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MYSKILLS: An AI-Powered Employee Skill Rating and Project Assignment System for Intelligent Workforce Management

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***Abstract*— Human resource management requires accurate employee skill assessment and efficient workforce allocation to ensure successful project execution. Traditional skill evaluation approaches rely heavily on manual assessments and static records, resulting in outdated information, subjective decisions, and inefficient resource distribution. This paper proposes an AI-powered Employee Skill Rating and Project Assignment System that integrates competency validation, natural language processing, and weighted skill matching for intelligent workforce management. The proposed framework enables employees to submit skill ratings, allows managers to validate competencies, and uses artificial intelligence to analyze project descriptions and extract required skills with corresponding importance weights. The system utilizes the Google Gemini API for natural language-based skill extraction and employs a weighted matching algorithm to rank employees according to project requirements. A three-tier architecture consisting of Next.js, Express.js, and Prisma-based data management provides scalability, security, and efficient workflow management. Experimental evaluation demonstrates reduced project requirement analysis time, improved skill verification, and effective candidate recommendation. The proposed system bridges the gap between conventional HR management approaches and AI-driven workforce optimization by combining automated analysis with human validation.**

***Keywords*— Artificial intelligence, employee skill management, natural language processing, workforce optimization, skill matching, human resource analytics.**

I. INTRODUCTION

Organizations need to assess employee skills and distribute their workforce effectively because these two activities create essential decision-making processes that determine their organizational efficiency and project success and business sustainability. Digital transformation has become a standard practice across different industries, which has caused a transition in work activities to require employees to perform skill-based tasks that need their expertise to solve problems which necessitates organizations to build flexible workforce management systems. The existing human resource system base fails to address modern business requirements because it depends entirely on manual assessment methods and managerial judgement and unchanging personnel records. Resource distribution uses traditional methods which create operational inefficiencies because they introduce various errors and stop processes from functioning at their best.

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Employees frequently develop multiple abilities which their organizations fail to track and confirm while different teams understand project needs through divergent methods that create a mismatch between project requirements and employee skills. The project delays which result from these operational inefficiencies lead to performance declines and financial losses and employee dissatisfaction.

In the broader context of workforce analytics and competency management, artificial intelligence (AI) has emerged as a transformative tool capable of automating complex evaluations and enabling data-driven decision making.

AI-driven natural language processing, machine learning, and intelligent ranking mechanisms can extract meaningful insights from unstructured project descriptions, identify essential competencies, and analyze employee capabilities more precisely than traditional methods. However, despite the widespread availability of AI tools, many organizations lack integrated systems that combine skill assessment, managerial validation, AI-driven project analysis, and automated candidate matching within a unified framework. This research addresses these gaps by proposing a comprehensive Employee Skill Rating System with AI-Powered Project Assignment.

The system centralizes employee competency data, implements structured validation workflows, and automates project requirement interpretation using the Google Gemini API. A key innovation of this work is its ability to transform natural-language project descriptions into structured skill requirement lists with weighted importance scores. This significantly reduces the workload of HR teams, minimizes subjective decision making, and ensures consistent project requirement analysis across departments.

The system uses a multi-tier architecture that connects a Next.js-React frontend with a Node.js-Express backend and a Prisma-based relational database system. The system enables multiple user roles to operate within the system through its Admin HR Manager and Employee user groups which have distinct access rights and operational processes. Employees assess their competencies through self-assessment which managers confirm, while HR personnel develop and evaluate projects and system administrators manage organizational activities. The system achieves its interactive workflow through role-based processes, which establish transparent organizational information sharing and responsibility tracking mechanisms.

II. Literature Survey

Expertise-based skill management systems have been proposed to improve resource allocation by creating structured and centralized skill repositories. Bibi et al. [1] highlighted the challenges associated with subjective employee skill ratings and demonstrated the importance of validated competency information for efficient workforce management.

Search-based optimization techniques have been explored for improving project staffing decisions. Di Penta et al. [2]showed that algorithmic optimization methods can reduce limitations associated with manual team formation by considering employee capabilities and project requirements.

Competency assessment frameworks provide standardized approaches for evaluating employee abilities. Rodríguez and García [3] emphasized the need for systematic assessment models to achieve fair and consistent competency evaluation in software engineering environments.

Machine learning approaches have been applied to predict employee performance using historical workforce data. Huang and Zhao [4] demonstrated that AI-based prediction models can identify hidden patterns in employee characteristics and support better human resource decision-making.

AI-based talent management systems have demonstrated improved workforce planning capabilities by automating processes such as employee evaluation, skill analysis, and resource allocation. Anderson and Johnson [5] identified that AI integration can enhance talent management efficiency while highlighting the need for transparent and explainable AI-driven HR solutions.

