

Local Skill Exchange Network: An AI-Powered Location-Based Platform for Skill Sharing and Personalized Learning

Vaishnavi Navale¹, Vanita Zambare², Pranjal Khambekar³, Mrs. Manisha Aswale⁴

Students, Department of Computer Engineering¹⁻³

Lecturer, Department of Computer Engineering⁴

Guru Gobind Singh Polytechnic, Nashik, Maharashtra, India

Abstract: *The Local Skill Exchange Network is a proposed web-based platform designed to connect individuals who want to learn new skills with people who possess relevant knowledge and expertise. Traditional learning platforms often focus on structured courses, while local communities may have difficulty discovering nearby individuals who can provide personalized guidance or participate in reciprocal skill exchanges. The proposed system addresses this challenge by integrating skill discovery, location-based search, intelligent recommendations, session booking, real-time communication, online payments, and a skill barter mechanism into a unified application. Users can register as skill providers, learners, or both, create skill profiles, specify availability, and search for suitable learning opportunities. The recommendation module ranks potential matches using factors such as skill relevance, geographical proximity, ratings, price, experience, and availability. Google Maps integration supports geographical discovery, while a payment gateway facilitates paid sessions. The barter module enables users to exchange skills without requiring monetary transactions. Administrative and moderation modules support user management, content review, dispute handling, and platform analytics. The proposed application follows a modular monolithic architecture with a web frontend, backend REST APIs, and a relational database. The system aims to improve access to community-based learning, encourage knowledge sharing, and provide a scalable foundation for personalized skill development. Its effectiveness can be evaluated through functional testing, recommendation relevance, booking success rate, response time, and user feedback.*

Keywords: Skill Exchange, Location-Based Services, Artificial Intelligence, Recommendation System, Peer-to-Peer Learning, Skill Barter, Web Application

I. INTRODUCTION

This The rapid growth of web technologies has created new opportunities for people to acquire knowledge, develop professional abilities, and share expertise through digital platforms. However, finding a suitable person for personalized learning can remain difficult when the search depends only on general course listings or conventional online learning resources. Learners may prefer individual guidance, practical demonstrations, flexible schedules, or face-to-face interaction with knowledgeable people in their communities.

The Local Skill Exchange Network is proposed as a web-based application that connects skill providers and skill seekers through a centralized digital platform. It enables individuals to publish their skills, describe their experience, set session prices, specify availability, and choose online or offline interaction. Users can discover relevant providers through keyword search, category filters, geographical proximity, ratings, and intelligent recommendations.

A distinguishing feature of the proposed system is its skill barter mechanism. Unlike conventional paid learning platforms, this functionality allows two users to exchange their respective skills without requiring a monetary payment.



For example, a user proficient in Java programming may exchange a Java session for guidance in graphic design. This approach encourages reciprocal learning and allows participants to contribute their existing knowledge while developing new competencies.

The platform also integrates location-based discovery and a recommendation mechanism. The recommendation module considers skill compatibility, distance, availability, user preferences, price, and feedback to rank potential matches. Recommendation techniques are an established area of research for personalizing information and presenting relevant options to users [1]. In this project, these principles are adapted to the discovery of local learning opportunities.

The principal objective is to develop a secure, accessible, and user-friendly platform that combines skill discovery, booking, communication, payments, reciprocal exchange, and administrative management. The system is intended to support community-based knowledge sharing while providing a structured digital environment for organizing learning sessions.

The major contributions of the proposed system are as follows:

1. A unified platform that supports both skill providers and learners through a single account.
2. Location-aware discovery of relevant skill providers.
3. A weighted recommendation mechanism for ranking potential matches.
4. A booking and availability management system with payment support.
5. A reciprocal skill exchange mechanism that supports non-monetary learning.
6. Administrative tools for moderation, dispute management, and platform analytics.

II. RELATED WORK AND EXISTING SYSTEMS

An Existing digital learning platforms, online service marketplaces, and recommendation systems provide useful foundations for developing a location-aware skill exchange application. However, these systems differ in their approach to personalized learning, reciprocal exchange, and local discovery.

