

D.Y. PATIL COLLEGE OF ENGINEERING AND TECHNOLOGY
KASABA BAWADA, KOLHAPUR
(An Autonomous Institute)



D Y P A T I L
COLLEGE OF
ENGINEERING & TECHNOLOGY
(AN AUTONOMOUS INSTITUTE)

KASABA BAWADA, KOLHAPUR

AN INTERNSHIP REPORT

ON

Full Stack Web Development

Submitted in partial fulfillment for the award of the degree of
BACHELOR OF TECHNOLOGY IN
COMPUTER SCIENCE AND ENGINEERING

Submitted By

Mrunal Arvind Bhosale

PRN: EN22175519

Internship carried out at

IIT Bombay Edtech Society

Department of Computer Science and Engineering

D. Y. Patil College of Engineering & Technology, Kolhapur

2024-25

Internal Guide

Mrs. N. N. Patil

(Assistant Professor)

DYPCET, Kolhapur

D.Y. PATIL COLLEGE OF ENGINEERING AND TECHNOLOGY
KASABA BAWADA, KOLHAPUR
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING



CERTIFICATE

It is to certify that an internship report entitled “**Full Stack Web Development**” carried out by **Ms. Mrunal Arvind Bhosale PRN: EN22175519, Class: Btech, Div.: B, Roll no.: 81** is a bonafide student of D.Y. Patil College of Engineering & Technology, Kasaba Bawada, Kolhapur submitted in partial fulfillment of the requirements for the award of BACHELOR OF TECHNOLOGY in the DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING, Shivaji University,

Kolhapur at Semester: VII during the year 2024-2025. It is certified that all correction/suggestions indicated for internal assessment have been incorporated in the report. The internship report has been approved as it satisfies requirements for the said degree.

Faculty Mentor

Cell Coordinator

HOD

Principal

Date:

Place:

ACKNOWLEDGEMENT

Firstly, we would like to express our profound gratitude to our industry mentor, **Prof. Ramkumar Rajendran**, for his continuous support throughout the internship work. His patience, motivation, encouragement, and immense knowledge have been invaluable to the successful completion of this project.

We would also like to express our deep gratitude to our department internal guide, **Mrs. N.N.Patil**, for his valuable guidance and constant support during the internship period.

Our sincere thanks extend to our respected Head of Department, **Miss. Raddhika J. Dhanall**, for her continuous encouragement and motivation throughout the course of this work.

It is our pleasure to acknowledge the support received from the **Educational Technology Department, IIT Bombay, and EdTech Society, Mumbai**, for providing an excellent platform to carry out this internship project.

We are also thankful to our **Principal, Dr. Santosh Chede, D. Y. Patil College of Engineering and Technology, Kolhapur**, for his encouragement, support, and for providing the excellent facilities that enabled the successful execution of this internship.

Name of Student: Mrunal Arvind Bhosale

Sign

Class: B.tech Div: B

Roll no: 81

ABSTRACT

The AptiBattle project focuses on addressing a major challenge faced by students during placement and competitive exam preparation—maintaining consistent practice in aptitude topics such as quantitative reasoning, logical thinking, and problem-solving. Traditional learning tools often provide static question banks with limited interaction, leading to reduced engagement, motivation, and long-term retention. Many students struggle to stay committed without an element of competition or instant feedback. AptiBattle is designed as an interactive, gamified web platform that transforms aptitude practice into a fun, competitive, and socially engaging experience. The platform integrates daily challenges, multiplayer quiz battles, real-time leaderboards, performance insights, and instant solution feedback. Through its user-friendly interface and visually driven analytics, AptiBattle helps learners track their progress, understand their strengths and weaknesses, and stay motivated through streaks, achievements, and peer competition. The primary goal of this project is to make aptitude preparation structured, enjoyable, and impactful. By combining engagement, gamification, and continuous performance tracking, AptiBattle empowers students to improve their problem-solving abilities and maintain consistent preparation for campus placements and competitive assessments.