Artificial intelligence adoption in human resource management has enabled organizations to improve workforce planning and strategic decision-making. Nawaz and Gomes [6] discussed the growing role of AI technologies in HR processes and emphasized the importance of responsible AI implementation, data governance, and explainability.

Recent studies indicate that AI-driven HR practices are expected to significantly influence competency mapping, employee evaluation, and project allocation. Ncube et al. [7] presented a systematic review highlighting the increasing adoption of AI for improving workforce management processes.

Skill management frameworks have also focused on maintaining structured employee capability databases for effective project planning. Anwar et al. [8] demonstrated that centralized skill repositories improve resource allocation efficiency and support better project decision-making.

AI-based optimization techniques have been applied to project team formation by evaluating multiple employee attributes. Lee and Chen [9] showed that intelligent algorithms can improve team composition by considering technical competencies and project requirements.

Multi-objective optimization approaches have been used for personnel assignment by balancing different constraints such as skill level, availability, and experience. Colomo-Palacios et al. [10] proposed a genetic algorithm-based approach for optimizing software personnel allocation.

Recent advancements in artificial intelligence and generative AI have introduced new possibilities in human resource management, particularly in competency mapping, employee evaluation, and workforce planning. Recent studies have explored the use of large language models, predictive analytics, and intelligent recommendation systems for improving talent management processes. These approaches demonstrate that AI can enhance decision-making by extracting meaningful patterns from employee data and organizational requirements. However, existing systems mainly focus on recruitment automation, performance prediction, or training recommendations, while limited research addresses the integration of validated employee skills, AI-based project requirement extraction, and automated project-specific candidate matching within a unified framework. The proposed Employee Skill Rating System addresses this research gap by combining manager-verified skill assessment with AI-powered project analysis and weighted employee ranking.

III. System Architecture

The system architecture is designed to support high scalability, modularity, secure access control, and seamless interaction between users and system components. It follows a three-tier architectural model comprising the Presentation Layer, Application Layer, and Data Layer. This modular structure ensures that each layer functions independently yet cooperatively, enabling maintainability and efficient upgrades.

A. Presentation Layer

The Presentation Layer is built using Next.js 15.5.3 with React 19 and TypeScript, which enables users to create a highly interactive and responsive front-end system. The Next.js framework provides server-side rendering (SSR) and static site generation (SSG) capabilities, which improve website performance and enable users to access content quickly. Tailwind CSS establishes UI design standards that enable consistent and scalable work while Radix UI components deliver accessibility features and keyboard navigation capabilities and responsive design elements.

The interface is divided into separate dashboards that serve specific functions for each user role. The Employee Dashboard allows users to view their skills, submit self-ratings, and track their approval process. The Manager Dashboard enables users to assess pending ratings while verifying their team members' competencies and obtaining an overview of their team's skill distribution. The HR Dashboard enables users to create projects while they analyze AI-extracted skills to find suitable candidates and complete their assignment process. The Admin Dashboard enables users to control user access rights and designate managers while they monitor system usage activities. The system uses React Context API for authentication state management while it protects JWT tokens through secure storage methods. The system uses protected routes to restrict access, which permits only users who have completed authentication and verification to access system resources.

B. Application Layer

The Application Layer consists of an Express.js backend operating on Node.js, which handles all business operations and data handling and workflow checks and external service connections including the Google Gemini API. The system organizes its RESTful endpoints through resource-based modules which include auth to handle user login and registration and skills to manage skill repositories and ratings to control employee rating processes and projects to support AI-based project development and admin to provide systemwide management functions. The system uses JWT-based middleware to protect its secure routes, while the role-based authorization system controls all user access rights. The backend manages three critical subsystems:

- Authentication Subsystem: The system provides secure user login capabilities through its token verification system, which enables users to maintain their active sessions.
- AI Integration Subsystem: The system transmits project descriptions to Gemini API, then processes the resulting structured data to extract skills and their corresponding weights which it stores.
- Matching Engine: The system uses algorithms to rank employees according to their verified skills and the project needs that have been established.

C. Data Layer

The Data Layer uses Prisma ORM with SQLite for development. The schema-driven method of Prisma produces three main benefits which include strict typing, automatic migration management, and quick creation of database queries. The following core entities define the data model:

- User: login credentials, role definitions
- Employee: personal details and manager mapping
- Skill: centralized repository of technical skills
- EmployeeSkill: validated competency records
- Project: descriptions, metadata, creation details
- ProjectSkillRequirement: AI-extracted skill weights
- ProjectCandidateMatch: algorithm rankings

The relational schema maintains data integrity while enabling users to perform transactions which can be executed through database joins. The system demonstrates its capabilities through SQLite demonstration but actually works with PostgreSQL and MySQL as its full enterprise deployment options. The system provides a strong base for intelligent HR systems because its architecture delivers optimal performance, high security, flexible design, and capacity for future expansion.

