

# SkillForge: An Artificial Intelligence Enhanced Learning Platform for Technical Education and Interview Preparation

1. P Subba Rao

Assistant Professor, Computer Science  
and Engineering

Keshav Memorial Institute of Technology  
Hyderabad 500029, India  
[dasari2kishore@gmail.com](mailto:dasari2kishore@gmail.com)

2. Asanthula Rithesh

Fourth Year Student, Computer Science  
and Engineering

Keshav Memorial Institute of Technology  
Hyderabad 500029, India  
[asanthularithesh@gmail.com](mailto:asanthularithesh@gmail.com)

3. Jammu Sai Kiran

Fourth Year Student, Computer Science  
and Engineering

Keshav Memorial Institute of Technology  
Hyderabad 500029, India  
[jammusaikiran0@gmail.com](mailto:jammusaikiran0@gmail.com)

4. Poosa Shireesh Kumar

Fourth Year Student, Computer Science  
and Engineering

Keshav Memorial Institute of Technology  
Hyderabad 500029, India  
[poosashireeshkumar.2005@gmail.com](mailto:poosashireeshkumar.2005@gmail.com)

5. Sampasala Parjan Kumar

Fourth Year Student, Computer Science  
and Engineering

Keshav Memorial Institute of Technology  
Hyderabad 500029, India  
[parjankumar935@gmail.com](mailto:parjankumar935@gmail.com)

6. Addula Runith Reddy

Fourth Year Student, Computer Science  
and Engineering

Keshav Memorial Institute of Technology  
Hyderabad 500029, India  
[runithreddy7@gmail.com](mailto:runithreddy7@gmail.com)

**Abstract**—Students who learn technical subjects usually depend on many separate tools. They may read notes from one website, watch videos on another platform, attempt quizzes in a different application, and use a chat tool for doubts. Interview preparation is also handled separately in many cases. During actual use, this separation breaks the learning flow and makes it difficult for students to keep track of what they have completed.

This paper presents SkillForge, an artificial intelligence enhanced learning platform developed to bring these activities into one full-stack application. The platform is implemented using React and Vite on the frontend, Node.js and Express.js on the backend, MongoDB for data storage, and Groq-hosted large language models for educational support. The application includes topic-wise learning content, artificial intelligence based content generation, quiz generation, topic-aware doubt support, daily streak questions, badges, task tracking, reference video retrieval, feedback collection, and an artificial intelligence interview simulator with saved history.

The main purpose of SkillForge is to reduce unnecessary switching between platforms during self-paced learning. By keeping content delivery, practice, assistance, progress tracking, and interview preparation inside the same authenticated workflow, the platform gives students a more continuous way to learn

technical concepts and prepare for academic and placement needs.

**Index Terms**—E-learning platform, artificial intelligence, large language models, quiz generation, interview simulation, progress tracking, MERN stack

## I. INTRODUCTION

The need for self-paced technical education has increased as students prepare for software development, web technologies, machine learning, aptitude tests, and placement interviews. Most students do not depend on only one learning resource. They collect notes, watch tutorials, ask doubts through artificial intelligence chat tools, solve quizzes, and practice interview questions from different sources. Each resource may be useful, but the overall learning process becomes scattered.

One common problem during technical preparation is the loss of continuity. A student may study a topic and then move to another website for a quiz or doubt clarification. In that process, the topic context is often lost. Progress tracking also becomes difficult because the learning history is spread across

different tools. For beginners, this creates extra confusion and may reduce regular practice.

Many existing learning platforms solve only a part of this problem. Some platforms mainly provide static course content. Others focus on quizzes, coding practice, or video recommendations. General artificial intelligence chat tools can explain concepts, but they are not usually connected to the exact subject and topic selected by the learner. Similarly, mock interview tools are mostly separated from the learning path followed by the student.

To address these issues, this paper proposes **SkillForge**, an artificial intelligence enhanced learning platform that combines topic learning, assessment, doubt clarification, motivation, and interview preparation. The platform supports categories such as programming languages, frontend development, backend development, machine learning, and aptitude. It also includes user authentication, task completion, badges, streaks, feedback, and stored interview sessions.

The main contributions of this work are:

- A unified full-stack learning platform that connects topic study, quiz practice, artificial intelligence assistance, and interview preparation.
- Artificial intelligence based content generation for topics not already stored in the platform database.
- Dynamic quiz generation to assess learner understanding immediately after studying a topic.
- A context-aware artificial intelligence doubt assistant constrained to the selected subject and topic.
- A streak-based daily question mechanism to encourage consistent practice.
- Badge and task tracking features that add motivation through visible progress.
- An artificial intelligence interview simulator that generates adaptive follow-up questions and stores previous interview sessions.

