

AI-Powered Personalized Learning Path Generator

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Abstract - The AI-Powered Personalized Learning Path Generator is designed to create study plans. At its core, the platform builds a roadmap that matches your goals, skill level, and pace. Each step is carefully sequenced so you're always moving forward in a way that feels natural. Along the way, it recommends curate resources articles, videos, courses, and practice exercises so you're not left searching for what to study next. Everything is designed to make learning smoother, more engaging, and more effective. What makes this system stand out is its flexibility. The platform uses machine learning algorithms including decision trees and recommendation systems to build a roadmap that matches your goals, skill level, and pace. Traditional learning models often assume one size fits all, but this generator recognizes that every learner is different. Whether you're aiming for career advancement, academic success, or simply exploring a new interest, it adjusts to fit your ambitions. It's interactive, motivating, and built to keep you engaged, even when the subject matter gets challenging. The big idea is simple: learning should feel personal. By combining AI's ability to analyze your progress with an understanding of your needs and well-being, the platform creates a study environment that's both supportive and inspiring. It's not about studying harder; it's about studying smarter in a way that works for you.

Key Words: Artificial Intelligence (AI), Personalized Learning, Machine Learning, Learning Roadmap, Recommendation System, Skill Assessment, Progress Tracking, Adaptive Learning

1. INTRODUCTION

The rapid growth of technology and online education has increased the availability of learning resources for students. Learners can access numerous courses, tutorials, practice websites, and educational materials. However, many students face difficulty in identifying the right skills to learn, selecting suitable courses, and determining the correct sequence of learning according to their career goals. This often results in an unstructured learning process, time wastage, and reduced learning efficiency.

Artificial Intelligence (AI) can be used to provide personalized learning recommendations based on a learner's existing skills, knowledge level, and career objectives. The proposed AI-Powered Personalized Learning Path Generator analyzes these factors and generates a structured learning roadmap. The system recommends relevant online courses,

YouTube tutorials, practice websites, and mini projects to support both theoretical and practical learning.

The proposed system also includes skill assessment, progress tracking, and quizzes to monitor the learner's development. By combining personalized recommendations with a structured learning path, the system aims to reduce confusion in selecting learning resources and help students develop relevant skills according to their academic and career goals.

1.1 Background and Personalized Learning

Personalized learning focuses on providing learning content according to the individual needs, existing skills, knowledge level, and career goals of a learner. Traditional learning approaches generally provide similar learning content to students, which may not address the different abilities and objectives of individual learners. A personalized approach can help learners identify the skills they need to develop and follow a structured sequence of learning.

In the proposed system, the learner provides current skills and a desired career goal, followed by a skill assessment to evaluate the existing knowledge level. Based on this information, the system generates a personalized learning roadmap and recommends relevant courses, tutorials, practice websites, and mini projects. Progress tracking and quizzes are also provided to monitor learning progress and support continuous improvement.

1.2 Need for AI-Based Learning Path Generation

The availability of a large number of online learning resources can make it difficult for students to decide what to learn and which resources are suitable for their career goals. Many learners may spend considerable time searching for courses and tutorials without having a clear learning sequence. Existing learning approaches may also provide general recommendations rather than guidance based on an individual's current skills and career objectives.

The proposed system addresses this need by using Artificial Intelligence (AI) to analyze the learner's skills, knowledge level, and career goal and generate a structured learning path. The system provides personalized recommendations such as online courses, YouTube tutorials, practice websites, and mini projects. Skill assessment, progress tracking, and

quizzes are also included to support learners throughout the learning process.

2. LITERATURE REVIEW

Artificial Intelligence (AI) has become increasingly relevant in education for providing personalized learning experiences and intelligent recommendations. Existing research has explored the use of AI and learner behaviour analysis to recommend educational resources and support individual learning requirements. However, different approaches focus on specific learning domains or general educational assistance and may not provide a complete career-oriented learning path.

Previous studies have investigated AI-based personalized learning, learner behaviour analysis, and AI assistants for specific educational domains. These studies demonstrate the potential of Artificial Intelligence to improve learning recommendations and provide individualized educational support. The proposed system builds on these concepts by combining personalized recommendations, skill assessment, a structured learning roadmap, learning resources, mini projects, quizzes, and progress tracking within a single platform.

2.1 AI in Education

Artificial Intelligence (AI) has been increasingly applied in education to support learners and improve the learning process. AI-based educational systems can analyze learner information and provide recommendations according to individual learning requirements. These systems can assist learners by identifying suitable educational resources and providing guidance based on their learning needs.

