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Skillpulse: An AI-Powered Skill Analysis, Resume Building and Job Discovery Platform

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ABSTRACT:

Students and job seekers commonly use several separate platforms to search for jobs and internships, prepare resumes and understand the skills required for a desired role. This fragmented process is time-consuming and can lead to repeated effort and missed opportunities. SkillPulse is a web-based, AI-assisted career-support platform proposed to bring these activities together through structured user profiling, guided resume creation, opportunity discovery and skill-gap analysis. The central question is whether a single connected workflow, in which one user profile drives resume generation, opportunity matching and skill comparison, can make early-career preparation more structured and accessible.

The platform collects education, technical skills, interests, certifications and project details through a structured profile. A questionnaire-based resume builder organizes this information into an ATS-conscious resume without inventing experience. A job discovery module is designed to gather listings from reliable and authorized sources, and a skill analysis module compares profile skills with the requirements of selected roles to identify possible gaps. This paper documents the problem, objectives, related concepts, methodology, requirements, layered architecture, system modules, validation plan, limitations and future work. Features described as proposed or planned require implementation and testing before they are treated as completed results, and no recommendation accuracy or live-source coverage is claimed.

Keywords: SkillPulse, artificial intelligence, skill analysis, ATS-friendly resume, job discovery, internship recommendation, career guidance, skill gap analysis.

1. INTRODUCTION:

The transition from education to employment requires more than academic qualifications. Students and fresh graduates must understand industry expectations, present their skills clearly, prepare suitable resumes and identify relevant job or internship opportunities. These tasks are usually performed on separate websites and tools. Job portals provide listings, resume tools help prepare application documents and learning platforms offer skill-development resources, yet users still have to compare information manually and decide which opportunities match their current abilities.

SkillPulse is designed as a unified platform that connects a user's profile, resume preparation, skill analysis and opportunity discovery. The initial scope targets students, fresh graduates and early-career job seekers, with listings relevant to Tamil Nadu and other regions; the exact availability of listings depends on the data sources and access methods integrated into the system. SkillPulse is a support tool: users remain responsible for verifying listings and reviewing generated resume content.

The rest of this paper is organized as follows. Section 2 states the problem and objectives, Section 3 reviews related concepts, Section 4 explains the methodology, Section 5 presents system analysis and architecture, Section 6 describes the modules and user workflow, Section 7 outlines testing and validation, Section 8 discusses expected outcomes and applications, Section 9 covers challenges and limitations, and Section 10 concludes with future work.

2. PROBLEM STATEMENT, RESEARCH QUESTION AND OBJECTIVES:

The main problem addressed by SkillPulse is the fragmented process of career preparation and opportunity searching. Students may find it difficult to identify suitable jobs, understand the skills expected for a role and prepare a resume that presents their qualifications clearly. Searching across many sources can lead to missed opportunities and repeated effort. The research question is whether a connected, profile-driven workflow can reduce this fragmentation by supporting resume preparation, skill comparison and opportunity discovery in one environment, while keeping recommendations transparent and verifiable.

The aim of SkillPulse is to develop a web-based career-support platform that helps students and job seekers understand their skills, create structured resumes and discover relevant opportunities. The specific objectives are:

- Create a user profile containing education, skills, interests, certifications and project details.
- Generate an ATS-conscious resume through a guided questionnaire.
- Collect and display job and internship opportunities from reliable, authorized sources.
- Match opportunity requirements with the user's profile.
- Identify potential skill gaps and suggest areas for improvement.
- Provide a simple interface for reviewing and managing relevant opportunities.
- Present evidence and assumptions clearly so that planned features are not mistaken for validated results.

3. LITERATURE SURVEY AND RELATED CONCEPTS:

Online job and internship platforms: Employment platforms let candidates search vacancies by keyword, location, experience and other filters [1], [2]. They make job information easier to access, but users may need to visit several services to compare opportunities, and listings differ in format, freshness and eligibility details. SkillPulse proposes to organize selected listings in one interface while retaining the original source information for verification.