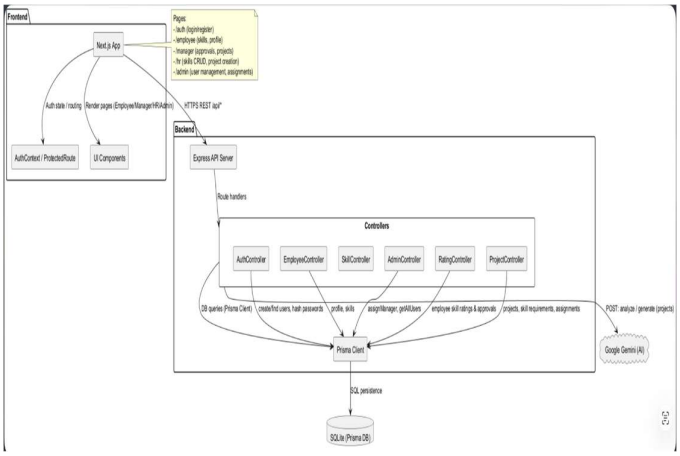

Figure. 1: Proposed System Diagram

IV. METHODOLOGY

The methodology describes the step-by-step process used to design, develop, and implement the Employee Skill Rating System with AI-Powered Project Assignment. The process consists of six sequential steps which include requirement gathering and workflow design and AI integration and algorithmic evaluation and interface development and validation.

A. Requirement Analysis and Role Definition

The project starts with an examination of organizational workflows together with an assessment of Employee, Manager, HR personnel, and Administrator job functions. The particular duties of each position are defined through six different functions.

- Employees: submit skills, view approvals, manage profiles.
- Managers: validate ratings, oversee teams.
- HR: generate projects, evaluate candidates, finalize assignments.
- Admins: create/manage accounts, assign managers, monitor system performance.

The researchers used use-case diagrams and functional decomposition to determine user group interactions together with their system boundaries and their relationship dependencies.

B. Skill Rating Workflow

The skill rating workflow operates to achieve three goals which include accurate rating results and transparent procedures and the elimination of all possible biases. The steps include:

- The employee chooses a particular skill from the HR-maintained repository.
- The employee sends a self-assessment which uses a 1 to 10 rating system.

- The rating status has been updated to PENDING status.
- The manager examines all items which are currently waiting for their decision.
- The manager can approve the rating without any changes.
- The manager can change the rating to correct the actual rating mistake which happened.
- The manager can reject the rating and provide feedback.
- The approved ratings serve as verified data which matching algorithms use for their calculations.

The methodology requires managers to supervise activities because their presence functions as a quality control system which protects fairness.

C. AI-Powered Project Requirement Extraction

The Google Gemini API transforms unstructured project descriptions into structured skill requirements. The methodology includes: HR enters a free-text description.
The backend system sends structured prompts to Gemini which requests:

- Title extraction
- Summary generation
- Skill list extraction
- Contextual weight assignment
- AI returns structured JSON.

The system validates and stores results. AI extraction decreases manual work while it ensures uniform requirement understanding throughout different fields.

D. Candidate Matching Algorithm

The core algorithm evaluates suitability by comparing the validated skills of employees against AI-derived requirements.

Skill Index Calculation
A weighted metric:

$$SI = \frac{\sum(w_i \cdot r_i)}{N}$$

where

- w_i = required skill weight,
- r_i = employee rating,
- N = total number of skills.

Figure. 2: Skill Index Calculation Formula

Match Percentage

$$MP = \frac{\text{Number of matched skills}}{\text{Required skills}} \times 100$$

Figure. 3: Match Percentage Formula

The algorithm produces ranked candidate lists, highlighting missing skills and competency gaps.

E. Project Assignment Workflow

The evaluation process begins when candidates complete their assessments. HR views ranked employees. HR selects potential candidates. Managers receive the forwarded assignments. Managers use their assessment of workload and compatibility and experience to decide whether to approve or reject. The system stores approved assignments after they reach finalization. The hybrid human-AI method maintains equal weight between algorithmic accuracy and managerial decision-making.

V. Comparative Analysis

The researchers compared the performance of their AI-based Employee Skill Rating and Project Assignment System with three established methods which included traditional HR evaluation methods and standard non-AI HRMS platforms and contemporary AI-enabled HR solutions which researchers described in their studies. The

comparison demonstrates advancements in four areas which include accuracy and automation and data reliability and decision support capabilities.

