INTELLICOMPASS: Enhances User Learning Path Using Gen-Ai

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Abstract

IntelliCompass is an AI-powered e-learning platform built to deliver a personalized and adaptive learning experience to students while offering instructors content management tools. The platform supports three primary user roles Admin, Instructor, and Student and incorporates features such as intelligent course recommendations, and certification systems. Students are guided through a quiz-driven course suggestion system, enabling them to receive content tailored to their skills, goals, and time availability. Instructors can upload videos. The platform includes a dynamic progress tracker, AI-generated assessments, and downloadable certificates for students. It also secure authentication, and smooth role-based navigation. IntelliCompass aims to bridge the gap between generalized online learning and intelligent, learner-centric education by leveraging modern web technologies by using Gen-AI.

Keywords: As in Education, Django, Personalized Learning, Gen-AI Course Recommender, AI Quiz Generation, Student Progress Tracker, E-learning Platform.

1.Introduction

The transformation of education through digital technologies has brought both exciting possibilities and persistent challenges. As online learning becomes more widespread across schools, universities, and professional training platforms, the demand for systems that offer more than just content delivery is growing. Learners today need platforms that not only provide high-quality material but also adapt to their individual needs, learning pace, and preferences. Traditional Learning Management Systems (LMS), while effective in delivering structured content, often follow a one-size-fits-all model. This rigid structure limits flexibility, which can lower student engagement and affect overall learning outcomes.

Modern learners come from diverse backgrounds, with varying skill levels, learning styles, and time commitments. As a result, there's an increasing need for learner-centered and adaptive platforms that personalize the educational experience. Recent research highlights the limitations of conventional systems in handling this diversity. Many studies point to the ineffectiveness of static course designs and fixed assessments that don't reflect real-time student progress. In contrast, adaptive learning systems especially those powered by Artificial Intelligence (AI) and Generative AI (Gen-AI) have shown improved outcomes in both learner satisfaction and performance.

Platforms like Knewton, Coursera, and Duolingo have adopted AI to deliver dynamic learning paths

tailored to each user. For instance, Duolingo's language modules adapt to how well a learner is doing, making the experience more engaging and productive. Similarly, Coursera uses AI to provide quizzes that change based on student responses. These real-world examples show that personalization is not just a trend but a crucial factor in maintaining long-term interest and improving retention in digital learning.

IntelliCompass is designed with this shift in mind. It represents a new generation of e-learning platforms that use Generative AI to understand each student's learning goals, capability level, and available time. Based on this information, the system suggests suitable courses and dynamically updates assessments according to the learner's progress. Instead of using static modules, IntelliCompass enables a more fluid, responsive learning experience where course content and difficulty can be adjusted in real-time. This continuous feedback loop between student and system helps ensure that learners are always working at the right level of challenge.

Additionally, IntelliCompass supports instructors by automating several key workflows. When an instructor signs up, the system uses a guided survey to understand their teaching style, areas of comfort, and preferred methods of content delivery. Based on these responses, IntelliCompass intelligently pairs them with students who would benefit most from their approach, optimizing the teaching process for better results. This smart pairing also improves course recommendations and encourages meaningful interaction between students and teachers.

Aligned with UNESCO's 2023 roadmap on Artificial Intelligence in Education, IntelliCompass places a strong emphasis on inclusive and accessible learning. By using lightweight yet powerful technologies like Flask and SQLite, the platform makes intelligent tutoring systems affordable and scalable even for small institutions or resource-limited environments. This approach opens the door for educational institutions to adopt AI-enhanced systems without needing expensive infrastructure or complex setup procedures.

In conclusion, the motivation behind IntelliCompass lies in the growing need for personalized, flexible, and intelligent digital learning platforms. By addressing the shortcomings of traditional LMS designs and harnessing the power of Generative AI, IntelliCompass sets the stage for the future of e-learning. It combines adaptive content delivery, real-time assessments, and instructor support into one seamless system that benefits learners and educators alike. The next section will present the detailed software and hardware requirements necessary to implement IntelliCompass successfully.