INDEX

| Sr. No. | Title | Page No |
|----------------|-----------------------------|----------------|
| 1 | Company Profile | 1-4 |
| 2 | Work Undertaken | 5 |
| 3 | Technologies/ Methodologies | 6 |
| 4 | Objectives | 7 |
| 5 | System Architecture Diagram | 8 |
| 6 | Modules | 9-10 |
| 7 | Snapshots | 11-12 |
| 8 | Conclusion | 13 |
| 9 | Reference | 14 |

1. Company Profile

IIT Bombay EdTech Internship Program

Program Name: IITB EdTech Internship TRACK 2 - Educational Product/Application Development (Fullstack)

Program Overview:

The IIT Bombay EdTech Internship Program represents a pioneering initiative in educational technology development, designed to bridge the gap between academic learning and industry-ready skills. This comprehensive program focuses on developing innovative educational solutions that address real-world challenges faced by students and educational institutions.

The program is structured to provide hands-on experience in full-stack development while working on meaningful educational projects that have the potential to create significant impact in the academic ecosystem. Interns work under the guidance of experienced faculty mentors and industry experts to develop cutting-edge educational applications.

Program Mission and Vision

Mission: To cultivate the next generation of educational technology innovators by providing comprehensive training in full-stack development while solving real educational challenges.

Vision: To become a leading platform for educational technology innovation, where students develop solutions that transform the learning experience for millions of learners worldwide.

Core Focus Areas

1. Educational Technology Innovation

The program emphasizes creating innovative solutions that address genuine problems in the educational sector. Participants are encouraged to identify pain points in the current educational ecosystem and develop technology-driven solutions.

2. Full-Stack Development Excellence

Comprehensive training in modern web development technologies including:

- Frontend development with React.js, Next.js, and modern CSS frameworks
- Backend development with Node.js, Express.js, and database management
- Cloud integration and deployment strategies
- AI and machine learning integration in educational contexts

3. User-Centered Design

Strong emphasis on understanding user needs through research, validation, and iterative design processes. The program teaches participants to develop solutions that are not just technically sound but also user-friendly and impactful.

4. Problem-Solving Methodology

Structured approach to problem identification, validation, solution design, and implementation. Participants learn to follow industry-standard development methodologies while maintaining academic rigor.

Program Structure and Methodology

Phase-Based Development Approach

The program follows a structured, phase-based development methodology:

Phase 1: Problem Identification and Validation

- Comprehensive user research and market analysis
- Problem statement formulation and validation
- Technical feasibility assessment
- Initial prototype development

Phase 2: Core Development and Integration

- Full-stack application development
- AI integration and advanced feature implementation
- Database design and optimization
- Testing and quality assurance

Phase 3: Enhancement and Deployment

- Advanced feature development
- Performance optimization
- Deployment and scaling considerations
- User feedback integration

Mentorship and Guidance

The program provides multi-level mentorship:

- Faculty Mentors: Experienced professors providing academic guidance and research direction
- Industry Experts: Professionals offering real-world insights and best practices
- Peer Collaboration: Team-based learning and knowledge sharing

Research and Innovation Commitment

The IIT Bombay EdTech Program is committed to advancing the state of educational technology through:

1. Cutting-Edge Research

Active involvement in research projects that explore the intersection of technology and

education, including AI-powered learning systems, personalized education platforms, and innovative assessment methodologies.

2. Industry Collaboration

Strong partnerships with leading technology companies and educational institutions to ensure that developed solutions meet real-world standards and requirements.

3. Open Source Contribution

Encouragement of open-source development and contribution to the broader educational technology community.

4. Publication and Dissemination

Support for publishing research findings and sharing innovative solutions with the academic and industry communities.

Contact Information and Program Details

Program Coordinator: Faculty Mentor, IIT Bombay

Duration: 10-12 weeks

Location: Hybrid model with both on-campus and remote collaboration

Website: <https://etsociety.org/>

The IIT Bombay EdTech Internship Program represents a unique opportunity for students to contribute meaningfully to educational technology while developing comprehensive technical skills under world-class guidance and mentorship.