Resume screening and ATS: Many organizations use Applicant Tracking Systems to organize and filter applications. A resume with clear section headings, consistent formatting, relevant keywords and readable text is generally easier for both software and recruiters to process. SkillPulse's guided resume builder produces a structured resume from information entered by the user; it does not depend on extracting details from an uploaded resume in the planned workflow.

Skill gap analysis: Skill gap analysis compares a person's current abilities with the skills expected for a role, using technical skills, tools, domain knowledge and experience described in a job requirement. A gap report helps users identify skills to learn or demonstrate through projects. Its quality depends on accurate profile information and well-structured job requirements.

AI-based recommendation: Recommender systems use user preferences and item characteristics to rank potentially relevant results [8]. In a career platform, profile attributes can be compared with job requirements using keyword matching, weighted scoring or machine-learning methods where suitable training data exist [5], [9]. The system should explain the main matching factors and avoid presenting a recommendation as a guarantee of selection.

Research gap: Existing services commonly focus on one major activity, such as job listing, resume preparation or learning, and users must connect these activities themselves. SkillPulse addresses this practical gap by proposing a connected workflow in which profile information supports resume generation, skill comparison and opportunity discovery. Its effectiveness must be evaluated through testing with real users and verified opportunity data.

Table 1. Conventional approach compared with the proposed approach

Aspect	Conventional approach	Proposed SkillPulse approach
Profile	Re-entered on every portal	Entered once; reused by all modules
Resume	Separate tool; manual formatting	Guided questionnaire; structured, editable output
Opportunities	Searched on many portals	Selected listings in one interface with source link
Skill comparison	Manual reading of job descriptions	Profile skills compared with role requirements
Transparency	Often a score or list only	Source, date and matching reasons shown

4. METHODOLOGY:

SkillPulse follows an iterative web-development approach. The process begins with identifying user needs and the information required for career support. The system is then divided into profile, resume, opportunity and skill-analysis modules, each of which can be developed and tested independently before integration. Figure 1 shows the proposed processing workflow.