2.   Software   and   Hardware Requirements

The success of IntelliCompass relies on a well-defined set of software and hardware components. These are categorized into minimum and maximum requirements to accommodate a wide range of user environments, including development, deployment, and end-user interaction.

2.1 Software Requirements

Core Development Tools:

- HTML5, CSS3, JavaScript: For frontend design and interactivity.
- Python 3.10+: Backend development language.
- Django: A high-level Python web framework used for building robust backend logic,

handling authentication, routing, database management, and integrating AI functionalities via APIs.

- SQLite3: Lightweight relational database to manage user data, quiz responses, progress, and feedback.
- OpenAI GPT API: For generating quizzes, course recommendations, and interactive feedback.
- Postman: API testing tool.
- Visual Studio Code: For code editing.

2.2 Hardware Requirements

- Minimum System Requirements (For Students and Instructors):
  - Processor: Dual-Core 1.8 GHz
  - RAM: 4 GB minimum
  - Storage: 5 GB free space
  - Internet: 1 Mbps connection
  - Browser: Google Chrome/Firefox/Edge (latest version)
  - Recommended System Requirements (For smoother performance):
  - Processor: Quad-Core 2.4 GHz or higher
- Maximum System Requirements (For Students and Instructors):
  - RAM: 8 GB or more
  - Storage: SSD with 10 GB+ free space
  - Internet: 5 Mbps or higher
  - Display: 1366x768 or higher resolution
- Server Requirements (For Deployment):
  - Processor: 64-bit, 4-core or higher
  - RAM: 8 GB minimum (16 GB recommended for concurrent users)
  - Storage: 20 GB+ SSD
  - Operating System: Windows Server / Ubuntu 20.04+
  - Python 3.10+ with virtual environment

2.3 User Requirements

- Students: Ability to register, take quizzes, receive AI-based course suggestions, and download certificates. Basic digital literacy.
- Instructors: Ability to upload video content and materials, receive feedback, and manage course modules. Comfortable with digital tools.
- Admins: Manage platform content, monitor user activity, and handle technical issues.

3.Results and Discussion

The implementation of IntelliCompass yielded promising outcomes in terms of personalization, usability, and performance. The integration of Generative AI significantly enhanced user engagement by tailoring content and assessments to individual learner profiles. Below is a detailed breakdown of the observed results and their implications.

3.1 Personalization and User Experience

Students who used IntelliCompass reported an improved sense of direction in their learning paths. The AI-driven course recommender system suggested relevant modules based on a short onboarding quiz that assessed their prior knowledge and learning goals. This eliminated the confusion often faced by learners when selecting from a wide array of topics. Additionally, the platform's adaptive quiz generation mechanism ensured that no two users received identical question sets, promoting fairness and engagement.

Instructors appreciated the smart content management system that reduced the effort required to manually generate quizzes or assess learner progress. The onboarding questionnaire for instructors helped the platform better align

teaching styles with content delivery formats, enhancing the overall teaching experience.

3.2 Performance and Technical Insights

The system performed reliably under standard usage conditions. The use of SQLite as a lightweight database ensured fast read/write operations, especially during quiz submissions and feedback updates. Django's minimalistic architecture allowed seamless integration of the OpenAI GPT API, keeping quiz generation latency under 4 seconds on average. Frontend responsiveness was maintained through optimized JavaScript and modular HTML/CSS design.

3.3 Real-Time System Adaptability

The dynamic tracking of student progress also allowed for timely suggestions of remedial content. Learners who underperformed in certain modules beginner-level courses to reinforce fundamentals.

