Unified Service Hub: A Dynamic Preference-Aware Service Matching Platform Using Adaptive Weighted Ranking

Gaurav Kumar Mishra[1] Mr. Shripad S. Bhide[2]
[1]Student [2]Assistant Professor
[1,2]Master of Computer Applications
[1,2]P.E.S. Modern College of Engineering, Pune, Maharashtra, India

Abstract — Digital service platforms have transformed the way users access professional and household services. However, many current systems depend heavily on static filtering mechanisms such as category, price, or location, which often fail to deliver the most relevant service options. This limitation increases user effort, delays decision-making, and reduces overall platform efficiency. This paper presents Unified Service Hub, a web-based intelligent service matching platform designed to improve service discovery through an adaptive weighted ranking framework. Unlike conventional filtering systems, the proposed platform evaluates services using multiple dynamic parameters including provider rating, service availability, response time, provider experience, user preference, and feedback-driven trust scoring. A dynamic ranking mechanism adjusts parameter weights based on user intent, enabling personalized and context-sensitive service recommendations. The system is implemented using a React-based Single Page Application frontend, a Spring Boot RESTful backend, and a MySQL relational database. To improve responsiveness and scalability, frontend optimizations such as lazy loading, caching, and paginated service retrieval are integrated into the architecture. Experimental evaluation indicates that the proposed system improves relevance in service selection, reduces user navigation effort, and creates a more adaptive and explainable recommendation process. The proposed framework establishes a practical foundation for future AI-driven recommendation systems in digital service marketplaces.

Keywords: Adaptive Ranking, Service Recommendation, Dynamic Weighting, React, Spring Boot, Intelligent Matching, Web Platform

I. Introduction

The growth of digital marketplaces has significantly changed how users discover and consume services. From home maintenance to specialized professional support, online service platforms have become central to modern convenience. Despite this expansion, service selection remains a challenge due to information overload and lack of intelligent prioritization.

Most existing systems primarily rely on static filtering, where services are narrowed down based on predefined filters. While filtering reduces the search space, it does not intelligently determine which provider is most suitable for a specific user context. Two providers may have similar ratings, but differ greatly in availability, response speed, experience, and relevance to user preferences.

To address this issue, this work proposes Unified Service Hub, an adaptive service matching platform that moves beyond static listing models. The platform introduces a dynamic weighted ranking mechanism that continuously evaluates service providers based on operational parameters and user-driven preferences.

Unlike traditional ranking approaches with fixed weights, the proposed model supports context-aware weighting, where ranking priorities adjust according to user intent. For example, if a user prioritizes speed, response time receives greater ranking weight; if service quality is preferred, provider rating becomes dominant.

This adaptive model creates a more personalized and efficient service discovery experience while maintaining transparency in decision logic.

II. Problem Statement

Current digital service platforms exhibit several operational and recommendation limitations:

- Dependence on fixed filtering criteria
- Lack of adaptive personalization
- Limited multi-factor evaluation
- No transparent ranking explanation
- Weak integration of user feedback into ranking logic
- High user effort in manual comparison
- Reduced decision efficiency in crowded marketplaces

These challenges motivate the development of an adaptive and explainable ranking-driven platform.

III. Proposed Methodology

The proposed platform introduces a Dynamic Preference-Aware Weighted Ranking Model (DPAWRM).
The ranking score is computed as:
Final Score =

$$(R \times Wr) + (A \times Wa) + (T \times Wt) + (E \times We) + (P \times Wp) + (F \times Wf)$$

Where:
R = Provider Rating
A = Availability Score
T = Response Time Efficiency
E = Experience Level
P = User Preference Matching Score
F = Feedback Trust Score
and:
Wr, Wa, Wt, We, Wp, Wf are dynamic weights adjusted according to user context.
Adaptive Behavior:
If a user selects:

"Fast service needed"
→ Response time weight increases.
"Best quality preferred"
→ Rating and feedback weights increase.

"Budget-friendly"
→ affordability parameter can be added with higher weight.
These converts ranking from static scoring into adaptive decision intelligence.
Fallback Recommendation:

- The Smart Fallback Recommendation Mechanism provides nearest matching service providers when exact search results are unavailable.
- It improves user experience by preventing "No Results Found" situations and ensuring continuous service recommendations.

IV. System Architecture

The system follows a layered architecture:

User Interface (React SPA)
↓
Preference Collection Layer
↓
REST API Communication
↓
Business Logic Layer (Spring Boot)
↓
Adaptive Ranking Engine
↓
Feedback Processing Module
↓
Repository Layer
↓
MySQL Database

V. Experimental Design

The system was evaluated using simulated service-provider datasets across multiple service categories.

A. Evaluation parameters:

- Ranking relevance
- Response efficiency
- User navigation effort
- Personalization effectiveness
- System scalability

B. Test scenarios included:

- urgency-driven booking
- quality-first selection
- availability-first ranking
- feedback-driven provider prioritization

VI. Results and Discussion

The adaptive ranking model demonstrated:

- improved service relevance

reduced comparison time

- better contextual recommendations
- improved platform usability
- transparent ranking explanation
- scalable modular architecture

Compared with static filtering systems, the proposed platform generated more personalized service ordering.

VII. Conclusion

Unified Service Hub presents a shift from passive service listing toward adaptive intelligent service matching. By integrating dynamic weighting, preference-aware ranking, feedback learning, and scalable web architecture, the system offers a practical and explainable framework for next-generation digital service platforms.

Future work may integrate machine learning models, real-time geospatial ranking, and predictive demand analytics.

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