Recent research has explored the use of AI for personalized learning and intelligent educational recommendations. AI-based approaches can analyze learner-related information and support the delivery of more relevant learning content. However, the capabilities of existing systems vary depending on the learning domain and the type of recommendations provided.

Table -1: Overview of AI-Based Learning Approaches

S.No.	Approach	Main Focus	Limitation
1	AI-Based Personalized Learning	Personalized educational content	Limited career-oriented guidance
2	Learning Behaviour Analysis	Learner behaviour and resource recommendations	Domain-specific recommendations

3	AI Learning Assistant	Interactive learning support	Limited to specific learning areas
4	Proposed System	Career-oriented personalized learning path	Integrates multiple learning support features

The proposed system extends these approaches by integrating learner skill assessment, career goals, personalized learning recommendations, structured learning roadmaps, mini projects, quizzes, and progress tracking into a single learning platform. This provides a more structured approach to personalized learning and career-oriented skill development.

2.2 Personalized Learning Systems

Personalized learning systems are designed to provide learning recommendations according to the individual requirements of learners. These systems can use information such as existing skills, learning behaviour, knowledge level, and learning objectives to identify suitable educational content. By considering learner-specific information, personalized systems can provide more relevant learning resources than generic learning platforms.

Previous research has explored personalized learning through Artificial Intelligence and learner behaviour analysis. AI-based personalized learning approaches focus on adapting educational experiences to individual learners, while learning behaviour analysis systems use learner activity to recommend relevant resources. However, these approaches may be limited to specific learning domains or may not provide a complete career-oriented learning roadmap.

The proposed system addresses this requirement by considering both the learner's current skills and career goal. It generates a structured learning path and recommends courses, tutorials, practice websites, and mini projects. Skill assessment, quizzes, and progress tracking are also incorporated to provide continuous support throughout the learning process.

2.3 AI-Based Recommendation Systems

AI-based recommendation systems can assist learners in selecting educational resources according to their learning requirements. These systems analyze information related to the learner and identify suitable content such as courses, tutorials, and practice materials. Recommendation techniques can reduce the time required to search for relevant learning resources and provide learners with more focused guidance.

Previous research has explored intelligent recommendation systems based on learner behaviour and Artificial Intelligence. Such systems demonstrate the usefulness of analyzing learner-related information for recommending appropriate learning content. However, the reviewed approaches may focus on a particular subject or learning domain and may not provide career-oriented learning paths that combine skill assessment, weekly planning, projects, and progress monitoring.

The proposed system uses an AI recommendation engine to analyze the learner's current skills, knowledge level, and career goal. Based on this information, it generates a personalized learning roadmap and recommends relevant courses, YouTube tutorials, practice websites, and mini projects.

2.4 Learning Path and Skill Assessment Approaches

Skill assessment is an important component of a personalized learning system because it helps identify the learner's existing knowledge and areas that require improvement. By evaluating the learner's current skills before generating a learning path, the system can recommend learning content that is more relevant to the learner's knowledge level.

The proposed system includes a skill assessment quiz to evaluate the learner's knowledge level. The assessment results are combined with the learner's current skills and career goal by the AI recommendation engine. Based on this information, the system generates a structured week-by-week learning roadmap containing suitable courses, tutorials, practice websites, and mini projects.

Existing approaches discussed in the project literature survey demonstrate the use of AI for personalized learning and learning-resource recommendation. However, the reviewed systems do not provide all the proposed features together, such as career-oriented learning paths, skill assessment, weekly roadmaps, mini project recommendations, progress tracking, and quizzes.

2.5 Research Gap

Existing research demonstrates the use of Artificial Intelligence for personalized learning, learner behaviour analysis, and intelligent educational recommendations. However, the reviewed approaches do not provide a complete personalized learning experience that combines a learner's current skills, career goals, skill assessment, and structured learning roadmap in a single system. Some approaches are also limited to specific learning domains. The identified gaps include the lack of career-oriented personalized guidance, limited skill assessment, absence of structured week-by-week learning roadmaps, and limited integration of mini project recommendations, quizzes, and progress tracking. The proposed AI-Powered Personalized

Learning Path Generator addresses these gaps by providing personalized recommendations, a structured learning roadmap, skill assessment, relevant learning resources, mini projects, quizzes, and progress tracking within a single platform.

3. METHODOLOGY

The proposed research follows a systematic methodology for generating personalized learning paths based on the skills and career goals of individual learners. The system collects learner information, evaluates the existing knowledge level through a skill assessment quiz, and processes the collected information using an Artificial Intelligence (AI) recommendation engine. Based on the analysis, a structured learning roadmap is generated with suitable courses, tutorials, practice websites, and mini projects.

