

EduWay - Integrated Career Pathway and Learning Platform

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Abstract - In the rapidly evolving landscape of education and employment, personalized and dynamic career guidance platforms are essential to bridge the skill gap and enhance employability. This paper introduces an AI-Powered Personalized Learning and Career Development Platform, **EduWay - Integrated Learning and Career Pathway Platform**, designed to create tailored learning paths and provide job recommendations based on user-specific data collected through an interactive survey at registration. By analyzing personal, educational, and professional backgrounds alongside career aspirations, the platform generates customized roadmaps, empowering users to achieve their goals efficiently.

The platform leverages cutting-edge technologies, including React for an intuitive user interface, Spring Boot for robust backend functionality, and AI/ML algorithms for intelligent content recommendations and job matching. Gamification elements such as badges, leaderboards, and progress dashboards ensure user engagement and motivation throughout the learning journey. The system also fosters community collaboration through group discussions, and team challenges.

This paper discusses the conceptual framework, implementation details, and future scope, including adaptive AI-driven learning by providing AI Agents and advanced job market analytics. By targeting both academic excellence and practical industry alignment, the platform aims to redefine personalized education and job readiness, positioning itself as a competitive tool.

Key Words: AI-Powered, Personalized Learning, Career Development, Job Recommendations, AI/ML Algorithms, Gamification, Badges, User Engagement.

1. INTRODUCTION

In an era of rapid technological advancements and shifting job market demands, individuals at various stages of education or professional life face significant challenges in navigating their career paths. From students making critical decisions after 10th or 12th grade to undergraduates unclear about their direction, or professionals seeking to advance or pivot their careers, the need for stepwise career and skill mapping is universal.

Traditional career counseling and education systems often fall short in addressing these diverse needs due to a lack of mentorship, inadequate resources, or insufficient knowledge of in-demand skills. This gap leads to untapped potential, mismatched training efforts, and ill-equipped candidates entering the job market.

To address these challenges, we propose **EduWay - Integrated Learning and Career Pathway Platform**, an AI-driven solution that offers personalized learning paths using AI Agents, gamified engagement, and career recommendations. The platform utilizes a detailed, interactive survey during registration to gather user information—such as educational background, career goals, learning preferences, and skills—and generates tailored roadmaps and resource suggestions.

EduWay bridges the gap between education and employability by empowering users to make informed decisions and acquire relevant skills and opportunities. Whether guiding high schoolers in choosing the right career, supporting undergraduates in building focused learning plans, or enabling professionals to reskill for new roles, EduWay aims to be a transformative tool for career success. This paper explores the platform's conceptual framework, development progress, and its potential to drive academic excellence, workforce readiness, and holistic growth for users at every stage.

1.1 Problem Statement

Career guidance and skill development are critical yet often overlooked aspects of an individual's journey toward personal and professional growth. Students and professionals alike face significant challenges at different stages of their lives:

High School Students (10th/12th Grade): Often lack access to reliable guidance on choosing the right career paths, leading to uncertainty and misinformed decisions during a pivotal stage of their education.

Undergraduate Students: Struggle to align their academic pursuits with industry demands, resulting in unclear goals, inefficient learning paths, and a lack of job readiness.

Professionals Seeking Career Transitions: Find it difficult to reskill or pivot into new roles, particularly in a fast-evolving job market that demands specialized and dynamic expertise.

Traditional systems fail to provide tailored support that accounts for individual aspirations, learning preferences, and current capabilities. This results in misaligned career choices, underdeveloped skills, and missed opportunities for growth. Additionally, the absence of a structured, personalized approach to skill development and job readiness exacerbates this problem, leaving individuals unprepared for the workforce and employers unable to find qualified candidates.

There is a pressing need for an innovative platform that bridges these gaps by offering personalized learning paths, actionable career guidance, and targeted job recommendations. Such a solution must cater to the unique needs of users at various stages of their journey, empowering them to make informed decisions, acquire relevant skills, and succeed in their chosen careers.

1.2 Proposed Solution

To address the challenges faced by individuals across diverse stages of their career journeys, we propose an **EduWay - Integrated Learning and Career Pathway Platform**. This platform leverages advanced technologies to provide tailored guidance, skill-building resources, and job opportunities based on the unique needs of users.

Survey-Based User Profiling: At registration, users complete an interactive survey capturing personal background, educational history, career aspirations, and learning preferences. This data helps the platform create a personalized user profile.