2. Work Undertaken

- 1) Conducted problem identification to understand challenges students face in maintaining consistent aptitude practice.
- 2) Performed user research through surveys and discussions with placement-focused students.
- 3) Validated the need for an interactive, gamified aptitude learning platform based on collected feedback.
- 4) Finalized the project problem statement and proposed AptiBattle as the competitive quiz-based solution.
- 5) Designed complete user flow and system architecture to define host–player interactions and multiplayer logic.
- 6) Developed the frontend interface using Angular and Tailwind CSS for a clean and responsive UI.
- 7) Built reusable UI components such as quiz cards, timers, buttons, and score boards for scalable development.
- 8) Implemented secure authentication using Firebase to manage user login and session handling.
- 9) Configured an organized Angular folder structure to separate modules, components, and services.
- 10) Developed backend APIs using Node.js for quiz management, scoring, and real-time communication endpoints.
- 11) Integrated WebSocket functionality to support live multiplayer quiz battles and instant score updates.
- 12) Created the user dashboard displaying daily challenges, progress stats, and battle history.
- 13) Implemented the live leaderboard module to track player rankings in real time.
- 14) Resolved challenges in real-time synchronization and UI responsiveness during quiz battles.
- 15) Documented the workflow, API structure, and system design through GitHub commits and reports.
- 16) Tested user authentication, quiz flow, timer accuracy, and multiplayer syncing for reliability.
- 17) Defined future development goals, including AI-based question recommendation, adaptive difficulty, and mobile responsiveness.

3. Technologies/ Methodologies:

1. Frontend Technologies

- Angular – For building the web application with server-side rendering and optimized performance.
- Tailwind CSS – Utility-first CSS framework for responsive and modern UI styling.

2. Backend Technologies

- Node.js – Runtime environment for executing server-side logic.
- Express.js – Lightweight framework for building APIs and handling routing.

3. Database and Authentication

- MongoDB - Stores persistent user and system data

4. Hosting

- Firebase – Firebase Enables public access to deployed app.

5. Development and Collaboration Tools

- GitHub – Version control, code repository, and team collaboration platform.

4. Objectives

- 1) **Daily Aptitude Challenges** – Deliver fresh quantitative, logical, and reasoning questions every day to build consistent practice habits.
- 2) **Competitive Multiplayer Battles** – Enable users to compete with friends through live or timed quiz battles to increase engagement and motivation.
- 3) **Instant Feedback & Solutions** – Provide immediate answer validation along with detailed explanations to enhance conceptual clarity.
- 4) **Progress Analytics & Insights** – Visualize user performance through dashboards showing accuracy, speed, strengths, and weak areas.
- 5) **Gamification for Motivation** – Introduce leaderboards , learning streaks, trophies, and achievement badges to encourage regular participation.
- 6) **User-Friendly Interface** – Build an intuitive and visually appealing web interface for smooth navigation and an engaging learning experience.
- 7) **Secure Authentication & Multiplayer System** – Implement user login, game session creation, and synchronized multiplayer quiz flow.

