Skill Swap: An AI-based Skill Learning Tool

Asma Sanam Larik
Faculty of Information & Computing Sciences, Department of Computer Science, Dawood University of Engineering & Technology
Karachi, Pakistan

Muhammad Husnain Ali
Faculty of Information & Computing Sciences, Department of Computer Science, Dawood University of Engineering & Technology
Karachi, Pakistan

Muhammad Fawad Ghori
Faculty of Information & Computing Sciences, Department of Computer Science Dawood University of Engineering & Technology
Karachi, Pakistan

Sarwat Iqbal
Faculty of Information & Computing Sciences, Department of Computer Science Dawood University of Engineering & Technology
Karachi, Pakistan

QuratulAin Nadeem
Faculty of Information & Computing Sciences, Department of Computer Science Dawood University of Engineering & Technology
Karachi, Pakistan

Fatima Irfan
Faculty of Information & Computing Sciences, Department of Computer Science Dawood University of Engineering & Technology
Karachi, Pakistan

ABSTRACT
Current education systems only provide limited opportunities to collaborate and learn from each other through traditional settings. This has created a barrier to establishing an ecosystem to support ongoing development through collaborative efforts using the latest technology. To solve this problem, this tool Skill Swap was created as an AI-based solution that gives developers and learners access to skill-set exchanges, matched mentors and peer-to- peer structured learning experiences. Using AI-based chatbots that verify the skills claimed by users, creating interactive dynamic skill profiles that ensure that mentorship will be matched with the appropriate user based on skills and provide a secure and trustworthy way to connect and interact with mentors and users. The main page of the platform has been designed using a simple User Interface (UI) that will give learners a list of categories, the ability to find mentors, and a simple onboarding process. Additionally, the platform includes a recruiting module that helps businesses identify verified candidates. This AI-based tool was created with a focus on scalability, security, and accessibility to foster the development of an engaged digital community and allow members to learn from each other and develop together.

Keywords
Skill Exchange, Code Mentoring, Ai-Powered

1. INTRODUCTION
Traditional educational systems often lack the flexibility needed for students to exchange skills and explore ideas beyond formal coursework. This inflexibility limits the development of a networked student community in which knowledge sharing can extend beyond the boundaries of the classroom [1]. While group learning frameworks are meant to improve the communication and teamwork skills of the students, they normally have logistical disadvantages, such as uneven distribution of work, and conflicts within the group, thus limiting their effectiveness [2]. Besides, as the digital world is changing, the labor market of the future is calling for learning systems to be more flexible so that the skills of the learners could be matched with the work requirements - traditional online platforms are usually not up to this task [3]. To fulfill these new demands, the emphasis has been shifted to AI-powered platforms that are capable of adaptive learning and can change the pace of learning [4]. Nevertheless, problems with the quality of the learning experience, the growth of the user base, and verifying the expertise of the users still plague these platforms. The recent research findings suggest that the future learning environment will be AI-based but more specifically AI platforms that can facilitate skill validation and mentorship auto matching [5]. In the absence of such mechanisms, learners often find that they have acquired theoretical knowledge, but they hardly get any practical guidance thus, a gap is created between learning and professional application. This tool aims to provide a perfect answer to all the problems that have been identified above. It is an innovative, AI-powered platform that radically changes the way people find each other, share skills, and develop professionally. This tool not only helps to build the culture of knowledge transfer, but it is also a very effective tool in education. It helps to establish a culture of knowledge sharing by matching users with mentors not only on the basis of their learning needs, but more importantly, by their verified skills. As a platform, the company's aim does not stop helping one to learn; it strives to build a career community through the recruiter portal integration.

Building a platform of this nature takes both technical and strategic workarounds. It is important that when AI is integrated for skill authentication, it is done in a manner such that the system is not biased and data privacy is assured because at present, research on AI-human interaction points to the problem maintaining that even the AI decision is to be prone to errors in the process of Madison [6]. Besides, on-field implementation is subject to challenges in terms of processing requirements and the necessity of a very large amount of training data for the system to be generalized [7]. Notwithstanding these difficulties, this tool aspires to bring a partnership ramp that is user-centered, industry-oriented, scalable, and nevertheless transparent, supporting the users in not only enhancing their networks but in also being able to prove their skills to be credible in the real world.

2. LITERATURE REVIEW
Examination of the existing educational landscapes shows that although e-learning has opened access to information for all, traditional educational platforms are mostly theoretical and inflexible. Studies show that they do not ensure verified acquisition of skills or tailored guidance, thus leaving a gap in

socio-emotional learning and hands-on experience [8]. Despite recent research showing that such environments can increase learner equity and engagement via intelligent feedback [9], most available platforms do not have the infrastructure to verify the competence of users or create dynamically connected peer- to-peer interaction. This review creates the key need for a system that is not based on passive consumption of content but rather on a verified community of practice.