AI-Driven Career Path Recommendations: The platform utilizes AI algorithms to analyze user data and generate career roadmaps tailored to their goals. These roadmaps highlight essential skills, recommend learning resources, and suggest achievable milestones.

Custom Learning Paths: Personalized learning paths are designed to address skill gaps and align with the user's career objectives. Resources include curated courses, tutorials, quizzes, and projects.

Gamified Learning Experience: Gamification elements such as badges, progress points, and leaderboards incentivize users to engage with learning materials and complete milestones.

Community Engagement Features: Users can connect with mentors, collaborate with peers, and participate in group projects. A built-in mentorship program fosters guidance from experienced professionals.

Targeted Job Recommendations: As users progress through their learning paths, the platform provides job recommendations that align with their skills and preferences. It also offers suggestions for additional skills to enhance employability.

Flexible Design for All User Levels: The platform is designed to support high school students deciding on career paths, undergraduates refining their goals, and professionals seeking new opportunities or career transitions.

1.3 Objectives

Empower Informed Career Decisions: Enable users to make well-informed career choices by providing personalized and actionable guidance.

Bridge the Skill Gap: Equip users with the necessary skills and certifications to meet current industry demands.

Facilitate Lifelong Learning: Promote continuous learning through adaptive roadmaps and updated resources tailored to evolving career goals.

Enhance Engagement Through Gamification: Increase user motivation and participation by incorporating rewards, challenges, and milestones.

Build a Collaborative Community: Foster a supportive network where users can learn from mentors, share knowledge, and collaborate on projects.

Streamline Job Matching: Connect users with relevant job opportunities based on their skills, progress, and preferences.

Support Diverse User Needs: Design the platform to address the needs of high school students, undergraduates, and working professionals.

2. SYSTEM DESIGN AND ARCHITECTURE

The proposed platform integrates multiple components to deliver a seamless and personalized experience for users. The architecture is designed to be scalable, modular, and robust, ensuring that it caters to diverse user needs efficiently. The system comprises several layers.

2.1 System Overview

The system is an AI-powered learning and career recommendation platform designed to provide users with personalized education paths and targeted job opportunities. The website offers a seamless client flow, ensuring a user-friendly experience for learners and job seekers.

User Onboarding: New users sign up and create profiles by providing details such as their interests, skill levels, and career goals.

Personalized Dashboard: Upon login, users access their dashboard, which displays recommended courses, progress metrics, and gamified elements like quizzes and badges.

Learning Path Recommendation: AI algorithms curate a learning path tailored to the user's preferences, leveraging past learning behaviors and interests.

Progress Tracking: Users track their progress with real-time analytics, including course completion rates, quiz scores, and milestones achieved.

Gamified Engagement: The system encourages participation through interactive quizzes, badges, and leaderboards displayed on the dashboard.

Job Marketplace Integration: Users explore job opportunities on a dedicated section of the platform, where AI-powered matching algorithms suggest roles based on their skills and certifications.

Feedback and Support: A dedicated support section allows users to provide feedback or seek help, ensuring continuous improvement of the platform.

This flow ensures a streamlined, intuitive experience for users, empowering them to achieve their learning and career objectives efficiently.