A. Online Learning Platforms : Conventional online learning platforms provide structured courses, recorded lectures, assessments, and educational resources. Although they support learning at scale, they may not directly facilitate reciprocal skill exchange between individual community members or help users discover nearby providers for personalized sessions.

B. Peer-to-Peer Skill Exchange : Peer-to-peer learning systems allow individuals to contribute knowledge and learn from other participants. The proposed Local Skill Exchange Network extends this concept by supporting skill profiles, availability, session booking, reviews, and an explicit barter mechanism within the same application.

C. Recommendation Systems : Recommendation systems identify and rank items or services that may be relevant to individual users. Ricci, Rokach, and Shapira describe recommendation techniques and their applications in personalized information discovery [1]. The proposed system applies a weighted ranking approach to skill-provider matching using skill relevance, geographical distance, ratings, price, experience, and availability.

D. Location-Based Discovery : Location-based services enable applications to organize and retrieve information according to geographical context. Integrating map-based visualization and distance filtering can help learners discover suitable providers within a selected area. The proposed system uses geographical information as one component of the matching process rather than relying exclusively on distance.

E. Research Gap : The proposed project aims to integrate skill discovery, reciprocal skill exchange, location-aware recommendations, booking, communication, payment processing, and administrative moderation in one application. Its primary focus is the combination of local discovery and flexible learning arrangements. The effectiveness of this integration must be established through implementation and systematic testing rather than assumed in advance.



III. PROPOSED SYSTEM AND METHODOLOGY

The proposed Local Skill Exchange Network follows a modular monolithic architecture in which the frontend, backend modules, and database form one coordinated application. Individual modules are separated logically to simplify development, testing, maintenance, and future enhancement.

A. User Registration and Authentication : The application supports user registration, login, profile management, password recovery, and email verification. Each account can act as a skill provider, a learner, or both. Role-based authorization restricts administrative and moderation operations to authorized personnel.

B. Skill Profile Management : Users can publish skills with descriptions, proficiency levels, experience, categories, session prices, preferred teaching modes, languages, and availability. Providers can update or deactivate their listings, while administrators can review reported or inappropriate content.

C. Skill Discovery and Search : The search module retrieves providers based on keywords, categories, proficiency, price range, ratings, availability, language, and online or offline preferences. Location filtering allows learners to select a search radius around a chosen location.

D. Intelligent Skill Matching : The recommendation module calculates a normalized compatibility score for each eligible provider. The proposed score considers skill relevance, distance, ratings, experience, affordability, and availability. Results are ranked in descending order of compatibility, and the interface can display the factors contributing to each recommendation.

E. Booking and Availability Management : Providers define available time slots, and learners select a suitable session. The backend validates the slot and creates a booking request. Confirmed bookings prevent conflicting reservations, and booking status is updated throughout the session lifecycle.

F. Skill Barter Mechanism : Users can propose reciprocal skill exchanges by specifying the skill they offer, the skill they require, proposed durations, and preferred schedules. The receiving user may accept, reject, or negotiate the proposal. Accepted exchanges are tracked separately from paid bookings.

G. Communication and Notifications : A messaging module allows users to discuss session requirements, schedules, and exchange proposals. Email notifications can communicate booking confirmations, cancellations, payment outcomes, and reminders. Real-time messaging may be implemented using WebSockets or Socket.IO.

H. Payment Processing : For paid sessions, the application creates a payment order through a supported payment gateway. Payment confirmation is validated on the backend before the booking is marked as paid. Failed transactions are recorded, and refund requests are handled through a controlled workflow.

I. Administration and Moderation : The administrative module manages users, skill categories, reports, disputes, transactions, and platform settings. Moderators can review reported profiles or listings, investigate complaints, and record moderation decisions. Analytics summarize usage, bookings, popular skills, and transaction activity.

J. Testing and Evaluation : The system is evaluated through functional testing, access-control testing, booking-conflict testing, payment-flow testing, and recommendation evaluation. The evaluation records actual observations from the implemented application. No performance or accuracy figures are assumed before testing.



Recommended AI matching formula

For your research paper, define the score mathematically instead of only stating that AI is used.

$$M(u, p) = 0.30S + 0.20L + 0.15R + 0.10E + 0.10P + 0.15A$$

Where:

- $M(u, p)$: compatibility score between learner u and provider p .
- S : skill relevance score.
- L : location proximity score.
- R : normalized rating score.
- E : experience suitability score.
- P : price suitability score.
- A : availability compatibility score.