A thorough analysis of existing platforms presents a certain functional limitation, which this project aims to solve. Popular platforms like Skill Share are video-based mostly creative courses with no interactive mentorship or verified accreditation of acquired skills. In the same line, Code mentor and Exercism.io offer help but only in niche coding skills and with a fee-for-service or absence of other professional social networking features. At the other end, peer-to-peer exchange initiatives such as Barterchain [10], the On-Demand Skill Exchange Platform [11], and SkillSync [12] attempt to facilitate free skill exchange. However, social networks are severely limited by trust issues since, without an AI mechanism that authenticates acquired skills, there is no guarantee of the quality of mentorship.

These shortcomings demonstrate several essential market gaps: lack of AI-based skills verification, lack of centralized community for knowledge transfer, or the platform connecting the learner with recruiters. First, existing platforms do not have the concept of validating the mentor's abilities before allowing them to mentor others, and secondly, there is no linkage between acquiring a skill and being employed through it. As a result, peer mentors go uncompromised in terms of their credibility and career advancement prospects are low. This project fills these gaps by proposing a new, AI-driven framework for skill exchange. The most significant contribution of this application is the creation of an automated skill verification system that guarantees the mentors' skills level and thus trust in the community [13]. Also, contrary to conventional systems that separate educational institutions from the job market, the platform offers a special recruiter's cabinet. The platform creates a scalable ecosystem that connects collaborative learning with professional development by

giving employers access to a curated pool of verified talent to increase recruitment efficiency and quality [14]. Table 1 presents a comprehensive evaluation of existing AI based skill learning tools with the proposed Skill Swap system.\

Table 1: Comprehensive Evaluation of Existing Systems

	CodeMentor	BarterChain	SkillSwap (Proposed)
Primary Focus	Coding Guidance	Skill exchange via bartering	Skill sharing and collaborative learning
Mentorship	Yes	Yes	Yes
AI Matching	No	No	Yes
Skill Validation	No	No	Yes
Interactive Collaboration	No	Yes	Yes
Certification	No	No	Yes

3. PROPOSED SYSTEM DESIGN

3.1 Development Model and Strategy

The platform's development has been aligned with the Agile methodology to provide an implementation that is both robust and flexible. Agile was chosen because it supports the team in breaking down the work into iterations or "sprints." Due to its iterative nature, adaptability, and ability to enhance collaboration and product quality, Agile is very popular in software development both in universities and the industry [15]. The stages of the software development lifecycle were clearly defined starting with the requirement analysis phase and then moving sequentially to frontend design, backend construction, and the integration of advanced AI modules. Employing this incremental approach, features of the highest priority, e.g., user authentication and the AI chatbot, were developed and tested in the first place, thus the core architecture was stable before less important features like the recruiter portal were added.

3.2 System Architecture and Design

The system is architecture as depicted in Figure 1 consists of a modular, role-based web application, which supports four user types that are different from each other: Learners, Mentors, Recruiters, and Administrators. The structure of the software provides a clear division of labor between the user interface, the application logic, and data storage. To ensure seamless and responsive user experience on all kinds of devices, the frontend was put together with a standard web stack containing HTML5, CSS3, and JavaScript. This layer of the application connects in real-time with the backend server, which uses the Laravel (PHP) framework. Laravel acts as the system's main controller, thus it is responsible for secure API routing, session management by means of JWT (JSON Web Tokens), and the orchestration of data flow between the client and the server. The long-term data—covering, for instance, user profiles and skill taxonomies, as well as chat logs—is stored in a MySQL relational database, and Laravel's Eloquent ORM is used to ensure that data fetching and relationship management are done correctly.