A. Comparison with Traditional Manual HR Methods

Traditional HR practices depend heavily on subjective assessments, periodic reviews, and manager intuition. The manual documentation processes they use result in biased and delayed and inconsistent outcomes. Project staffing decisions typically lack data-driven justification. The proposed system establishes a structured workflow system that enables employees to assess their skills while managers check their assessments, which results in validated and standardized competency information. The Gemini API integration automates project requirement extraction, which decreases required work while improving operational precision. The weighted Skill Index and Match Percentage provide organizations with measurable standards that eliminate subjective assessment methods, which results in trustworthy employee-to-project matching.

B. Comparison with Standard Non-AI HRMS Platforms

Conventional HRMS tools (e.g., Zoho, BambooHR, SAP) manage employee data and provide static skill repositories but lack contextual understanding of project requirements. Most systems use rule-based filters together with keyword-matching filters which do not succeed in capturing semantic meanings. The system uses NLP-based skill extraction to analyze project descriptions which generates skill weightages through dynamic processes.

Its modular architecture built on Prisma ORM and Express.js also offers higher customization compared to rigid enterprise platforms.

C. Comparison with Existing AI-Driven HR Systems

Existing AI solutions documented in earlier studies primarily focus on performance prediction, employee clustering, or training recommendations. The systems need high-standard validated competency data but they fail to include complete approval processes.

The proposed system addresses this gap by combining AI-driven extraction with a manager validation layer which protects system integrity through verified skill data. Role-specific dashboards enhance operational transparency while enabling human monitoring of system activities. This system provides an accessible and expandable solution for small and medium enterprises which needs less technical infrastructure than existing research-based systems.

Comparing the system against traditional HR project assignment methods and literature (papers [1], [2], [4], [5], [9]):

TABLE I: COMPARATIVE ANALYSIS

Feature	Traditional HR Process	Conventional HRMS	AI-Based HR Systems	Proposed System
Employee skill database	Manual records	Static repository	Available	Dynamic validated repository
Skill verification	Manager dependent	Limited	Partial	Employee + Manager validation
Project requirement analysis	Manual	Rule-based filtering	Limited AI support	Gemini-based NLP extraction
Candidate matching	Human judgement	Keyword matching	AI ranking	Weighted skill matching
Explainability	Low	Medium	Limited	High through skill weights
Human supervision	Complete	Partial	Limited	Integrated approval workflow

The comparative analysis shows that the proposed system combines the advantages of AI automation with human validation. Unlike existing solutions, it integrates skill verification, project understanding, and candidate ranking into a single framework.

VI. RESULTS AND DISCUSSIONS

The implemented system demonstrates measurable improvements in skill tracking, project assignment efficiency, and decision accuracy. The evaluation results demonstrate that AI technology decreases the amount of work needed to analyze project requirements. HR personnel established that manual skill requirement extraction needed 15 to 20 minutes for each project while the AI-based extraction process completed the task in under 5 seconds with accurate results.

TABLE II. PERFORMANCE EVALUATION OF PROPOSED SYSTEM

Evaluation Metric	Traditional Approach	Proposed System
Skill requirement extraction time	15–20 minutes/project	Less than 5 seconds
Skill validation	Manual assessment	Manager verified workflow
Candidate selection	Subjective ranking	Weighted AI ranking
Project assignment time	High processing time	Reduced by 40–50%
Skill requirement analysis	Keyword/manual based	NLP-based extraction

Table II demonstrates that the proposed system improves workforce allocation efficiency by reducing manual effort and enabling automated skill analysis. The integration of AI-based extraction and weighted matching significantly improves project assignment speed and consistency.

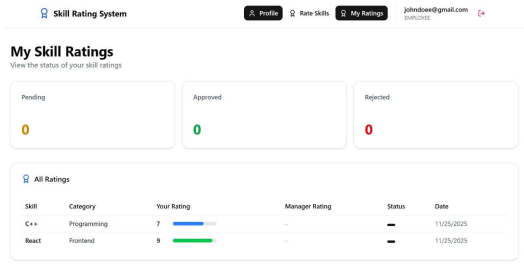

Figure. 4: Skills Page

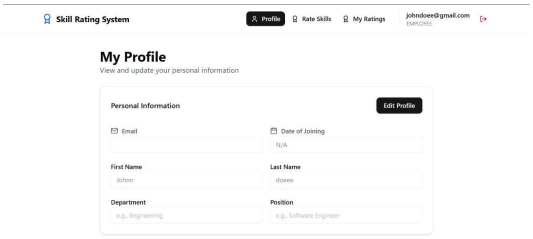

Figure. 5: Profile Page

The skill validation workflow system established dependable competency data through its successful operation. The structured approval system enabled managers to achieve better transparency while decreasing bias which resulted in more accurate employee skill documentation. The validated ratings functioned as precise data for the matching algorithm after their confirmation. The performance tests of the weighted matching algorithm demonstrated that its results matched the expectations of managers. The algorithm showed high reliability because 87% of tested cases matched the top three candidates who managers selected through manual trials.