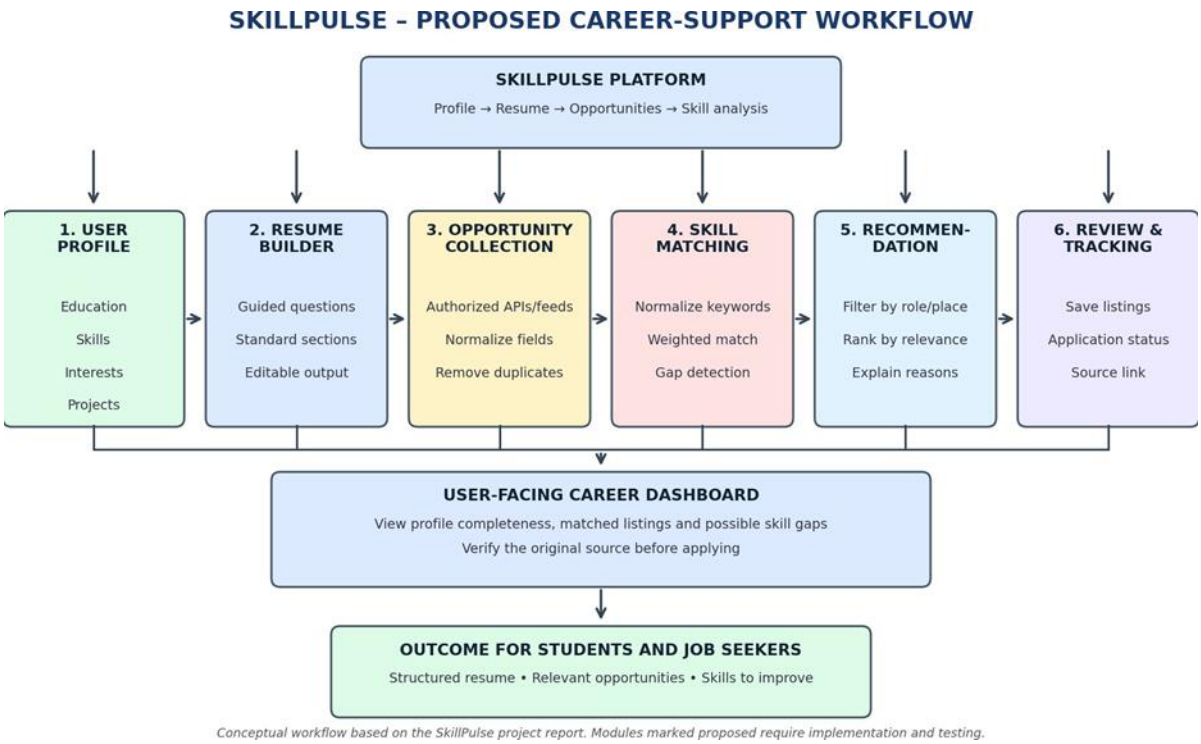


Figure 1. SkillPulse proposed career-support workflow

4.1 User profile data

The profile is the main source of information for personalization. Users enter details through forms and structured questions (Table 2). Clear validation reduces missing or incorrectly formatted details, and the information can be edited as the user gains new experience.

Table 2. User profile information

Profile area	Example information	Purpose
Personal and contact	Name, email, location	Identify and contact the user
Education	Course, institution, year	Understand academic background
Skills	Programming languages, tools, domains	Support skill comparison
Interests	Preferred roles and fields	Improve opportunity relevance
Projects	Title, description, technologies	Present practical experience
Certifications	Course or certification details	Show additional learning

4.2 Resume generation process

The resume builder collects information through a guided questionnaire covering personal details, education, skills, projects, certifications and other relevant information. The system organizes these details into standard resume sections and generates a clean, editable document. Generated text uses only information supplied or approved by the user, and the user should review all details before downloading or submitting the resume. The approach is questionnaire-based rather than automatic OCR extraction from an uploaded resume.

4.3 Opportunity data collection

The job discovery module is designed to retrieve job and internship information from reliable sources through permitted APIs, feeds, partnerships or other authorized access methods. Each listing should retain key fields such as role title, organization, location, description, required skills, date and source link. Collection must respect the terms of the source websites and applicable privacy and access rules. Listings are checked for duplicates and outdated information where possible, and the source and retrieval date are recorded.

4.4 Skill matching and gap analysis

The system compares skills in the user profile with the skills and qualifications mentioned in an opportunity. A basic version normalizes keywords (case, punctuation and known synonyms) and applies weighted matching. If R is the set of normalized skills required by a role, each with an assigned weight w, and U is the set of normalized skills in the user's profile, a candidate relevance indicator can be defined as the weighted fraction of required skills that the user already has, that is, the sum of the weights of skills in both R and U divided by the sum of the weights of all skills in R. Skills in R but not in U are listed as possible gaps for the user to review. The weights, normalization rules and any threshold are design choices that must be documented and evaluated before the indicator is reported as a score. A later version may use NLP to recognize related skill terms and machine-learning models if suitable labelled data become available [5], [9].

4.5 Recommendation workflow

After profile completion, the system processes the user's preferences and skills. Available opportunities are filtered by criteria such as role, location and opportunity type, and the remaining listings are ranked by profile relevance. The interface can show matching skills, missing or recommended skills and the original application link. The user can then review, save or apply through the source platform.

5. SYSTEM ANALYSIS AND ARCHITECTURE:

5.1 Existing approach and its limitations

In the conventional process, users search for opportunities on different job portals, prepare resumes with separate tools and independently compare their skills with job descriptions. Information is often re-entered across services, and it is hard to maintain a clear record of suitable opportunities. The main limitations are:

- Career information is distributed across multiple platforms.
- Users spend considerable time searching and filtering listings.
- Resume preparation may require repeated manual formatting.
- Skill requirements are not always compared directly with the user profile.
- Duplicate, expired or incomplete listings reduce the usefulness of search results.
- Users may lack a clear view of the skills they need to improve.

5.2 Proposed system

SkillPulse proposes a unified web platform with separate user and admin areas. The user side focuses on profile management, guided resume creation, job and internship discovery and skill analysis. The admin area is maintained separately for administrative activities and is not replaced by the user-side workflow. The system provides profile-based recommendations while preserving source links so that users can verify opportunities.