## II. RELATED WORK

### A. Digital Learning Platforms

Online learning platforms have improved access to technical education by providing recorded lectures, notes, and structured courses. These platforms are useful for content delivery, but many of them do not provide a complete learning cycle. A student may still need a separate tool for doubt solving, another one for quizzes, and another one for interview preparation. Because of this, learning depends heavily on how well the student manages different resources.

### B. Artificial Intelligence in Education

Large language models have created new possibilities in education by supporting explanation generation, conversational tutoring, and automatic question creation. These tools are useful when a learner needs quick clarification. However, the quality of support depends on how well the tool understands the learner's current context. In SkillForge, the assistant is linked with the selected subject and topic, so the response is expected to stay closer to the learning activity.

### C. Assessment and Gamification

Quizzes are widely used to check understanding after learning a concept. Features such as badges, streaks, and task completion are also used to motivate learners. These methods are simple, but they work better when they are connected to actual learner activity. For example, a badge becomes more meaningful when it is awarded after completing a topic quiz instead of being shown as a separate reward.

### D. Interview Preparation Systems

Mock interview tools help students prepare for placement rounds, but many of them provide fixed question lists. A real interview is usually more interactive, where the next question depends on the previous answer. An artificial intelligence based interview simulator can give a closer practice experience by generating follow-up questions. Still, this feature needs careful prompt design because unrelated or very broad questions can reduce the usefulness of the session.

### E. Gap in Existing Systems

The main gap in existing systems is not the absence of learning resources, but the lack of connection between them. Content, quizzes, doubt support, progress tracking, and interview preparation often exist as separate workflows. SkillForge tries to reduce this gap by placing these modules over a shared database and authentication layer, so that student activity can be continued and stored in one place.

## III. SYSTEM ARCHITECTURE

SkillForge follows a three-layer architecture consisting of a React-based frontend, a Node.js and Express.js backend, and an artificial intelligence processing layer. MongoDB is used as the persistent database for storing users, learning content, badges, tasks, feedback, streak data, video links, interview sessions, and interview history.

### A. Frontend Layer

The frontend is built using React.js with Vite. React Router is used for page navigation, and protected routes are used to restrict dashboard and learning pages to logged-in users. During implementation, the frontend was divided into pages and components so that learning, quizzes, streaks, and interviews could be handled as separate views while still sharing user state.

The user interface includes:

- Landing page and authentication pages for login and signup
- Dashboard for topic navigation, badge visibility, and progress overview
- Topic pages for subject-wise structured learning paths
- Content pages supporting reading, videos, quizzes, artificial intelligence chat, and feedback
- Daily streak interface for multiple-choice practice
- Artificial intelligence interview simulator with session history

### B. Backend Layer

The backend is implemented using Node.js and Express.js. It exposes REST APIs for authentication, content handling, quiz generation, badges, streaks, feedback, video links, and interview sessions. JSON Web Token based authentication is used to identify users after login. Passwords are handled using bcryptjs before storage.

The backend handles:

- User registration and login with JWT-based authentication
- Content storage and retrieval from MongoDB
- Badge and task persistence
- Feedback submission and video link storage
- Streak question generation, answer validation, and streak updates
- Interview session creation, follow-up generation, saving, updating, and deletion

### C. Artificial Intelligence Processing Layer

SkillForge uses Groq-hosted models to support artificial intelligence based learning features. This layer is called from the backend whenever content, quizzes, streak questions, doubt answers, or interview questions are required. Since generated output can vary, the backend expects structured formats for features such as quizzes where answer validation is needed.

The artificial intelligence layer supports four important workflows:

- **Content Generation:** Generates detailed educational content for a selected subject and topic when the database does not already contain that content.
- **Quiz Generation:** Produces five multiple-choice questions for a topic in JSON format for instant assessment.
- **Daily Streak Questions:** Generates daily multiple-choice questions across key categories such as machine learning, programming, aptitude, and web development.
- **Interview Simulation:** Generates an initial interview question and then logical follow-up questions based on the learner's answers.

### D. Data Layer

MongoDB collections are used to store the learner's state and platform data. This is important because the application is not designed as a one-time question-answer tool. A learner's completed tasks, badges, streaks, feedback, and interview sessions need to remain available after logout and later login.