2.2 Flow Diagram

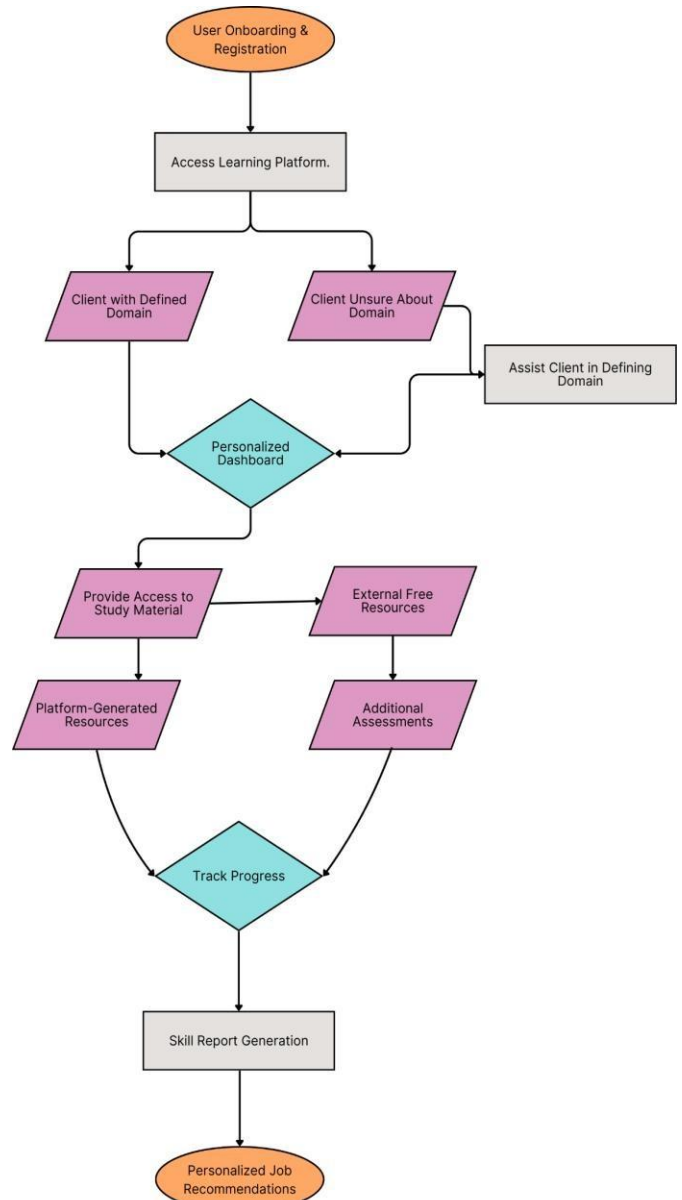


Fig -2.2.0: Process Flow

2.3 Technology Stack

1. Frontend Stack (User Interface & Interaction Layer)

The frontend of the application is responsible for delivering an interactive, user-friendly experience for users interacting with learning paths, quizzes, progress dashboards, and career suggestions.

React.js: A core JavaScript library for building dynamic and modular user interfaces.

HTML5: Used for structuring content and web pages.

CSS3: Employed for styling, animations, and layout design.

React Router: Manages navigation between different pages and views within the application.

Axios: A promise-based HTTP client used for making requests to the backend API.

Redux (Optional): A state management library to efficiently manage complex data flows in large-scale applications.

2. Backend Stack (Business Logic & API Layer)

The backend is responsible for processing business logic, handling API endpoints, and managing secure interactions between the frontend and the database.

Java: The primary programming language used for backend development.

Spring Boot: A lightweight framework used for developing microservices, RESTful APIs, and backend systems efficiently.

Spring Data JPA: Utilized for Object-Relational Mapping (ORM) to facilitate interaction with relational databases.

RESTful API: Exposes APIs to enable seamless data exchange between the frontend and backend.

2.1 Database Management:

MySQL / PostgreSQL: Relational databases used for storing structured data.

Hibernate (JPA): ORM framework used for smooth integration with relational databases.

2.2 Security:

Spring Security: Handles authentication and authorization for secure access control.

JWT (JSON Web Tokens): Ensures secure session management for user authentication.

2.3 Tools for Testing:

JUnit: Used for unit testing backend services.

Postman: Utilized for testing RESTful APIs.

3. AI/ML Stack (Recommendation Engine Layer)

The AI/ML stack powers personalized learning paths and job recommendations by processing user data and applying machine learning models.

Knowledge-Based Filtering Model: The primary recommendation engine for suggesting skills and career paths based on user profiles.

Decision Tree Algorithm: A rule-based approach used to make recommendations based on user input.

Python Libraries:

Scikit-Learn: Used for implementing machine learning models, including the Decision Tree algorithm.

Pandas: Facilitates data manipulation and analysis.

Numpy: A library used for numerical operations.

Flask: A microservice framework used for deploying AI/ML models as APIs, especially when hosted separately from the Spring Boot backend.

4. Cloud & Deployment Stack (Hosting & Infrastructure Layer)

The cloud and deployment stack is designed to provide scalable, secure, and high-performance infrastructure for hosting the application.

4.1 AWS Services:

EC2 (Elastic Compute Cloud): Provides scalable compute resources for hosting the web server and backend services.

S3 (Simple Storage Service): Used for storing static files and learning resources.

RDS (Relational Database Service): Manages the PostgreSQL database for secure, scalable, and highly available data storage.

3. METHODOLOGY

The platform uses AI to personalize learning and career guidance. Users start with an onboarding survey to capture their background, goals, and skills. The backend, powered by Spring Boot, processes this data to recommend career paths and learning resources. It features a modular design with a recommendation engine, gamification, and job matching algorithm to enhance engagement. Progress tracking and community features encourage collaboration, while AWS cloud deployment ensures scalability. The platform continuously adapts based on user feedback.