The methodology consists of student registration, profile creation, skill assessment, AI-based recommendation, personalized learning path generation, learning resource recommendation, progress tracking, and quiz evaluation. The overall workflow of the proposed system is as follows:

Student Registration → Profile Creation → Skill Assessment → AI Recommendation Engine → Personalized Learning Roadmap → Learning Resources and Mini Projects → Progress Tracking → Quiz Evaluation.

3.1 Research Method

The proposed system follows a systematic approach for developing a personalized learning path based on the learner's existing skills and career objectives. The process begins with student registration and profile creation, where the learner provides information about current skills and the desired career goal. A skill assessment quiz is then conducted to evaluate the learner's knowledge level.

The assessment results and learner profile are analyzed by the Artificial Intelligence (AI) recommendation engine. Based on this analysis, the system generates a personalized learning roadmap containing suitable courses, YouTube tutorials, practice websites, and mini projects. Progress tracking and quiz evaluation are subsequently used to monitor the learner's development and support continuous learning.

3.2 Student Profile and Data Collection

The first stage of the proposed system involves student registration and profile creation. The learner provides information about their current skills, knowledge level, and desired career goal. This information forms the basic input for generating a personalized learning path.

The collected learner information is used by the system to understand the student's current learning position and

target career objective. The profile data is then combined with the results of the skill assessment quiz and provided to the Artificial Intelligence (AI) recommendation engine for further analysis. This process enables the system to generate learning recommendations according to the individual learner's requirements.

3.3 Skill Assessment

The skill assessment module is used to evaluate the learner's existing knowledge level before generating the personalized learning path. A quiz is provided to assess the learner's understanding of relevant skills and identify areas that require further improvement.

The results obtained from the skill assessment are analyzed along with the learner's current skills and career goal. This information is provided to the Artificial Intelligence (AI) recommendation engine, which uses the assessment results to determine suitable learning requirements and generate an appropriate learning roadmap.

3.4 AI Recommendation Engine

The AI recommendation engine is the core component of the proposed system. It analyzes the learner's current skills, skill assessment results, knowledge level, and career goal to identify suitable learning requirements. The analyzed information is used to generate recommendations that match the learner's individual needs.

Based on the learner profile and assessment results, the recommendation engine generates a personalized learning roadmap and suggests relevant courses, YouTube tutorials, practice websites, and mini projects. This enables the learner to follow a structured learning sequence instead of selecting learning resources without a clear plan.

3.5 Personalized Learning Path Generation

The personalized learning path generation module creates a structured learning roadmap based on the learner's current skills, skill assessment results, and career goal. The generated roadmap organizes the required skills and learning activities into a suitable sequence, helping the learner understand what to learn and when to learn it.

The learning path includes recommended courses, YouTube tutorials, practice websites, and mini projects. By providing these resources in a structured roadmap, the system helps learners follow a clear learning sequence and develop the skills required to achieve their selected career objective.

3.6 Learning Resource Recommendation

The learning resource recommendation module provides suitable educational resources according to the learner's personalized learning path. The system recommends online

courses, YouTube tutorials, practice websites, and mini projects that are relevant to the skills identified by the Artificial Intelligence (AI) recommendation engine.

These resources are organized as part of the generated learning roadmap so that learners can access appropriate study materials and practical activities during each stage of their learning process. The inclusion of mini projects also provides opportunities for learners to apply the concepts they have studied and develop practical skills.

3.7 Progress Tracking and Quiz Evaluation

The progress tracking module is used to monitor the learner's development throughout the personalized learning path. It helps learners keep track of the learning activities completed and evaluate their progress according to the generated roadmap.

Quizzes are used to evaluate the learner's understanding of the topics covered during the learning process. The quiz results can be used to monitor learning performance and identify areas that may require additional practice. By combining progress tracking with quiz evaluation, the system provides continuous support and helps learners follow their personalized learning path effectively.

3.8 System Implementation

The proposed system can be implemented as an integrated platform consisting of modules for student registration, skill assessment, AI-based recommendation, learning path generation, learning resource recommendation, and progress tracking. The learner's profile and assessment information are processed to generate a personalized roadmap according to the selected career goal.

The system provides the generated learning path along with recommended courses, tutorials, practice websites, and mini projects. Progress tracking and quiz evaluation are incorporated to monitor the learner's development throughout the learning process. This integrated implementation provides a structured environment for learners to plan, follow, and evaluate their learning journey.