5.3 Functional and non-functional requirements

Table 3. Functional requirements

ID	Functional requirement	Priority
FR-01	Allow users to create and update a career profile.	High
FR-02	Collect education, skills, interests, projects and certifications.	High
FR-03	Generate a structured resume using guided questions.	High
FR-04	Display job and internship listings with source information.	High
FR-05	Filter opportunities by role, location and type.	High
FR-06	Compare profile skills with opportunity requirements.	High
FR-07	Show possible skill gaps and improvement suggestions.	Medium
FR-08	Allow users to save and review selected opportunities.	Medium
FR-09	Preserve a separate admin area for administrative tasks.	High

Table 4. Non-functional requirements

Attribute	Requirement
Usability	Simple navigation, readable content and clear forms.
Performance	Profile pages and opportunity results should load within an acceptable time.
Reliability	Validate user inputs and handle unavailable data sources gracefully.
Security	Protect user information and apply suitable access controls.
Maintainability	Keep profile, resume, data collection and recommendation modules separate.
Scalability	Allow additional opportunity sources and regions to be added.
Transparency	Show opportunity source, date and matching reasons where available.

5.4 System architecture

The proposed architecture has five logical layers (Figure 2). The presentation layer provides the website interface. The application layer manages user profiles, resume generation and opportunity workflows. The analysis layer performs skill comparison and recommendation ranking. The integration layer connects permitted external data sources. The data layer stores user-entered information and normalized opportunity records. The layers communicate through defined interfaces, so individual modules can be updated without redesigning the platform.

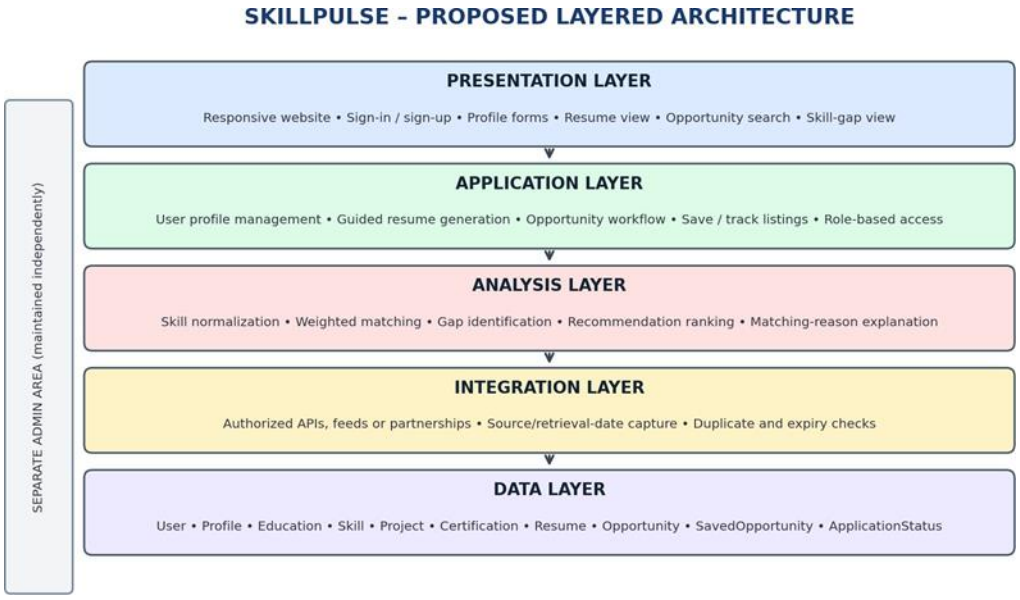


Figure 2. SkillPulse proposed layered architecture

5.5 Proposed technology stack

Table 5. Proposed technology stack (candidate technologies; final choices to be confirmed against the current codebase)

Component	Candidate technology	Purpose
Frontend	HTML, CSS, JavaScript or React	Responsive pages and interactive forms
Backend	Python with Flask or FastAPI	Application logic and API requests
Data processing	Python, pandas, NumPy	Clean and organize profile and listing data
AI / ML	scikit-learn; NLP libraries when required	Skill comparison and recommendation
Database	SQLite or PostgreSQL	Store profiles and normalized opportunity records
Integration	Authorized APIs, feeds or permitted data access	Retrieve external opportunity information
Version control	Git and GitHub	Track source-code changes and collaboration