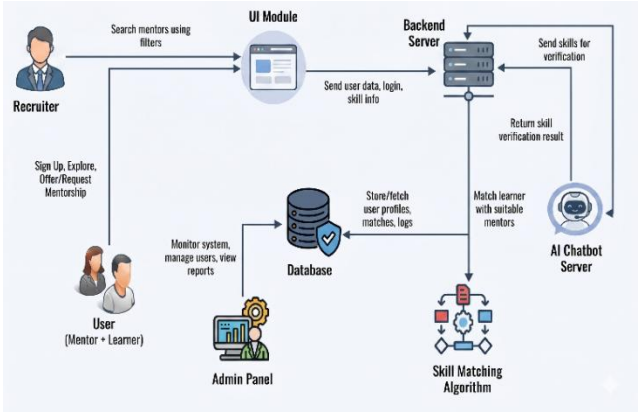

Figure 1: System Architecture

3.3 AI-Based Skill Verification and Matching Logic

One of the major innovations of this work is the coupling of an AI-powered skill verification system to the research. This tool, in contrast to conventional platforms, which depend on the self-reporting of users' skills, has a totally independent Python- based server that hosts the Llama Large Language Model (LLM) with 4.4 billion parameters. When a user signs up as a mentor, this facility is invoked through RESTful APIs. The chatbot conducts a dynamic, context-aware question-and- answer session to evaluate the user's proficiency.

The architecture evaluates the scientific correctness of the answers and awards a certain level of confidence; the database records those users who go beyond a specific threshold as "Verified" only. In order to complement the confirmation module, a skill matching system was specifically tailored and implemented in the backend logic. The backend, which is the server-side part of the application, uses JavaScript to write this matching algorithm. It enables the backend to narrow down the list of possible mentors by checking a number of conditions such as their status of AI verification, whether their skill categories correspond, and whether they have enough time. Thus, learners and recruiters get to see the most qualified and verified mentors on the "Explore" page rather than being randomly directed to the listings of the directory.

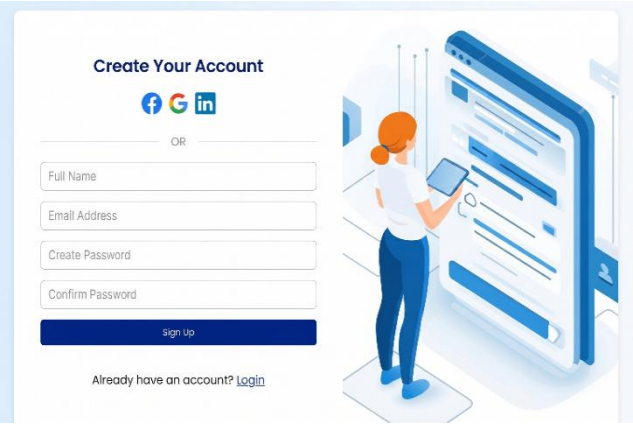

Figure 2: Screenshot of Login Page

3.4 Recruiter Integration and System Modeling

To reconnect education with employment, the platform has gone so far as to build a separate Recruiter Module. This interface that is designed in such a way to be user-friendly enables outside companies to dig the database for talent that has been verified by applying filters like the level of experience and the special skill sets. To make the design of these intricate flows perfect for the users, the phase took advantage of Figma to draft wireframes and UI mockups that are very detailed. In addition, the logic of the system was charted out with the help of the Unified Modeling Language (UML) standards, particularly Data Flow Diagrams (DFD) and Sequence Diagrams, to provide a clearer picture of the interaction between the user, the Laravel backend, and the AI server when they are involved in the most important steps like the registration-to-verification pipeline.

4. EXPERIMENTS AND RESULTS

This section discusses Skill Swap final performance, performance tests, and the skill verification module provided by the Artificial Intelligence layer. The aim of the testing was to ensure that the system functions consistently across its core features, and that both verification and matching algorithms successfully work as intended.

4.1 Experimental Setup

All the experiments were performed in the application's live web application. Backend is built on PHP Laravel with MySQL database and front end is based on HTML, CSS, JavaScript. Navigational modules such as user on-boarding, chatbot-based skill testing, mentor recommendation and recruiter search were tested by controlled interactions with users and repeated walkthroughs with the interface.

For this, a real as well as simulated users were used to assess the correctness and response time. Screenshots of the interfaces and backend tables were done to affirm the correctness of navigation, data flow & module connection.

4.2 Prototype Development

The detailed walkthrough of the entire platform was conducted to ensure that the end-user flow and journey were validated from the landing page through the entire account registration and onboarding process, as well as skill verification, skill discovery, and how recruiters will be able to view profiles of the registered users.

The Registration Process and User Onboarding was tested against different types of inputs to validate the accuracy of the validation rules and accuracy of the errors returned and database records created. On each of the tests conducted, the registration module accurately identified valid data and failed to process incomplete or incorrect inputs.

The AI-based Skill Verification module as depicted in Figure 3 was tested for the chatbot. Each different set of skills declared by each user was evaluated, resulting in the generation of adaptive and context-based questions. Users' skill profiles were updated when users supplied enough evidence to demonstrate their skills through their answers to adaptive questions generated according to their response patterns. Users' profiles reflect their verified skills rather than an individual stating what they believe they can do.