3.1 Data Collection

The data collection process begins with a comprehensive **user survey** conducted during the registration phase. This survey captures key information such as personal

background, educational qualifications, career interests, skill preferences, and professional goals. The data is categorized into structured segments, including demographic details, learning preferences, and career aspirations, to personalize the user experience.

The collected data is securely stored in a **relational database** (e.g., MySQL or PostgreSQL) through the backend (Spring Boot). The platform employs REST APIs to transmit data between the client interface (React) and the database. Advanced data analysis techniques, powered by machine learning algorithms, process this information to identify career paths, recommend learning resources, and generate tailored quizzes.

Data privacy and security are prioritized by implementing encryption for sensitive information and access controls to ensure compliance with global standards like GDPR. Continuous feedback is collected from users post-survey to refine recommendations and improve platform accuracy. This iterative data collection approach enhances the relevance of learning paths and job recommendations.

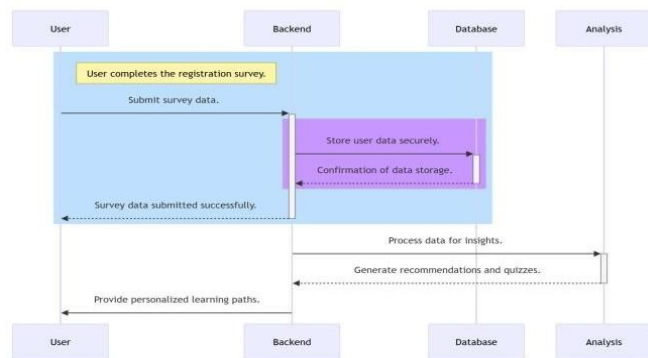


Fig -3.1.0: Data Collection

3.2 AI Algorithm for Personalized Learning Path

User Input & Data Collection: Users provide inputs like skill preferences, quiz results, and career interests through the frontend, which are transmitted to the backend for further processing.

Backend Processing & Decision Tree for Personalization: The backend uses a Decision Tree algorithm as the core of the recommendation engine.

Feature Extraction: User inputs such as skill levels, domain choices, and quiz scores are treated as features.

Decision Nodes: The decision tree evaluates these features at multiple decision nodes, splitting data based on

conditions like "Is the user skilled in Python?" or "Does the user score above a threshold in Data Structures?"

Path Generation: Based on the splits, the tree classifies the user into a learning segment (e.g., beginner, intermediate, advanced).

Output Recommendation: The final leaf node outputs a tailored learning path, suggesting specific courses and resources aligned with the user's profile.

AI Agent for Dynamic Personalization & Feedback Loop: The AI agent functions as a continuous feedback mechanism by interacting with the decision tree model. It monitors user progress and refines the learning path by re-evaluating new inputs, ensuring dynamic personalization. The refined path is sent back to the frontend, enabling a personalized and evolving learning experience.

3.3 Progress Tracking System

After receiving a personalized learning path generated by the Decision Tree-based AI model, a progress tracking system will be embedded to monitor the user's journey throughout the platform. As the user engages with suggested courses, quizzes, and modules, progress data such as course completion rates, quiz scores, and time spent on tasks will be collected through the frontend (React.js) and transmitted to the backend (Spring Boot) via RESTful APIs. This data will be stored in a PostgreSQL database, directly linked to the user's profile for continuous tracking.

The AI agent will regularly evaluate this progress data to refine the learning path dynamically. If a user shows consistent progress and high quiz scores, the model will recommend advanced resources, whereas lower performance may trigger suggestions for foundational learning content. This system ensures a personalized, adaptive learning experience while keeping users motivated with visual progress indicators, milestones, and badges, helping them stay on track toward their career goals.

3.4 Job Matching Algorithm

The progress tracking system not only monitors user activity but also provides valuable insights into skill acquisition and content mastery. As users engage with courses, quizzes, and assessments, their progress data is continuously analyzed to assess the depth of understanding in various skill areas. Once a detailed skill profile is created, the Job Matching Algorithm leverages this data to recommend career opportunities aligned with the user's competencies. By comparing the user's acquired skills with job role

requirements, the algorithm identifies matching positions and suggests relevant roles where the user can excel. If certain job requirements are unmet, the platform can further suggest targeted upskilling content to close skill gaps. This approach ensures a data-driven, personalized career guidance system, where job recommendations are based on verified learning progress, maximizing both user employability and market alignment.