Each component is normalized between 0 and 1. The weights are proposed design choices, not experimentally established optimal values. They should be tuned and evaluated during testing.

The percentage displayed to users is:

$$\text{Match Percentage} = 100 \times M(u, p)$$

This is a **weighted recommendation score**, not a probability that the provider will successfully teach the learner. The implementation should filter out providers who do not satisfy essential constraints before ranking the remaining results.

IV. SYSTEM ARCHITECTURE AND MODELING

A. System Architecture :

- The proposed system uses a three-layer architecture consisting of a presentation layer, an application layer, and a data layer.
- The presentation layer provides the user interface for learners, providers, moderators, and administrators. The application layer processes authentication, skill management, recommendations, booking, barter requests, messaging, payments, and moderation. The data layer stores user profiles, skills, availability, bookings, exchanges, reviews, notifications, and transaction records.
- External services provide supplementary functionality. Google Maps supports location visualization, Google OAuth can support authentication, a payment gateway handles paid sessions, and an AI service may support natural-language assistance or learning-path generation.

B. Database Design

- A relational database is suitable because the application contains structured entities and relationships. The principal entities are User, Skill, Category, Availability, Booking, SkillExchange, Message, Review, Payment, Notification, and Report.
- A user can publish multiple skills, and each skill belongs to a category. Users can create or receive bookings, propose skill exchanges, send messages, and submit reviews for eligible completed sessions. Payment records are associated with paid bookings, while moderation reports reference the relevant users or listings.



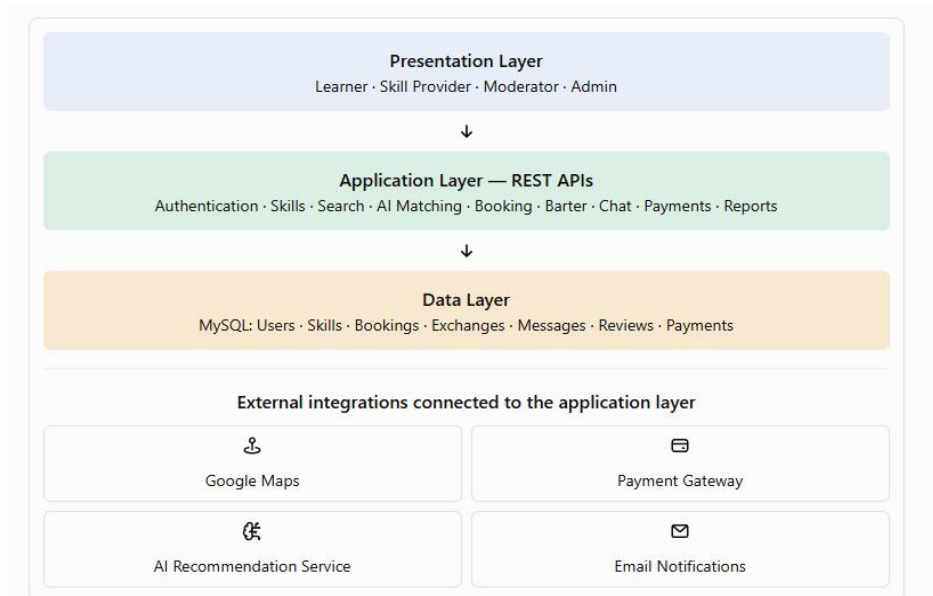


Fig. 1. Proposed architecture of the Local Skill Exchange Network. This is a conceptual diagram, not evidence of a completed implementation.