5.6 Data model

The main data entities are User, Profile, Education, Skill, Project, Certification, Resume, Opportunity, OpportunitySkill, SavedOpportunity and ApplicationStatus. User identifies the account and Profile stores career preferences. Skills, projects and education describe the user's background. Opportunity stores listing details and its source, OpportunitySkill links listings to required skills, and SavedOpportunity and ApplicationStatus help users organize shortlisted listings.

6. SYSTEM MODULES AND USER INTERFACE:

User profile module: Collects education, technical skills, interests, projects and certifications to personalize the platform, with validation to reduce missing or incorrectly formatted details.

Resume builder: Guides users through questions and organizes answers into sections such as contact details, summary, education, technical skills, projects, certifications and achievements. It uses readable formatting and relevant keywords without adding experience or skills the user has not supplied, and lets users review and correct the final content.

Job and internship discovery: Brings selected listings into the interface. Users search or filter by job title, domain, location and opportunity type. Each result shows the organization, role, location, key requirements, source and original application link, and indicates when a listing was retrieved; expired listings are not presented as current when their status is known.

Skill analysis: Compares profile skills with the requirements of a selected role or opportunity and displays matching skills, possibly missing skills and suggested improvement areas. It guides learning and project planning rather than judging employability.

Recommendation and tracking: Ranks relevant opportunities and explains the main matching factors. Users can save listings and record progress, distinguishing shortlisted, applied and completed opportunities. These functions depend on the corresponding implementation.

Admin module: A separate area for authorized tasks such as reviewing platform information, managing supported sources and monitoring content. Its existing functions remain separate from changes to the user-side career modules.

The user workflow (Figure 3) is: open the website and access the user area; create or update the profile; use the guided resume builder; search or browse relevant jobs and internships; review matching skills and possible gaps; and save suitable opportunities and follow the original application link.

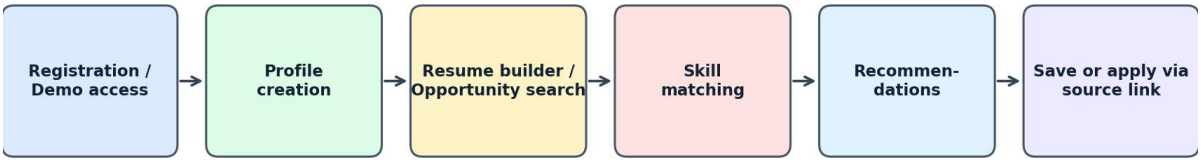


Figure 3. SkillPulse user flow

6.1 Implementation status

The project is planned around separate user and admin areas, with the current development focus on user-side career features. The sign-in/sign-up interface has been initiated and the project website is available at https://skillpulse-silk.vercel.app/. The resume builder and job discovery workflow are described as project modules and should be marked completed only after the corresponding functions are implemented and tested.

7. TESTING AND VALIDATION PLAN:

Testing is performed module by module and again after integration. The main areas are form validation, profile storage, resume generation, opportunity retrieval, filtering, skill matching, access control and interface usability. The tests in Table 6 form a validation plan; actual pass or fail results should be entered only after the team executes them.

Table 6. Functional test cases (validation plan)

Test ID	Test case	Expected result
TC-01	Submit a profile with valid details.	Profile information is accepted and displayed correctly.
TC-02	Leave a required field empty.	A clear validation message is displayed.
TC-03	Generate a resume from completed answers.	A structured resume is produced from the supplied details.

Test ID	Test case	Expected result
TC-04	Search for an opportunity by role and location.	Relevant available listings are displayed.
TC-05	Open an opportunity source link.	The original listing page opens correctly.
TC-06	Compare profile skills with role requirements.	Matching and possible missing skills are displayed.
TC-07	Use filters with no matching results.	A suitable no-results message is displayed.
TC-08	Access the user area with an unauthorized role.	Access is restricted according to role permissions.

