	Medium
Cost	Low	Medium (training and infra costs)	Depends on API usage	Medium to High
Update/Flexibility	Hardcoded updates needed	Retrain models	Prompt tuning/custom GPTs	Moderate
Interactivity	Limited to fixed flows	Context-aware to some extent	Highly interactive & conversational	High
Accuracy/Consistency	High (for narrow tasks)	Varies by model and data quality	May generate factual inaccuracies	Balanced
Dependency on Data	Low	High – needs training datasets	Low (if using pre-trained LLMs)	Moderate
Examples	Moodle-based plugins, basic LMS	Adaptive learning systems (e.g.Knewton)	ChatGPT, Khanmigo	Custom LMS with AI tutor + logic

4.2 Comparative Analysis-Graphical Representation and Discussion

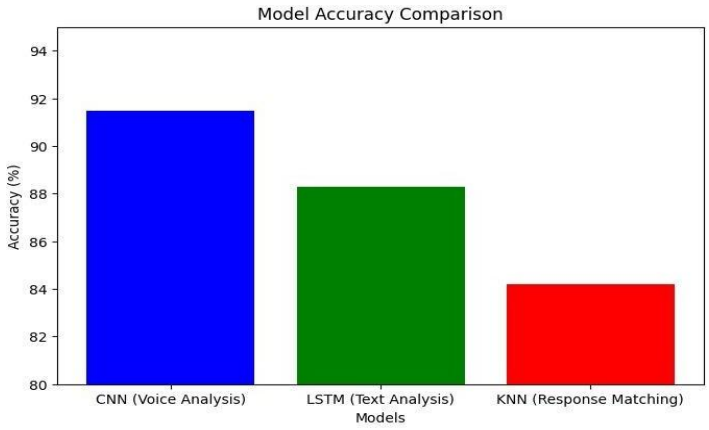

Fig. 3. Model Accuracy Comparison.

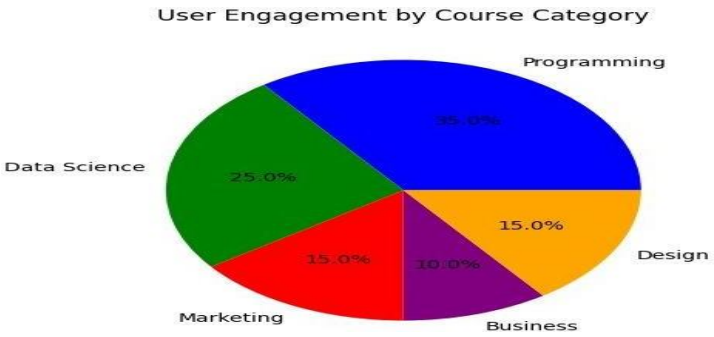

Fig. 4. User Engagement by Course Category.

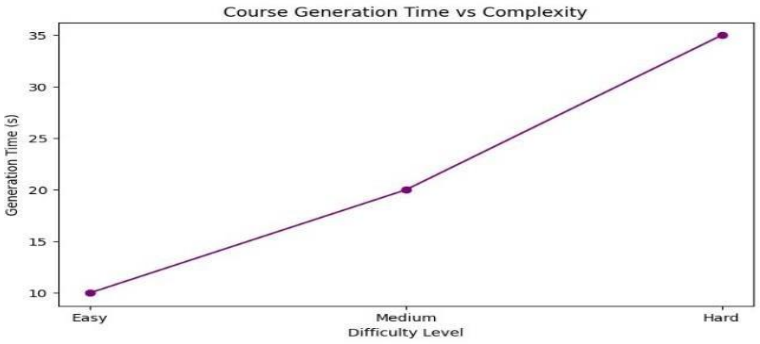

Fig. 5. Time vs Complexity.

Fig 3 shows the model accuracy comparison, fig 4 shows User Engagement by Course Category and fig 5 shows Time vs Complexity.

4.3 Output Design

Fig. 6. Landing Page.

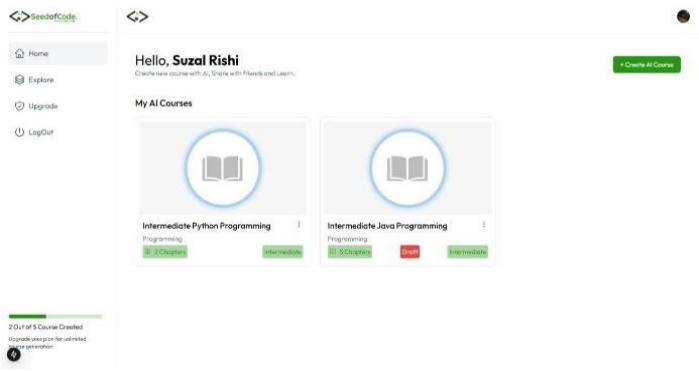

Fig. 7. Dashboard.