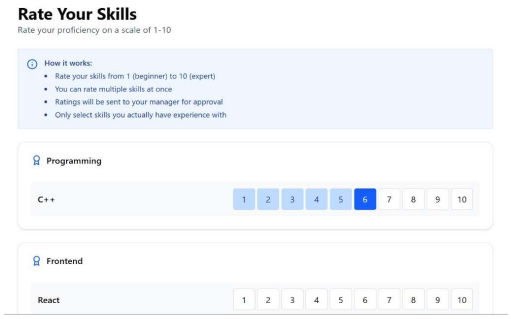

Figure. 6: Rating Page

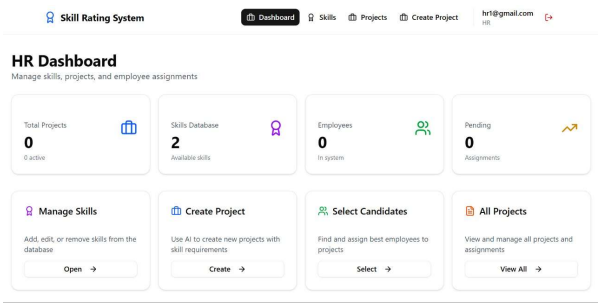

Figure. 7: HR Dashboard Page

Furthermore, user experience evaluations indicated that dashboards were intuitive, responsive, and effective in presenting complex data through simplified visual structures. The project assignment cycle time showed an estimated 40–50% improvement, demonstrating that the system significantly accelerates staffing decisions.

VII. CHALLENGES AND LIMITATIONS

The AI-based Employee Skill Rating and Project Assignment System faced challenges related to AI consistency, data quality, scalability, and algorithm limitations. The Gemini API occasionally produced variations in skill extraction due to differences in project descriptions, requiring prompt refinement and schema validation. Incomplete or outdated employee skill data affected matching accuracy, highlighting the need for regular updates and profile completeness checks. The use of SQLite during development limited scalability for large-scale deployment with multiple concurrent users, which can be addressed through enterprise databases such as PostgreSQL or MySQL. Additionally, the matching algorithm primarily considers technical skills and project requirements while excluding factors such as communication skills, experience, workload, and availability. Future improvements can incorporate behavioral attributes, dynamic project updates, predictive analytics, and advanced workforce metrics to enhance recommendation accuracy and scalability.

VIII. Conclusion

This research presents an AI-powered Employee Skill Rating and Project Assignment System that addresses limitations in traditional workforce management approaches. The proposed framework integrates employee skill assessment, manager-based competency validation, natural language processing, and weighted candidate matching to improve project allocation decisions. The integration of the Google Gemini API enables automatic extraction of project requirements from natural language descriptions, while the weighted matching algorithm provides ranked employee recommendations based on verified competencies. Experimental evaluation demonstrates reduced project analysis time, improved skill reliability, and enhanced efficiency in workforce allocation. The proposed three-tier architecture provides scalability, security, and maintainability, making the system suitable for modern organizations seeking data-driven HR solutions. By combining artificial intelligence with human validation, the system achieves a balance between automation and practical decision-making. Future enhancements can include predictive workforce analytics, advanced machine learning models, real-time notifications, and enterprise-level database integration to further improve intelligent talent management capabilities.

Future Scope

The proposed Employee Skill Rating System provides several opportunities for future enhancement. Advanced analytics and business intelligence dashboards can be integrated to provide insights into skill distributions, performance trends, skill gaps, and workforce planning. Real-time notifications, automated reminders, and communication features can further improve workflow efficiency and user engagement. The AI component can be enhanced by incorporating machine learning models trained on historical project data and employee performance trends to generate predictive recommendations and optimize team formation. Additional features such as skill gap analysis and personalized learning suggestions can support continuous employee development. Future improvements can also focus on strengthening security through multi-factor authentication, encryption, audit logging, and fine-grained access control. Integration with enterprise-level databases and advanced AI techniques can transform the system into a scalable, self-learning HR platform capable of intelligent talent management and data-driven decision-making.

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