4. RESULTS

The proposed AI-Powered Personalized Learning Path Generator is designed to provide learning recommendations based on the learner's current skills, knowledge level, and career goal. The system processes the learner profile and skill assessment results to generate a structured learning roadmap. The generated roadmap contains relevant learning resources, including online courses, YouTube tutorials, practice websites, and mini projects.

The system also provides progress tracking and quiz evaluation to monitor the learner's development throughout

the learning path. These features support a structured learning process and help learners identify the skills and resources required to progress toward their selected career goal.

4.1 Personalized Learning Path Analysis

The generated learning path is based on the learner's current skills and selected career goal. The system analyzes the learner profile and skill assessment results to identify the skills that need to be developed. Based on this analysis, a structured learning roadmap is generated to guide the learner through the required topics in a suitable sequence. The roadmap provides learning resources such as online courses, YouTube tutorials, practice websites, and mini projects. This approach helps learners understand the skills required for their selected career path and provides a structured sequence for developing those skills.

4.2 Recommendation Results

The recommendation module generates learning resources according to the learner's skills and career objective. The system provides relevant online courses, YouTube tutorials, practice websites, and mini projects as part of the personalized learning roadmap.

The recommendations are organized according to the generated learning path, allowing learners to access suitable resources at different stages of their learning process. This helps reduce the time spent searching for learning materials and provides resources that are aligned with the learner's selected career goal.

4.3 Progress Tracking Results

The progress tracking module is used to monitor the learner's development after following the personalized learning roadmap. It helps the learner keep track of completed learning activities and understand their progress throughout the learning process.

Quiz evaluation is also incorporated to assess the learner's understanding of the topics covered. The combination of progress tracking and quiz evaluation provides continuous feedback and helps learners identify areas that require further practice. This supports a more organized and effective learning experience.

4.4 System Evaluation

The proposed system evaluates the learner's progress through skill assessment, personalized learning recommendations, quizzes, and progress tracking. The skill assessment identifies the learner's existing knowledge level, while the recommendation engine generates a learning path based on the learner's skills and career goal.

The generated roadmap and recommended resources provide a structured learning process, while quizzes and progress tracking help monitor the learner's development. The expected outcome of the system is to help students identify the appropriate learning path, improve their subject knowledge, develop technical and practical skills, save time in selecting resources, and improve learning efficiency.

5. DISCUSSION

The proposed AI-Powered Personalized Learning Path Generator provides a structured approach for guiding learners according to their current skills and career goals. The system combines skill assessment, AI-based recommendations, learning resources, mini projects, quizzes, and progress tracking to support the learner throughout the learning process.

The generated learning roadmap helps learners identify the skills that need to be developed and provides suitable resources for each stage of learning. The integration of practical resources such as mini projects and practice websites can support the development of both theoretical and practical skills. Progress tracking and quiz evaluation further provide a way to monitor learning development.

5.1 Analysis of Personalized Recommendations

The recommendation process considers the learner's current skills, knowledge level, and career goal before generating the learning path. This allows the system to provide recommendations that are related to the learner's intended career direction rather than presenting only general learning resources.

The system generates a structured roadmap along with courses, tutorials, practice websites, and mini projects. This integrated approach can help learners organize their learning activities and reduce confusion when selecting appropriate resources.

5.2 Practical Significance of the Proposed System

The proposed system can support students in identifying suitable learning paths and developing industry-relevant technical and practical skills. It can also help learners prepare for examinations, assignments, interviews, and career opportunities through structured learning activities. The combination of personalized recommendations, learning resources, quizzes, mini projects, and progress tracking provides a single platform for organizing the learner's development. The system can therefore support continuous skill development and improve the overall organization of the learning process.

6. CONCLUSION

The AI-Powered Personalized Learning Path Generator is designed to help students identify a suitable learning path based on their existing skills and career goals. The system uses Artificial Intelligence to analyze learner information and generate a structured learning roadmap with relevant courses, tutorials, practice websites, and mini projects.

The system also incorporates skill assessment, progress tracking, and quizzes to monitor the learner's development throughout the learning process. By combining these features, the proposed system provides a structured and personalized learning experience that can help students develop relevant technical and practical skills, save time in selecting learning resources, and work toward their academic and career goals.

6.1 Future Scope

The proposed system can be further enhanced by incorporating additional Artificial Intelligence and Machine Learning techniques to improve the accuracy of personalized recommendations. Future development can include more advanced skill assessment methods, adaptive learning paths that automatically change according to learner progress, and additional career-oriented recommendations.

The system can also be extended by integrating a wider range of learning platforms, certification recommendations, advanced progress analytics, and interactive learning features. These enhancements can provide learners with a more comprehensive platform for continuous skill development and career-oriented learning.

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