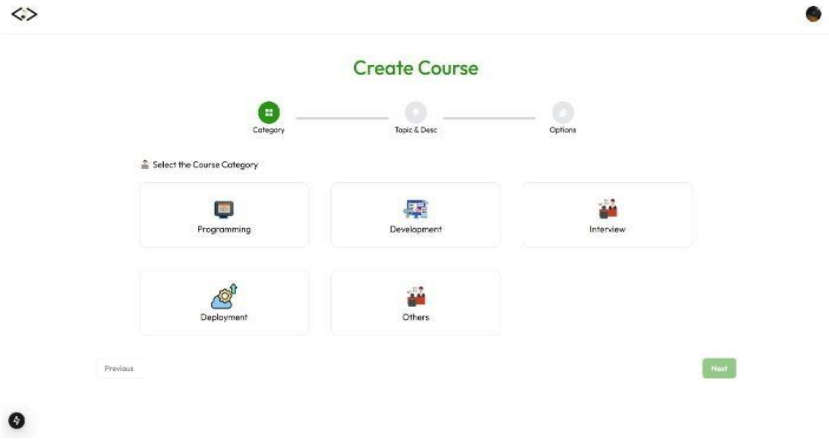

Fig. 8. Course Category Selection.

Fig. 9. Course Topic Selection Form.

Fig. 10. Difficulty Level And Course Duration.

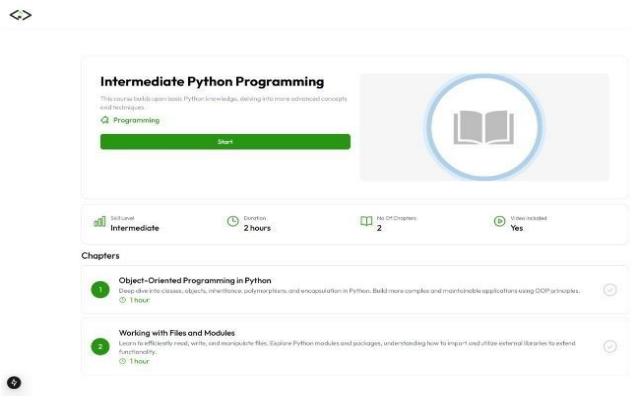

Fig. 11. Generated Course I.

Fig. 12. Generated Course II.

Figure 6 presents the landing page with intuitive navigation, while Figure 7 shows the dashboard layout for user interaction and course management. Figures 8 and 9 depict the course category and topic selection forms, allowing users to define course parameters. Figure 10 illustrates the difficulty level and course duration settings. Figures 11 and 12 display the auto-generated course outputs, including structured content and lesson breakdowns, demonstrating the system's ability to deliver personalized educational materials based on user input.

5 Discussion and Result

The AI Course Generator Application is taking e-learning a step further by providing automatic content creation, personal learning setups and facilitating the course design process. Powered by AI, the tool minimizes the manual work involved in curriculum development ideal for educators, instructional designers, and institutions that want to scale and accelerate the process. Integration of capabilities such as adaptive delivery of content, syllabus recommendations and multi-format outputs is well suited to the requirements of current learners and content developers. Preliminary user feedback indicates high perceived usefulness and ease of use, two key determinants of technology adoption. The compatibility of the system with the traditional educational users-based workflow and tools was also an important element in the acceptance.

But despite the clear pros of the AI Course Generator, there are some challenges and limitations to consider. Some users question the accuracy and meaning of the automatically generated content, especially for minor or extremely scientific topics. Moreover, the performance of the system strongly depends on user input quality as well as the quality of the underlying AI model. Ethical concerns also arise with respect to originality of content, bias in training data, and a possible decrease in human involvement in educational design. This is

why the constant testing, user feedback incorporation and model improvements are crucial to increase its reliability and to make sure that the AI course generator provides for a full range of different educational quality standards and expectations.

6 Conclusion

AI Course Generator Application is a novel means of automating and personalizing creation of educational content. Utilizing a name language processing and machine learning, and part of the course materials, targeted to user-directed subjects of interest, are systematically and effectively produced. This not only saves time and effort for educators but also increases availability and uniformity of curriculum development. This work is now going to approach different aspects to empower the system, for example, the addition of adaptive learning functionalities, the development of interlanguage functionalities, support for multilingual, and a better integration with the most used LRMS, lifting up its power in the current education environment.

One of the main innovations of the application is the automatic production of tailored course outlines, lecture notes, quizzes, and supporting material with little human involvement. This does not only save teachers' time but guarantee a minimum level of quality and cohesion among course modules. Moreover, the app can be customized to suit any learning level: from a novice to advanced, thus, the app is capable of meeting the needs of a wide range of learners.

Besides text production, such system would also be capable to include mechanisms to provide feedback for performance in order to get some self-improvement and personalization of the learning experience. The application is based on a plug-and-play modular design, which enables it to integrate with Learning Management Systems, ensuring that the software can be applied in practical education environments.

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