The database stores learning-related artifacts such as:

- User information and authentication data
- Topic content and associated metadata
- Video links per topic
- Badge counts and completed tasks
- Daily streak records
- Learner feedback
- Interview sessions and previous interview chat history

## IV. CORE FEATURES AND THEIR BENEFITS

### A. Structured Topic-Wise Learning

SkillForge organizes subjects into categories such as programming languages, frontend, backend, machine learning, and aptitude. Each category contains a list of topics that can be opened by the learner in a planned manner.

This organization is useful for beginners because related topics are grouped together. It also makes revision easier, since the student does not need to search for each topic separately across many resources.

### B. Artificial Intelligence Based Content Generation and Retrieval

When a learner opens a topic, the backend first checks whether content for that subject and topic already exists in MongoDB. If the content is available, it is returned directly. If it is missing, the artificial intelligence module generates instructional content and the generated result is stored for later use.

This design reduces repeated artificial intelligence calls for the same topic and also allows the content base to grow gradually. One limitation is that generated content still depends on the quality of the prompt and model output, so future versions may need review or moderation before showing content as final material.

### C. Reference Video Integration

For each topic, the platform retrieves and stores a relevant YouTube reference video. The content page allows the learner to switch between reading material and video-based learning.

This feature was added because students often use both text and videos while studying. Keeping the video link inside the topic page reduces the need to search manually, although video quality may still depend on the external search result.

### D. Dynamic Quiz Generation

SkillForge generates topic-specific multiple-choice quizzes on demand. A learner can start the quiz, move between questions, submit selected answers, and view the final score.

The quiz module changes passive reading into active recall. Since the questions are generated for the selected topic, the assessment is closer to what the student just studied. The implementation also needs structured JSON output from the model so that options and correct answers can be processed reliably.

### E. Topic-Aware Artificial Intelligence Assistant

The chat assistant is designed to answer doubts based on the current subject and topic. Instead of acting as a general chatbot, it receives topic context while generating the response.

This gives the learner a more focused doubt-solving experience. Short answers are preferred in the interface so that the chat does not distract from the main learning page.

### F. Daily Streak Practice

The platform includes a daily streak module that fetches multiple-choice questions and validates learner responses. When all answers are correct, the streak count is updated for the user.

Daily practice is useful for maintaining consistency. In the current implementation, streak progress depends on correct answers, so it encourages careful practice rather than only opening the page.

### G. Badges and Task Tracking

SkillForge tracks completed tasks and updates badge progress based on successful topic-level quiz completion. The dashboard shows badge counts and topic progress to the learner.

These features provide visible progress indicators. They do not replace actual learning, but they give students a small motivation to complete more topics and return to the platform regularly.

### H. Artificial Intelligence Interview Simulator

The interview module starts a topic-based technical interview and stores the session. After the learner answers a question, the artificial intelligence model generates a follow-up question based on that answer. Older sessions can be viewed again or deleted.

This module is useful for placement preparation because students need practice in explaining concepts, not only selecting answers in quizzes. The follow-up style makes the session more natural than a fixed question list, though the quality of the interview still depends on answer interpretation by the model.

### I. Feedback Collection

Each topic includes a feedback section where learners can rate content quality, clarity, usefulness, user experience, and recommendation likelihood.

Feedback gives a basic way to understand how learners respond to the material. In a future version, this data can be used to identify weak topics or improve generated content.

### J. Authentication and Route Protection

The application uses JWT-based validation to protect routes

and maintain user identity during a session.

Authentication is necessary because badges, tasks, streaks, and interview history are personal to each learner. Without route protection, the platform would not be able to provide a reliable personalized workflow.

## V. WORKING METHODOLOGY

The operational flow of SkillForge can be summarized as follows:

- 1) A learner signs up or logs into the platform.
- 2) The learner accesses the dashboard and selects a subject or topic.

- 3) The system fetches stored content; if unavailable, artificial intelligence generates and stores new content.
- 4) The learner studies the topic through textual content and optional reference video.
- 5) The learner takes a generated quiz to validate understanding.
- 6) Successful completion updates tasks and badge progress.
- 7) The learner may ask topic-specific doubts to the artificial intelligence assistant.
- 8) The learner can participate in daily streak questions for consistency.
- 9) The learner can launch an artificial intelligence interview session for topic-based oral practice.

This flow shows that the platform is not limited to content display. It connects learning, practice, doubt solving, and interview preparation in a single sequence. The stored progress also allows the learner to return later without starting from the beginning.