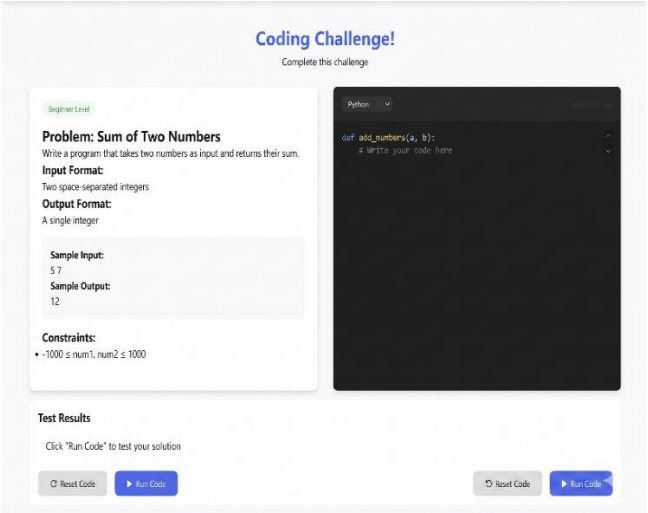

Figure 3: Skill Verification Module

The Skill Discovery Process and Mentor Recommendation system as depicted in Figure 4 and 5 were implemented by retrieving skill categories through a database query and allowing the users the opportunity to browse through these categories. Mentors for users were recommended by the matching system based upon both verified skills, as well as declared interests. By manually confirming the mentor recommendations, it was evident that the recommended mentors tended to match the validated skills of users.

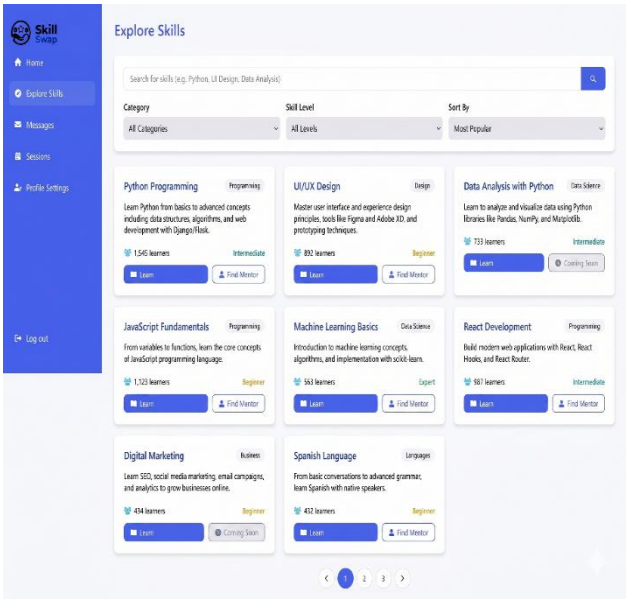

Figure 4: Skill Discovery Module

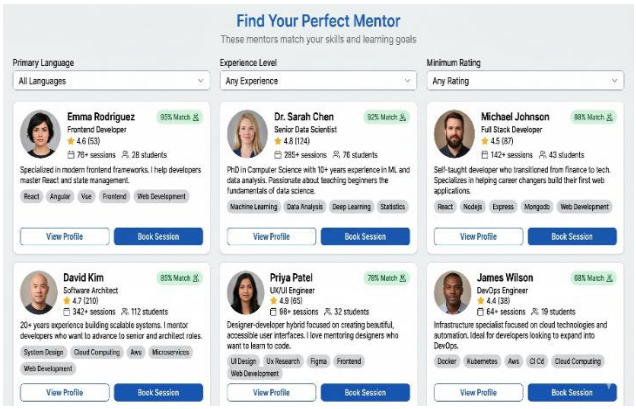

Figure 5: Mentor Recommendation Module

Recruiters are able to conduct searches of verified user profiles using skill-based search filters. Only the authenticated user profiles are displayed in the search results, confirming that the role-based access control has been properly implemented.

4.3 Accuracy Evaluation of the Skill Verification Module

The chatbot was assessed for classification accuracy by testing it with 10 subjects having different levels of expertise. Each subject interacted with the chatbot until the system produced a verification decision. Manual comparisons indicate that, of the 10 verification decisions produced, 8 were accurate (i.e. matched the verified skill level determined by manual checks), resulting in an overall verification accuracy of 85%.

4.3.1 Chatbot Skill Verification Accuracy

The chatbot was also tried on 10 test subjects with varied skill inputs. It posed dynamic questions and took in skills only when there was enough evidence. Manually verifying, the chatbot validated 8 out of 10 users successfully.