3.5 Quizzes and Gamification

To enhance user engagement and foster an interactive learning experience, the platform integrates quizzes and gamification elements.

Quizzes are dynamically generated from a structured database and tailored to users' career paths. These quizzes assess comprehension and provide instant feedback, reinforcing learning outcomes.

A point-based gamification system rewards users for completing tasks such as finishing quizzes, reaching milestones, or achieving specific learning goals. Users earn badges for accomplishments, which are displayed on their profiles to motivate continued progress.

Gamification is implemented through a layered architecture, where the backend (Spring Boot) tracks points, achievements, and user milestones, while the frontend (React) visualizes progress through dashboards, leaderboards, and badge collections. These elements not only encourage active participation but also provide a sense of accomplishment, creating a seamless blend of education and motivation.

4. IMPLEMENTATION

EduWay is implemented using Spring Boot for the backend, React for the frontend, and MySQL for the database. User data collected through an interactive survey is processed with AI/ML algorithms to generate personalized learning paths and career recommendations. Gamification features like badges and leaderboards enhance engagement, while quizzes assess progress. The platform is hosted on AWS for scalability and provides a seamless, intuitive interface for tracking learning and career growth.

4.1 User Registration and Profile Creation

In modern web applications, user authentication and profile management are critical components. Java Spring Boot simplifies these tasks with its powerful features, such as Spring Security for authentication and authorization, and Hibernate for database interaction. This section outlines how a user profile is created, login and registration are handled, and how security mechanisms function in the backend.

1. Database Design for User Profiles

The first step in building a user management system is to design the database schema. Typically, a user table is created to store user-related information such as id, username, email, password, and additional profile details like firstName, lastName, and address. If the application requires role-based access control (RBAC), a roles table is also included.

The relationship between users and roles is many-to-many, which is implemented via a user_roles join table. This schema allows each user to have multiple roles and each role to be associated with multiple users.

2. User Registration Workflow

User registration is facilitated through a REST API endpoint. The registration flow involves the following steps:

- 1. Client-Side Input:** Users fill out a registration form with their details (e.g., username, email, and password).
- 2. Backend Validation:** The backend validates the input to ensure all fields are properly formatted and no duplicate usernames or emails exist in the database.
- 3. Password Hashing:** The password is hashed using a secure algorithm like BCrypt. This ensures that even if the database is compromised, plaintext passwords are not exposed.
- 4. Database Storage:** The validated and encrypted user data is saved to the database.

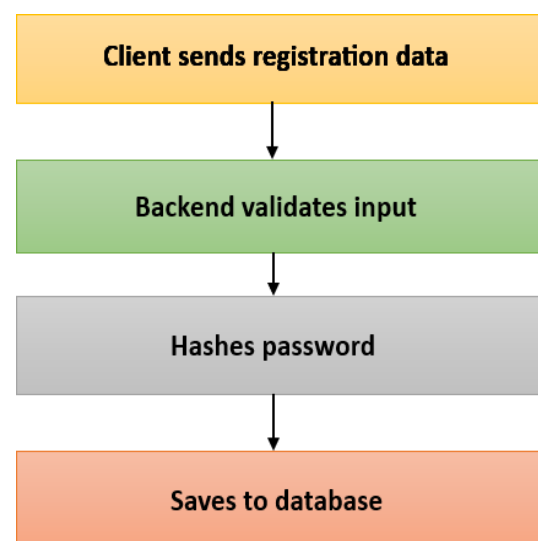


Fig – 4.1.0: User Registration Workflow

3. User Login and Authentication

User login is implemented via another endpoint where the user provides their username and password. The workflow is as follows:

- 1. User Input:** The client sends the credentials to the backend.
- 2. Credential Validation:** Spring Security's authentication manager checks the credentials against the database.
- 3. Token Generation:** If valid, a JWT is generated and returned to the client. The token is used for subsequent requests to prove the user's identity.