## VI. TECHNOLOGY STACK

TABLE I  
TECHNOLOGY STACK USED IN SKILLFORGE

| Layer          | Technology                                  |
|----------------|---------------------------------------------|
| Frontend       | React.js, Vite, Tailwind CSS, Axios         |
| Backend        | Node.js, Express.js                         |
| Database       | MongoDB, Mongoose                           |
| Authentication | JWT, bcryptjs                               |
| AI Services    | Groq SDK, LLaMA-based models                |
| Utilities      | React Router, React Toastify, Framer Motion |
| Scheduling     | node-schedule                               |
| External APIs  | YouTube Data API                            |

## VII. FUNCTIONAL ANALYSIS

TABLE II  
COMPARISON OF SKILLFORGE WITH FRAGMENTED LEARNING WORKFLOWS

| Feature                              | SkillForge                                         | Separate Tools                                |
|--------------------------------------|----------------------------------------------------|-----------------------------------------------|
| Topic Content<br>Quiz Practice       | Integrated and persistent<br>Generated in-platform | Often scattered<br>External platform required |
| AI Doubt Support                     | Topic-aware and contextual                         | Generic, detached                             |
| Progress Tracking                    | Badges, tasks, streaks                             | Manual or absent                              |
| Interview Practice                   | Adaptive and saved                                 | Usually standalone                            |
| Feedback Loop<br>Learning Continuity | Built-in<br>High                                   | Often missing<br>Low due to switching         |

The functional comparison shows the practical difference between an integrated platform and a workflow built from separate tools. SkillForge keeps the main learning actions under one login and one database. Separate tools may still be powerful individually, but they usually do not share progress or topic context with each other.

## VIII. RESULTS AND DISCUSSION

The implemented system demonstrates that artificial intelligence can be useful in a learning platform when it is connected to a structured workflow. Content retrieval with artificial intelligence fallback allowed topics to be served even when pre-written material was not available. This reduced the need to manually prepare content for every topic before testing the platform.

Quiz generation and daily streak questions added an active practice component to the learning process. Instead of only reading material, the learner can immediately check understanding through multiple-choice questions. The topic-aware assistant further supports the learning flow by answering doubts on the same page where the topic is studied.

The interview simulator extends the platform beyond ordinary lesson practice. Since follow-up questions are generated from learner answers, students get a more interactive practice session than a static list of questions. However, artificial intelligence generated interview questions may sometimes need refinement, especially for highly specific technical topics. This is an important limitation to consider in future work.

From an implementation point of view, the modular API-based design made the platform easier to extend. New subjects, topic groups, and artificial intelligence supported features can be added without changing the entire application structure. The use of stored tasks, badges, feedback, and interview history also creates a persistent learner record, which is important for long-term usage.

## IX. CONCLUSION

This paper presented **SkillForge**, an artificial intelligence enhanced learning platform that combines structured technical learning, artificial intelligence assistance, quiz generation, progress tracking, daily streaks, badges, feedback, and interview simulation. The project was developed to reduce the difficulty students face when they depend on several disconnected tools for learning and placement preparation.

The platform shows how large language model support can be combined with a full-stack application to provide a more continuous learning experience. It does not try to replace teachers or standard learning resources, but it gives students one place to study, practice, ask doubts, and prepare for interviews.

Future work can include stronger analytics, short-note persistence, recommendation of next topics, admin-level review of generated content, and adaptive learning paths based on quiz and interview performance.

## REFERENCES

- [1] React Documentation, "React: The library for web and native user interfaces," <https://react.dev/>
- [2] Vite Documentation, "Next Generation Frontend Tooling," <https://vitejs.dev/>
- [3] Node.js Documentation, "Node.js," <https://nodejs.org/>
- [4] Express.js Documentation, "Fast, unopinionated, minimalist web framework for Node.js," <https://expressjs.com/>
- [5] MongoDB Documentation, "MongoDB Manual," <https://www.mongodb.com/docs/>

- [6] Mongoose Documentation, "Elegant MongoDB object modeling for Node.js," <https://mongoosejs.com/>
- [7] Auth0, "JSON Web Tokens Introduction," <https://jwt.io/introduction>
- [8] Groq Documentation, "Groq API and SDK Documentation," <https://console.groq.com/docs>
- [9] W. X. Zhao et al., "A Survey of Large Language Models," arXiv preprint arXiv:2303.18223, 2023.
- [10] X. Zhai et al., "Generative Artificial Intelligence in Education: Applications, Challenges, and Future Directions," 2024.