5. System Architecture

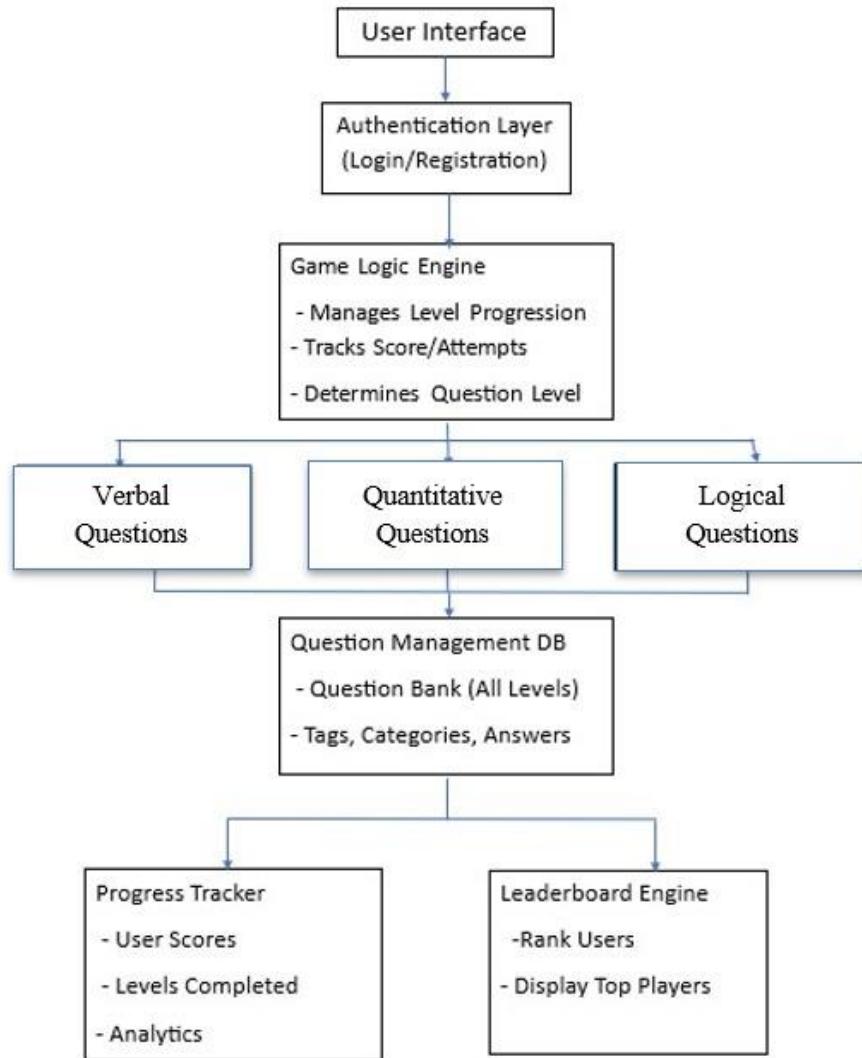


Fig. 1: System Architecture diagram

6. Modules implemented

User Module Features

1. User Authentication & Profile Management

- Secure registration and login (Email/Password or Google Sign-In)
- Profile creation with aptitude level and performance details
- Role-based access for users (player/host)

2. Dashboard & Performance Analytics

- Personalized dashboard showing daily challenges and battle history
- Visual graphs for accuracy, speed, and improvement trends
- Real-time notifications for invites and leaderboard updates

3. Aptitude Practice & Daily Challenges

- Daily aptitude questions across quantitative, logical, and reasoning topics
- Timed quizzes with instant evaluation
- Detailed explanations for every attempted question

4. Multiplayer Quiz Battles

- Host can create quizzes and generate unique game codes
- Players join using the shared code
- Live quiz battles with real-time scoring and smooth gameplay

5. Leaderboard & Gamification

- Daily, weekly, and global leaderboards
- Badges, XP points, streak tracking, and achievement rewards
- Performance comparison with friends

6. Progress Reports & History

- Detailed battle history with accuracy and speed insights
- Topic-wise performance tracking
- Downloadable progress reports

7. User-Friendly Interface

- Clean and responsive UI
- Easy navigation during quizzes
- Mobile-friendly design

Admin Module Features

1. User Management

- Manage user accounts and access roles
- Monitor active users and engagement

2. Battle Session Monitoring

- Track multiplayer quiz sessions
- View player participation and scoring patterns

3. Security & Maintenance

- Enforce authentication and access controls
- Maintain activity logs and ensure system stability

7.Snapshots

First Page:

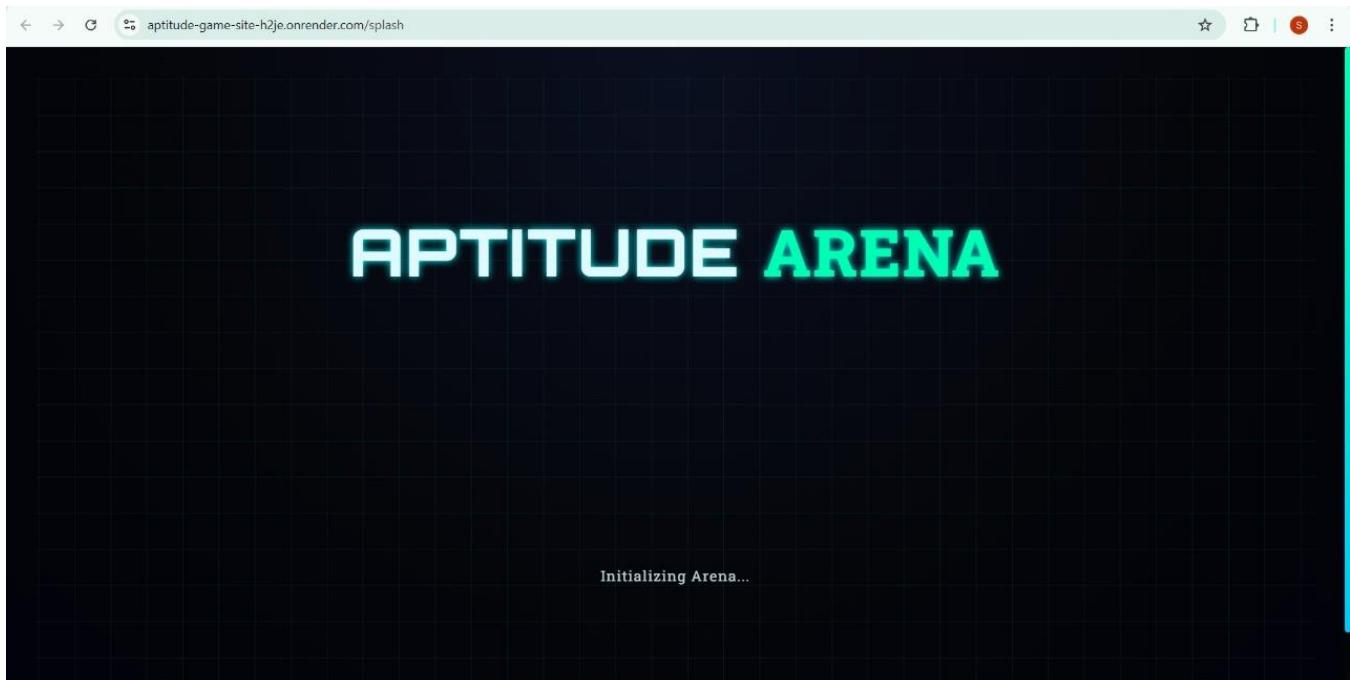


Fig.1: First Page

Login Page:

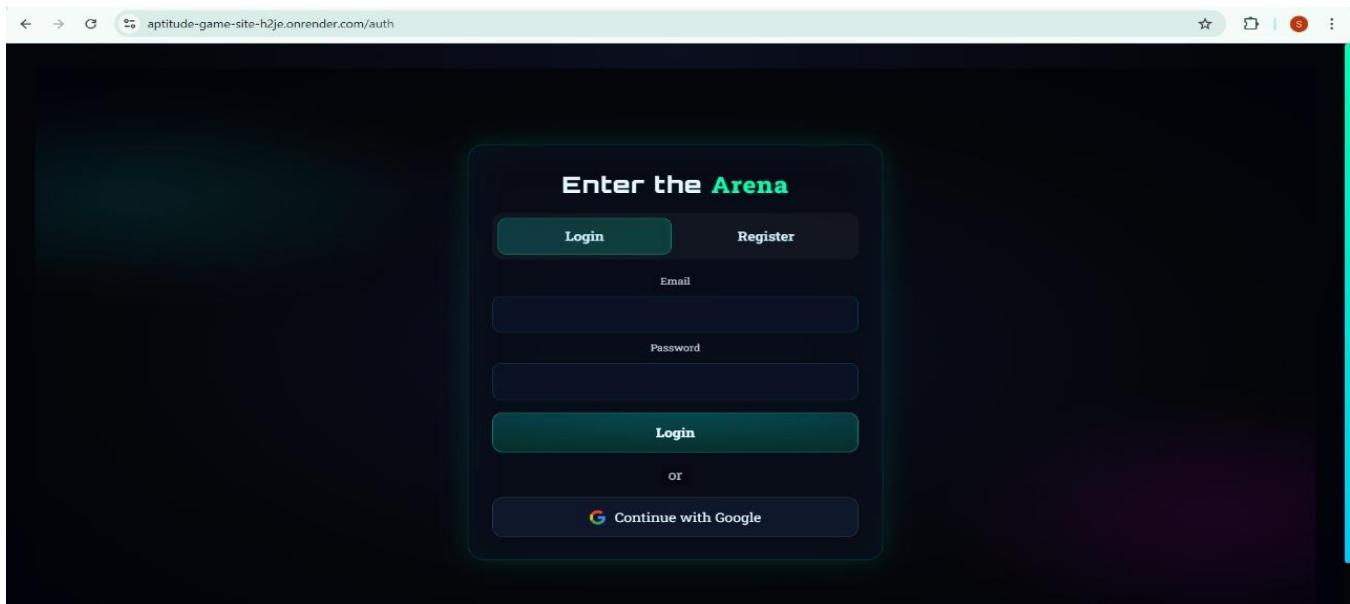


Fig.2: Login Page

DashBoard:

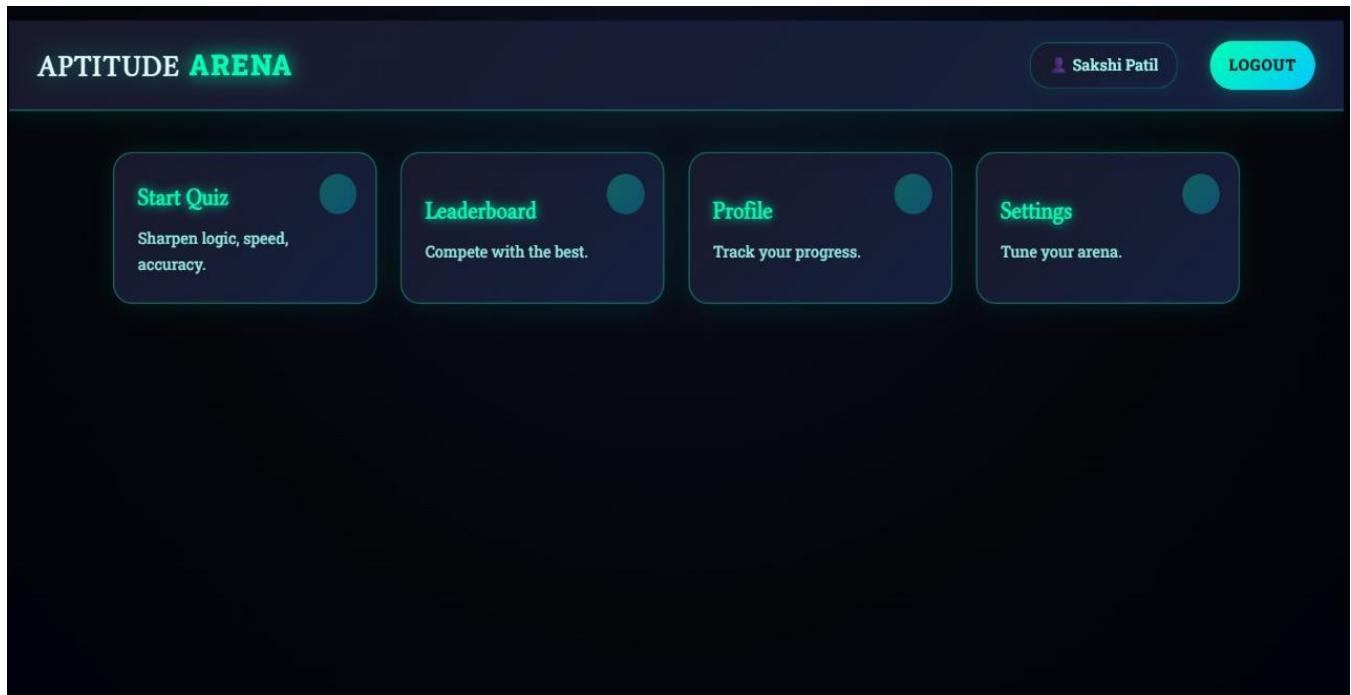


Fig. 3: DashBoard

Choose Battleground:

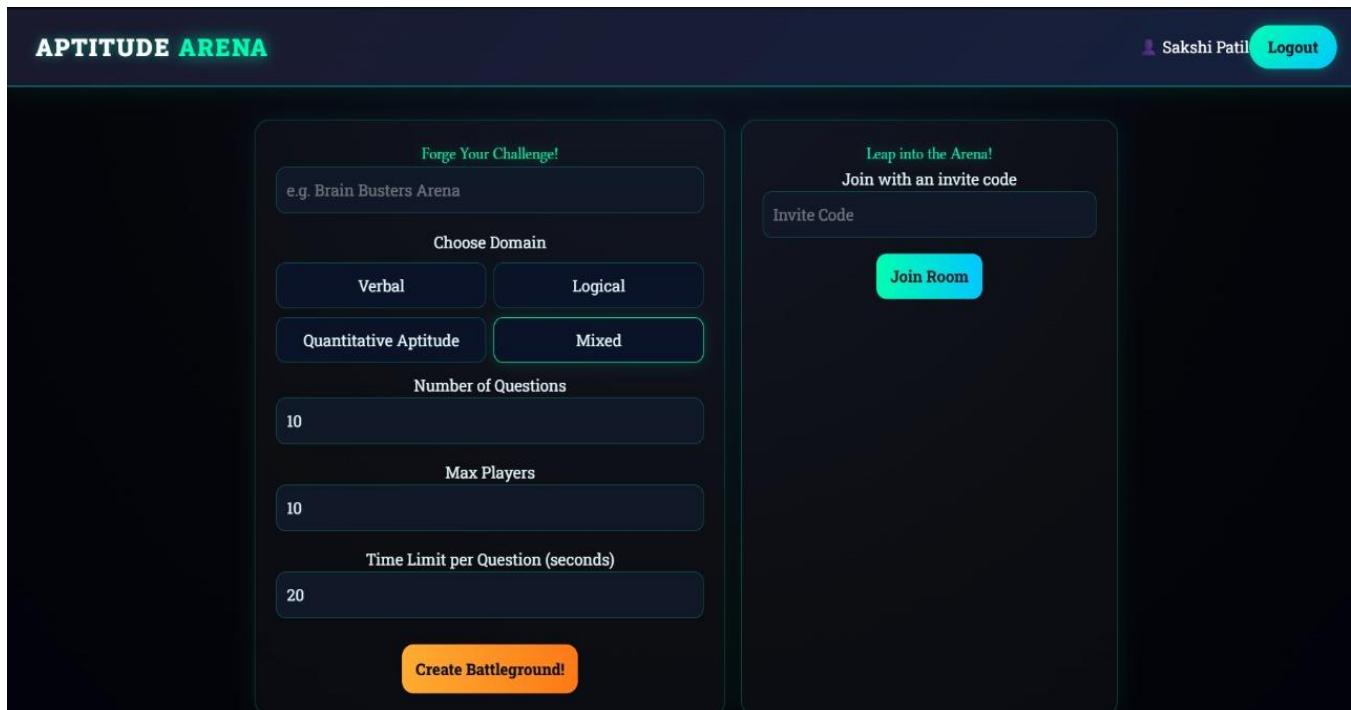


Fig. 4: Choose Battleground

8. Conclusion

The IITB EdTech Internship project offered an invaluable opportunity to combine technical development with educational impact. Through the creation of AptiBattle, I explored the intersection of gamification, data-driven learning, and web application development. The project successfully demonstrated how real-time competitive features can make aptitude learning more engaging and consistent for students. The combination of Angular, Node.js, MongoDB, and Firebase enabled a robust, scalable, and secure full-stack solution suitable for multi-user environments. From a learning perspective, this internship deepened my understanding of software engineering practices, full-stack frameworks, and user-centric design. It also improved my skills in documentation, deployment, and teamwork within an academic project framework. Overall, this project strengthened both my technical and analytical abilities, while providing valuable exposure to building scalable EdTech applications. It was a rewarding journey that combined creativity, logic, and technology to make learning more interactive and impactful..

9. References

Websites

1. Angular Documentation— Angular Official Docs, Google Developers, available at:
<https://angular.dev/>
2. Node.js Documentation— Node.js Foundation, available at: <https://nodejs.org/en/docs>
3. MongoDB Documentation— MongoDB Inc., available at: <https://www.mongodb.com/docs/>
4. Firebase Authentication— Firebase Docs, Google, available at:
<https://firebase.google.com/docs/auth>
5. Socket.IO Real-time Communication— Socket.IO Official Website, available at:
<https://socket.io/docs/v4/>
6. Postman API Testing— Postman Learning Center, available at: <https://learning.postman.com/>
7. Render Deployment Guide— Render Official Documentation, available at:
<https://render.com/docs>
8. Overleaf— LaTeX Documentation Platform, available at: <https://www.overleaf.com/learn>
9. GitHub Repository— AptiBattle Project: <https://github.com/SejalNavale/aptitude-game-site>
10. Tutorial: Real-time Web Apps using Node.js and Socket.IO— FreeCodeCamp, YouTube, 2023.
11. Article: “Gamification in Education: Enhancing Student Engagement”— IEEE Education Society, 2022