The following snippet illustrates a login process in Spring Boot:

```
@PostMapping("/login")
public ResponseEntity<?>
authenticateUser(@RequestBody LoginDto loginDto)
{
    Authentication authentication =
    authenticationManager.authenticate(
    new
    UsernamePasswordAuthenticationToken(loginDto.getUsername(),
    loginDto.getPassword()));
    SecurityContextHolder.getContext().setAuthentication(
    authentication);
    String jwt =
    jwtProvider.generateToken(authentication);
    return ResponseEntity.ok(new JwtResponse(jwt));
}
```

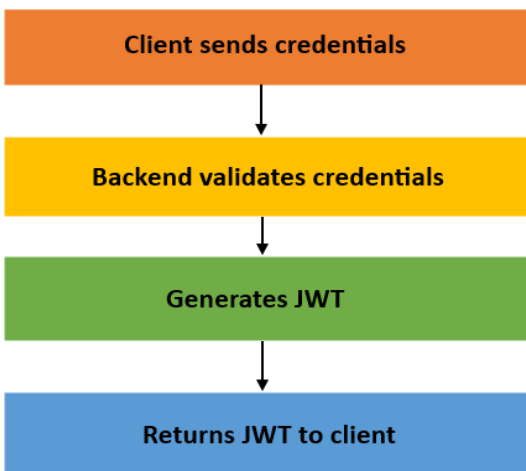


Fig – 4.1.1: User Login Workflow

4. Profile Management

Once logged in, the user can access and manage their profile data. Secured endpoints fetch user details and return them in JSON format. For updates, the backend validates the new data before saving it to the database.

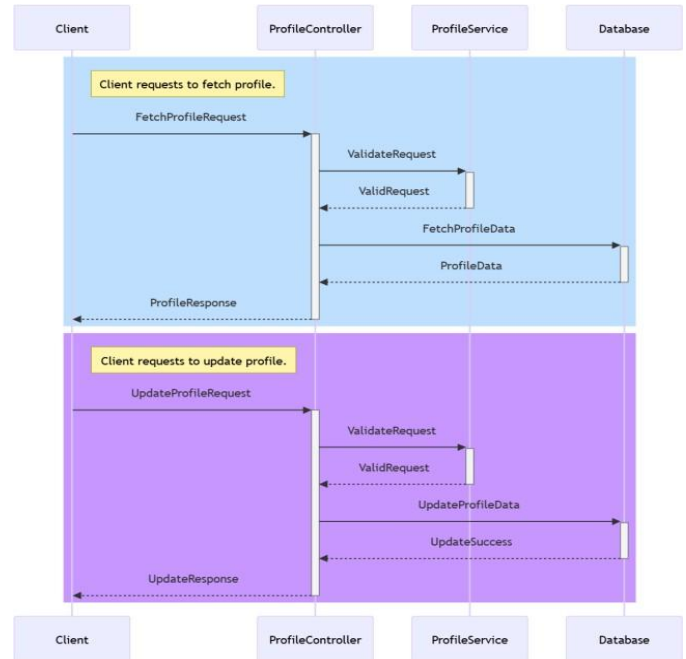


Fig – 4.1.2: Profile Management

Example endpoint for fetching user profile:

```
@GetMapping("/profile")
public ResponseEntity<?> getUserProfile(Authentication authentication) {
    User user =
    userService.getUserByUsername(authentication.getName());
    return ResponseEntity.ok(user);
}
```

5. Security Mechanism

Spring Security provides a robust security framework with the following workflow:

- 1. Request Filtering:** Every HTTP request is intercepted by the security filter chain.
- 2. Authentication Validation:** If a JWT is present, it is validated. If valid, the user is authenticated.

- 3. Role-Based Access Control:** Access to endpoints is determined by the user's roles.
- 4. Controller Handling:** The request is forwarded to the appropriate controller only if authentication succeeds.

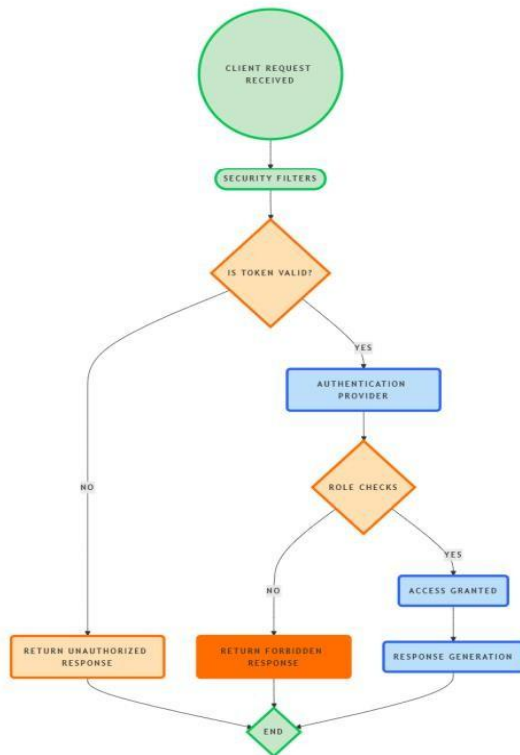


Fig – 4.1.3: Security Workflow

Spring Boot allows you to configure the security filter chain using a configuration class:

@EnableWebSecurity

```
public class SecurityConfig extends
WebSecurityConfigurerAdapter {
```

@Override

```
protected void configure(HttpSecurity http) throws
Exception {
```

```
http.cors().and().csrf().disable().authorizeRequests()
```

```
.antMatchers("/register", "/login").permitAll()
```

```
.anyRequest().authenticated().and().addFilter(new
JwtAuthenticationFilter(authenticationManager()));
```

```
}
```

```
}
```

4.2 Platform Interface

The platform interface is designed to provide an intuitive and engaging user experience, catering to individuals at various stages of their educational and professional journeys. The interface includes an easy-to-navigate survey section for gathering essential user information. Built with a focus on accessibility and functionality, the interface integrates seamlessly with backend services, ensuring real-time updates and personalized recommendations for users.

Following images shows the Interface of the platform along with its information.

Home Page:

The Home Page serves as the central hub of the platform, providing a seamless user experience and directing visitors to essential sections and features. It prominently displays the platform's purpose, offering users an engaging first impression. The page includes a "Career Explorer" button, which directs users to an interactive tool to explore various career paths, and a "Survey Form" button to collect feedback and insights from users to refine the platform's offerings. Additionally, a Sign In button enables existing users to access their profiles and resources easily.

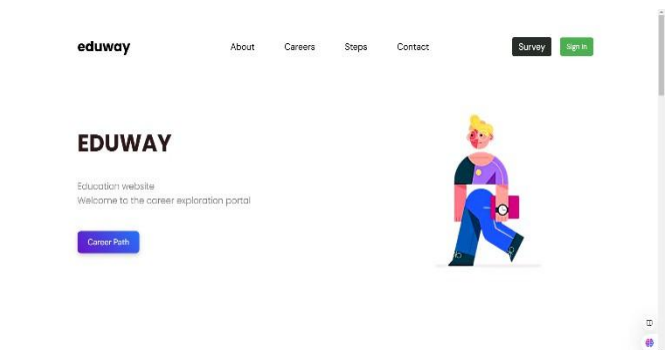


Fig – 4.2.0: Responsive home page

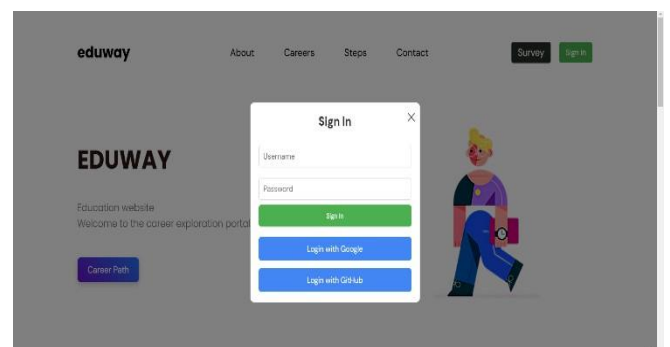


Fig - 4.2.1: Sign In Section

About

Information About Us

EduWay is an innovative educational platform designed to simplify career exploration and empower individuals to achieve their professional goals. With a focus on personalized guidance, the platform offers a user-friendly interface to help students and professionals navigate complex career decisions effortlessly. Leveraging AI-driven insights, EduWay provides tailored recommendations based on users' skills, interests, and aspirations. The platform features a tree-like structure to visualize career paths, interactive tools like assessment quizzes and resume builders, and a rich resource hub with expert advice and tutorials.

Journey to Career Success



Fig – 4.2.5: About and Steps

4.3 Career Path Generation Module

The Decision Tree Algorithm is used to generate personalized learning paths by segmenting user data based on skill levels, domain preferences, and learning history.

User data collected during registration is stored in PostgreSQL and retrieved by the backend (Spring Boot).

The AI engine (Flask microservice) applies the Decision Tree model to classify users into skill tiers and recommend appropriate courses.

Real-time adjustments are made as user progress and quiz performance are recorded, refining the learning path dynamically. Empowers users by providing a tailored learning experience that evolves with their growth.

Motivates continuous learning with personalized milestones and achievable goals. The AI engine is deployed using Docker containers managed on AWS EC2, ensuring scalability and flexibility.

The entire model is accessible via secure RESTful APIs integrated with the backend for seamless interaction with the frontend.