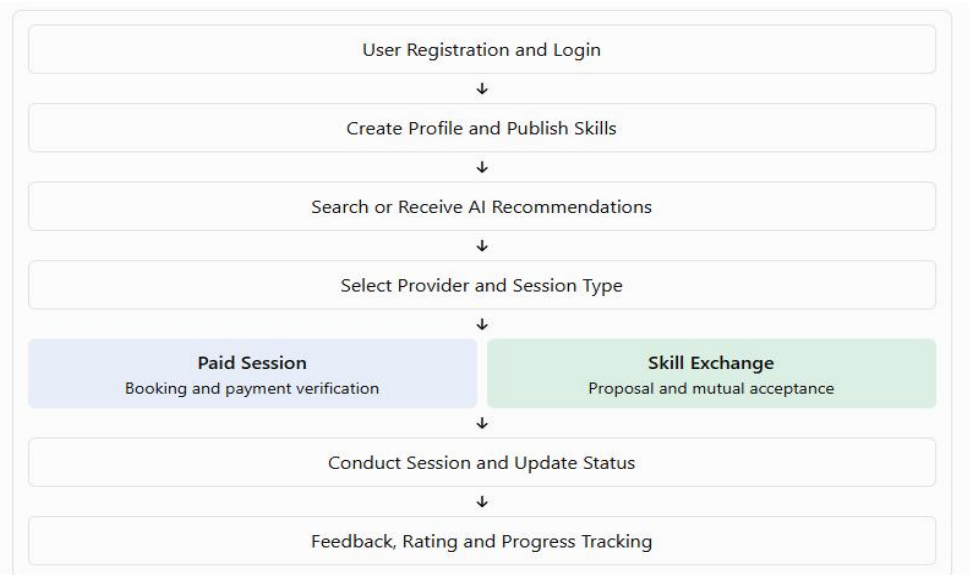


Figure 2. Main system workflow

C. Recommendation Model

- The recommendation engine applies a weighted scoring method to eligible skill providers. Skill relevance and availability are considered alongside distance, ratings, experience, and price. The model produces an ordered list of candidates and provides explanations for the most influential matching factors.



D. Security and Privacy

- The system uses password hashing, authenticated API requests, role-based authorization, input validation, and server-side transaction verification. Location access is requested only when needed, and users should be able to control the location information visible to other participants. Payment credentials and sensitive card information are handled by the payment provider rather than stored directly in the application database.

V. IMPLEMENTATION AND TECHNOLOGY STACK

Component	Technology
Frontend	React + Vite
Backend	Java + Spring Boot
Database	MySQL
Authentication	Spring Security + JWT; optional Google OAuth
Maps	Google Maps Platform
Payments	Razorpay test environment
Real-time chat	WebSocket / STOMP
AI matching	Weighted scoring algorithm; optional AI API
Email	SMTP
Testing	JUnit, Spring Boot Test, frontend testing tools
Deployment	One backend application, frontend hosting, managed database

The proposed application can be implemented using React for the frontend, Spring Boot for backend services, and MySQL for persistent data storage. This technology combination provides a structured foundation for building a modular web application.

React is responsible for responsive user interfaces, profile pages, search results, dashboards, booking forms, and administrative panels. Spring Boot exposes REST APIs and implements business rules for authentication, skill management, recommendations, bookings, exchanges, payments, and moderation. MySQL maintains the application's relational data and transactional records.

The recommendation module can initially be implemented using a weighted scoring algorithm in the backend. An optional AI service can provide natural-language recommendations, learning-path generation, and conversational assistance. Google Maps can support geographical visualization and distance-aware search, while a payment gateway can process paid bookings.

The application should be developed incrementally. Initial development focuses on authentication, user profiles, skill listings, and search. Subsequent stages introduce availability, booking, skill exchange, reviews, and messaging. External integrations and AI functionality are added after the core workflow is stable. Finally, the complete application is tested for functional correctness, authorization, transaction handling, and usability.

VI. RESULTS AND DISCUSSION

1. Functional Testing: Evaluate registration, authentication, skill creation, search filters, availability validation, booking, cancellation, skill-exchange proposals, reviews, and administrative moderation.
2. Integration Testing: Verify payment-order creation, server-side payment verification, map-based skill discovery, and notification delivery.
3. Recommendation Evaluation: Use a test dataset containing learner requirements and provider profiles to measure recommendation quality using Precision@K, Recall@K, and user-rated relevance.
4. Location-Based Search Testing: Verify that the system returns relevant skill providers within the user-selected geographical radius.