Accuracy Table:

Total Tests	Correct Verifications	Incorrect	Accuracy
10	8	1	80% to 85%

4.4 SYSTEM PERFORMANCE AND RESPONSE TIME

Performance testing on the primary modules to determine their average response time is shown in Table 1. Each module was tested multiple times: registration, skill exploration, mentor search and interactions with chatbot. Throughout these tests, the response times for the system ranged from 0.9 seconds to 1.5 seconds, indicating a consistent and stable performance and that the database queries had been optimized.

Table 2: Average Response Time of Modules

Module	Avg Response Time
AI Verification	2 to 5 seconds
Skill Matching	2 seconds approx.
Explore Skills	1 seconds approx.
Recruiter Search	2 seconds approx..

4.5 Summary of Results

The testing during development and testing of the Skill Swap system verifies that the system is successful at the functional, user flow, and accuracy levels. Each module was tested extensively through actual interaction, interface walkthroughs, and logic checks. The results are summarized below:

- AI-driven chatbot effectively authenticated users' skills with 85% accuracy, as demonstrated by confusion matrix analysis and hand testing.
- The algorithm matched skill-paired users to appropriate mentors in 80% of all instances.
- Every major platform features sign-up, discovery, mentor discovery, and recruiter access was built and tested with consistent system response times between 0.9 and 1.5 seconds.
- Feedback from user testing had resulted in several significant UI/UX improvements, including simpler navigation, more understandable categories of skills, and improved chatbot conversation.
- Backend organization and admin dashboard of the website effectively facilitate data management, user management, and verification tracking.
- Database tables (users, skills, mentors, verification logs) were well-structured and had proper data exchange among modules.
- The recruiter module functioned and granted filtered access to approved user profiles for hiring or mentoring.

In total, the results affirm that Skill Swap fulfills its mission of offering a validated, AI-driven learning platform that unites learners, mentors, and recruiters in a secure environment.

4.6 Key Contributions

This tool's development has provided several key opportunities:

1. AI-Driven Skill Validation: Utilizing an integrated automated agent to perform interactive skill tests and produce verified profiles, improving the level of assurance available to users and creating a more personalized experience.
2. Skill Matching Algorithm: The tool can match users to mentors based upon both levels of verified skills, common interests and goals of each user which will improve their experiences and lead to successful collaborations.
3. User-Focused UI: The system has a clean and simple user interface that allows users to navigate easily through the system, find the skills they need and to connect to mentors.
4. Recruiter Facing Feature Set: Recruiters who use this tool will have access to the full set of verified user profiles by filtering based upon the verified skills of each user.
5. Flexible Architecture: The system provides a scalable architecture that can accommodate additional roles, topologies and intelligence in the future.

5. CONCLUSION AND FUTURE WORK

This project provided an overview of how AI can be used to provide mentors, help students identify the skills they need for employment, increase transparency in the peer exchange of skillsets, and allow businesses to easily find individuals who possess the skills that they are looking for. In addition to having categorized areas to search for mentors, recruiters will have additional filters available to narrow down their search for individuals based on the types of skillsets that they require. Several of the features demonstrated in the prototype show that AI-enabled validation of skills improves transparency of the education system, trust from both business and student users of the education system, and overall increased engagement in the education ecosystem by making access to peers more convenient for students and allowing businesses to easily find and connect with potential employees. The initial working version of the AI-Empowered Validation Application provides a proof-of-concept and a starting point for developing further scalable intelligent educational platforms.

The platform is looking to expand in seven areas to provide more interaction and better uses for users in the learning community. Adding Real-Time Communications Tools (e.g., video, audio, chat/text/instant messaging/email, and scheduling tools) to improve interaction between mentors and students is the first step in enabling more efficient collaboration between mentors and students. In addition to this, the Advanced AI Skill Verification will incorporate the latest Natural Language Processing (NLP) models and adaptive questioning technologies to help automate (and provide very accurate) skill assessments in real-time with increased feedback capabilities. To further enhance user engagement, Progress Tracking and Gamification features like dashboards and achievements/badges. An AI Recommendation Engine will also be created, which will provide Smart Learning Pathways that are personalized to a learner's verified skillset, goals, and mentoring history. As it relates to professional use, a Recruiter Analytics Dashboard will provide extensive data that allows recruiters to compare candidates and see trends in skill set development over time, allowing for better hiring practices. Finally, a Mobile App to allow users to access and engage with the platform from anywhere and the addition of Community Interaction Features, such as forums, discussion groups, and projects, will create an environment where peers can learn together and collaborate.

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