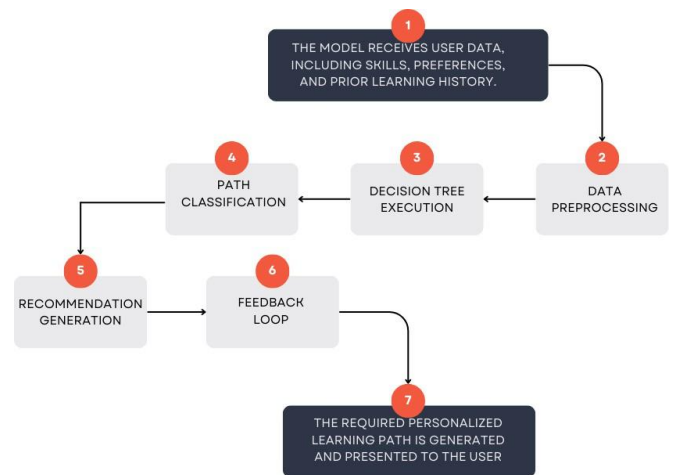


Fig – 4.3.0 Career Path Generation Module

4.4 Job Marketplace Integration

The Job Marketplace Integration module connects users to relevant job opportunities based on their skill profiles generated through progress tracking and learning outcomes. The platform uses a Job Matching Algorithm to compare the user's acquired skills, certifications, and performance data with job role requirements from various integrated job portals and company APIs. The backend (Spring Boot) processes user data and queries external databases to fetch job listings aligned with the user's current skill set. If skill gaps are identified, the system proactively suggests additional courses or resources from the learning modules to help the user meet the desired job criteria. This seamless data exchange ensures real-time job updates and personalized recommendations, enhancing the user's career readiness. Additionally, the platform empowers users by presenting career suggestions that match both their professional aspirations and learning progress, bridging the gap between education and employability. Skill profiles matched with job requirements using the Job Matching Algorithm. External job portals and company APIs integrated for personalized career options. Identifies skill gaps and suggests additional learning content.

4.5 Quizzes and Badges

To enhance user engagement and motivation, our platform incorporates gamification and quizzes as key features.

1. Badges:

The platform uses a points-based reward system, where users earn points by completing courses, quizzes, and milestones. These points contribute to unlocking badges and higher achievement levels, displayed on user profiles. Badges are awarded for reaching specific milestones (e.g., completing 5 quizzes or mastering a skill). These badges

act as a visual representation of progress and accomplishment, encouraging continued participation.

2. Quizzes:

Quizzes serve as an interactive assessment tool, providing users with the opportunity to test their knowledge and reinforce learning. A dynamic quiz system is implemented using a relational database to store questions, options, and correct answers. Questions are tailored to the user's chosen learning path. APIs built using Spring Boot fetch questions and store results, while the front-end (developed using React) provides an intuitive and engaging quiz interface with immediate feedback on performance.

5. FUTURE WORK

5.1 Enhancement

Advanced AI Models: Upgrade from a basic Decision Tree to more advanced models like Random Forest and Gradient Boosting for better accuracy.

Real-Time Adaptive Learning: Implement real-time data analysis to modify learning paths instantly based on quiz performance.

Integration of NLP: Use Natural Language Processing (NLP) to assess written responses and suggest personalized resources.

Expanded Data Sources: Incorporate data from third-party platforms and open educational resources for richer insights.

Gamification Elements: Introduce more engagement features like adaptive quizzes, leaderboards, and personalized rewards.

5.2 Long-term Vision

AI as a Career Advisor: Evolve the model into a full-scale AI-driven career advisor offering dynamic career suggestions based on evolving skill data.

Collaborative Learning Platform: Enable peer-to-peer learning by suggesting collaborative projects and group assessments.

Free Resource Integration: Link users to high-quality free educational content like OpenCourseWare and free coding platforms.

Skill Certification Integration: Offer verifiable digital certifications and badges recognized by industry partners.

Continuous Learning Loop: Create a system where progress data refines both the user's learning path and the model's recommendations over time.

Global Accessibility: Expand language support and accessibility features, ensuring inclusive education for a diverse audience.

7. CONCLUSIONS

EduWay is a transformative platform that bridges education, skill development, and career opportunities. By using AI-powered recommendations, personalized learning paths, and gamification, it helps students, undergraduates, and professionals make informed career decisions. With a focus on skill mapping and data-driven insights, EduWay promotes continuous growth, reduces skill gaps, and supports sustainable career development.

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