Data validation: Required profile fields are validated; opportunity records are checked for missing titles, source links and locations; duplicates are identified using suitable identifiers; source and retrieval date are recorded; and unavailable or malformed source responses are handled without crashing.

Recommendation validation: Checked using sample user profiles and job descriptions. The team manually verifies that displayed matching skills are present in both records, and representative users judge whether suggested opportunities are relevant. Any evaluation score is reported only after the test data, method and results are documented.

Resume validation: Generated resumes are reviewed for correct personal details, section order, spelling, readability and consistency, and checked for selectable text and a clean layout. The system must not invent qualifications. ATS compatibility is a design objective unless tested with a defined screening tool or method.

Usability, performance and security: Usability testing confirms that a new user can complete a profile, generate a resume and find an opportunity without confusion. Performance checks record page-loading, search-response and resume-generation times. Security checks confirm that users cannot access another user's private profile or the restricted admin area. Interface accessibility can be reviewed against WCAG 2.2 [7].

8. EXPECTED OUTCOMES, DISCUSSION AND APPLICATIONS:

The intended output of SkillPulse is a connected career-support workflow in which a user maintains a profile, generates a structured resume, explores job and internship listings and reviews skill matches for selected roles. The platform is expected to reduce the need to manage these activities through completely separate tools.

Its value depends on the quality of the user profile and the reliability of the opportunity data. A detailed profile supports more relevant recommendations, while incomplete job descriptions may reduce the accuracy of skill comparisons. Displaying the source link and matching reasons helps users review recommendations rather than rely only on a score. The main beneficiaries are:

- **Students and fresh graduates:** build a structured resume and see which skills to develop for target roles.
- **Early-career job seekers:** find relevant listings in one place and keep track of applications.
- **Training and placement cells:** use skill-gap views to guide learning and project suggestions for students.
- **Platform administrators:** manage supported sources and monitor content through a separate admin area.

9. CHALLENGES AND LIMITATIONS:

Availability of external job data depends on source permissions and API limits. Some listings may be incomplete, duplicated or outdated, and skill matching may miss synonyms or context in job descriptions. Resume quality depends on the accuracy of information entered by the user, ATS compatibility varies between employers and screening systems, and recommendations cannot guarantee interviews, selection or employment. Table 7 summarizes the main risks and planned mitigations.

Table 7. Project risks and mitigation

Risk	Possible effect	Mitigation
Outdated listings	Users may follow expired opportunities.	Show source and retrieval date; refresh records.
Restricted data access	A source may block or limit collection.	Use authorized APIs, feeds or approved access.
Incorrect profile data	Poor matching and resume errors.	Validate inputs and allow user review.
Keyword mismatch	Relevant skills may not be recognized.	Normalize terms and maintain skill synonyms.
Privacy exposure	Personal information may be disclosed.	Apply access control and data minimization.
Over-reliance on scores	Users may misinterpret recommendations.	Show reasons and explain limitations.

Validation: This paper does not claim measured recommendation accuracy, verified live-source coverage or quantified user benefit, because the project materials do not yet include test evidence.

10. CONCLUSION AND FUTURE WORK:

SkillPulse is a web-based platform designed to support students and job seekers through important stages of career preparation. It connects user profiling, guided resume creation, job and internship discovery and skill-gap analysis in one proposed workflow. By organizing career information and comparing user skills with opportunity requirements, the platform aims to make career exploration more structured and accessible. Its reliability will depend on accurate user information, permitted and up-to-date opportunity sources, transparent matching logic and thorough testing. SkillPulse is intended to assist career decisions and does not replace the user's own review or judgement.

Future work includes:

- Adding more verified job, internship and hackathon sources through permitted integrations.
- Improving skill matching with NLP-based skill extraction and synonym recognition.
- Providing role-specific resume customization based on selected job descriptions.
- Suggesting learning resources and project ideas for identified skill gaps.
- Adding application reminders and a more detailed application tracker.
- Supporting additional regions, languages and accessibility improvements.
- Evaluating recommendation relevance with larger user groups and documented metrics.

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