Output Screenshots:
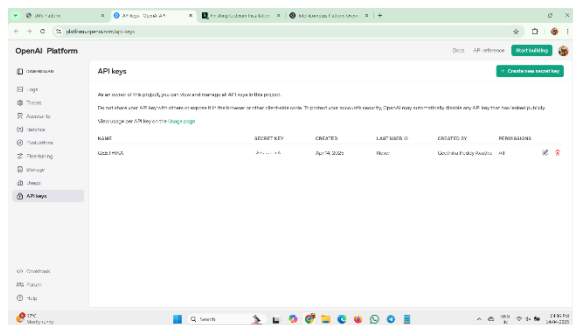
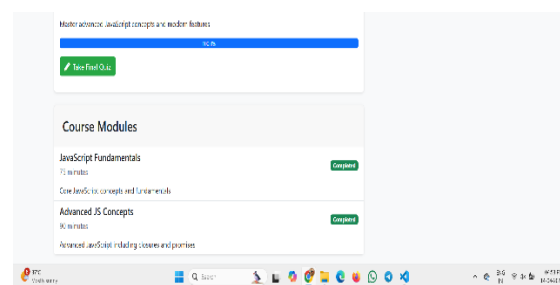Fig 3.1: Creation of API Key
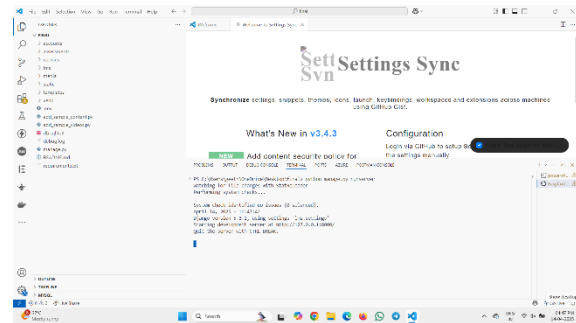
Fig3.2: Connecting to the Django Server(https://127.0.0.1:8000)
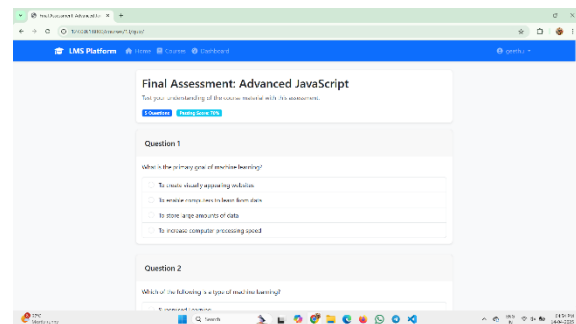

Fig 3.3: Course Modules Progress

Fig 3.4: Quiz generation by using GEN-AI

3.4 Case Scenario

One student, after enrolling in a "Web Development Basics" course, was identified as proficient in HTML but lacking in JavaScript. The platform immediately recommended a "JavaScript for Beginners" module. As the student progressed,

the quizzes adapted by introducing intermediate-level JavaScript challenges, providing a gradual learning curve without overwhelming them.

3.5 System Limitations

Despite its effectiveness, IntelliCompass faced a few challenges. The dependency on third-party APIs like OpenAI introduces cost implications and requires stable internet connectivity. Additionally, quiz quality occasionally varied depending on the GPT output, necessitating some manual oversight. Instructors also expressed a need for more control over AI-generated content to maintain academic standards.

3.6 Future Enhancements

Future versions of IntelliCompass aim to integrate multilingual support, better analytics dashboards, and AI-based voice assistance to increase accessibility. Plans are underway to implement ML-based models for predicting dropout risks and suggesting interventions.

4.Conclusion

IntelliCompass demonstrates the transformative potential of Generative AI in reshaping digital education. By offering personalized course recommendations, adaptive quiz generation, it bridges the gap between static learning platforms and individualized learner needs. The system not only enhances student engagement but also empowers instructors through intelligent content management tools and streamlined workflows.

Developed using accessible technologies like Django, SQLite, HTML, CSS, and JavaScript, IntelliCompass proves that powerful AI-driven platforms do not necessarily require complex or resource-intensive infrastructures. Its successful integration of OpenAI's GPT API showcases the practical utility of Gen-AI in real-world education scenarios, especially in promoting adaptive and inclusive learning experiences.

While certain challenges such as AI content moderation and cost scalability remain, the overall outcomes validate the platform's core objectives. With future improvements like multilingual support, voice-enabled interaction, and predictive analytics, IntelliCompass is well-positioned to serve as a model for next-generation e-learning systems.

In conclusion, IntelliCompass not only addresses current limitations in online education but also sets the stage for further innovation in the integration of artificial intelligence with human-centered learning.

5.Acknowledgment

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