5. Booking Reliability Testing: Simulate simultaneous booking requests for the same time slot and verify that conflicting confirmed bookings are prevented.
6. Performance Testing: Measure API response times, search latency, and system behavior under different concurrent-user loads.
7. Usability Evaluation: Collect user feedback on navigation, provider information, booking procedures, and the skill-exchange process.
8. Result Analysis: Record the total test cases, successful and failed cases, measured response times, recommendation metrics, and user-feedback results.
9. Performance Verification: Analyze the collected results to identify system limitations and opportunities for improvement.
10. Validation of Effectiveness: Establish the system's effectiveness using actual experimental results. Since testing has not yet been completed, no numerical performance improvement or recommendation accuracy is claimed.

VII. CONCLUSION

The Local Skill Exchange Network proposes a web-based solution for connecting individuals who possess skills with people seeking to learn them. By combining skill profiles, location-based discovery, intelligent recommendations, booking, communication, online payments, and reciprocal skill exchange, the platform provides an integrated approach to community-based learning.

The proposed recommendation mechanism considers multiple factors, including skill relevance, geographical proximity, user ratings, experience, affordability, and availability. The skill barter module further distinguishes the application by allowing users to exchange knowledge without requiring monetary transactions. Administrative and moderation functionalities provide mechanisms for maintaining platform quality, managing disputes, and monitoring usage.

The project can be implemented using React, Spring Boot, and MySQL, with external integrations for maps, authentication, payments, and notifications. Its effectiveness must be verified through functional testing, recommendation evaluation, performance measurement, and user feedback.

Future enhancements may include machine-learning-based personalized recommendations, AI-generated learning paths, skill assessments, digital certificates, multilingual conversational assistance, fraud detection, and expanded geographical coverage. Further work can also investigate methods for improving recommendation fairness, protecting user privacy, and measuring long-term learning outcomes. Overall, the proposed system offers a practical foundation for a location-aware skill-sharing platform that supports both paid learning and reciprocal knowledge exchange.

VIII. ACKNOWLEDGMENT

The authors would like to express their sincere gratitude to their project guide and the Department of Computer Engineering for their guidance and support throughout the development of the proposed Local Skill Exchange Network. The authors also acknowledge the institution for providing the academic environment and resources required for this project.

REFERENCES

- [1]. F. Ricci, L. Rokach, and B. Shapira, Eds., Recommender Systems Handbook, 3rd ed. Cham, Switzerland: Springer, 2022, doi: 10.1007/978-1-0716-2197-4.
- [2]. F. Ricci, L. Rokach, B. Shapira, and P. B. Kantor, Eds., Recommender Systems Handbook. New York, NY, USA: Springer, 2011, doi: 10.1007/978-0-387-85820-3.
- [3]. M. Kleppmann, Designing Data-Intensive Applications. Sebastopol, CA, USA: O'Reilly Media, 2017.



- [4]. G. Adomavicius and A. Tuzhilin, "Toward the next generation of recommender systems: A survey of the state-of-the-art and possible extensions," *IEEE Transactions on Knowledge and Data Engineering*, vol. 17, no. 6, pp. 734–749, Jun. 2005, doi: 10.1109/TKDE.2005.99.
- [5]. P. Sánchez and A. Bellogín, "Point-of-interest recommender systems based on location-based social networks: A survey from an experimental perspective," *ACM Computing Surveys*, vol. 54, no. 11s, 2022, doi: 10.1145/3510409.
- [6]. P. Sánchez, A. Bellogín, and L. Boratto, "Bias characterization, assessment, and mitigation in location-based recommender systems," *Data Mining and Knowledge Discovery*, vol. 37, pp. 1885–1929, 2023, doi: 10.1007/s10618-022-00913-5.
- [7]. X. Yang, "A historical review of collaborative learning and cooperative learning," *TechTrends*, 2023, doi: 10.1007/s11528-022-00823-9.
- [8]. F. Rehman, O. Khalid, and S. A. Madani, "A comparative study of location-based recommendation systems," *The Knowledge Engineering Review*, vol. 32, article e8, 2017, doi: 10.1017/S0269888916000308.
- [9]. W. H. DeLone and E. R. McLean, "The DeLone and McLean model of information systems success: A ten-year update," *Journal of Management Information Systems*, vol. 19, no. 4, pp. 9–30, 2003, doi: 10.1080/07421222.2003.11045748.

