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Intelligent Staff Reallocation System

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ABSTRACT

In modern organizations, efficient workforce management is essential for maintaining productivity and ensuring optimal utilization of human resources. The Intelligent Staff Reallocation System is designed to dynamically allocate and reassign staff members to different departments or tasks based on workload, employee skills, availability, and organizational requirements. Traditional staff allocation methods are often manual, time-consuming, and prone to inefficiencies, which may lead to uneven workload distribution and reduced operational performance. The proposed system utilizes data-driven decision-making and intelligent algorithms to analyze employee profiles, departmental workload, and task priorities. By processing this information, the system recommends suitable staff reallocations that balance workloads and improve overall efficiency. The application provides an interactive interface for administrators to monitor staff distribution, track resource utilization, and make informed decisions quickly. Additionally, the system can incorporate machine learning techniques to predict staffing needs and optimize future allocations. By automating the reallocation process, the Intelligent Staff Reallocation System minimizes administrative effort, enhances workforce productivity, and ensures better resource management within organizations. This solution is particularly beneficial for institutions and companies that require flexible workforce management in dynamic working environments.

CHAPTER 1 INTRODUCTION

1.1 OVERVIEW

The Intelligent Staff Reallocation System (ISRS) is a smart workforce management application designed to optimize the allocation and redistribution of staff within an organization. In many organizations, staff members are often assigned to departments or tasks manually, which can lead to uneven workload distribution, underutilization of skilled employees, and reduced productivity. The proposed system addresses these issues by using data-driven techniques to automatically analyze and recommend suitable staff reallocations.

The system collects and processes important information such as employee skills, experience, availability, departmental workload, and task priorities.

The main objective of this system is to ensure that the right employee is assigned to the right task at the right time. The system collects and analyzes multiple factors related to employees and organizational requirements. These factors may include employee skills, experience level, availability, current workload, department requirements, and project priorities. By processing this information, the system can identify gaps in staffing and suggest appropriate reallocation of staff members to balance the workload across departments.

The system uses modern technologies such as Artificial Intelligence (AI) and Machine Learning (ML) to

analyze patterns in staff performance, workload trends, and departmental demands. These intelligent techniques help the system to make data-driven decisions instead of relying solely on manual judgment. As a result, organizations can achieve better workforce utilization and improved operational efficiency. These suggestions help users avoid over-spending and encourage practical, step- by-step decision making development.

Another important feature of the Intelligent Staff Reallocation System is its ability to provide a user-friendly interface for administrators and managers. Through this interface, administrators can easily add or update employee information, monitor department workloads, and view system-generated recommendations for staff reassignment. The system may also generate reports that help management understand workforce distribution and identify areas where additional staff support may be required.

Furthermore, the system helps organizations respond quickly to sudden changes in workload or project demands. For example, if a department experiences a temporary increase in workload, the system can recommend transferring suitable employees from other departments with lower workloads. This flexibility allows organizations to maintain smooth operations without overburdening employees. This implementation of such a system also improves transparency and fairness in staff allocation. Since the decisions are based on data and predefined criteria, employees are less likely to feel that allocations are biased or unfair. This can lead to higher employee satisfaction and better teamwork within the organization.

In many workplaces, project requirements and workloads frequently change due to new tasks, deadlines, or unexpected employee absences. Without a proper system, it becomes difficult for managers to quickly identify available staff with the required skills. The proposed system addresses this problem by continuously monitoring employee data and departmental workload information. It analyzes these factors and provides recommendations for reallocating employees where their skills can be most effectively utilized.

Overall, the Intelligent Staff Reallocation System provides an efficient and systematic approach to workforce management. By combining intelligent algorithms, employee data analysis, and an easy-to-use interface, the system helps organizations optimize staff utilization, reduce administrative workload, improve productivity, and support better decision-making.

OBJECTIVES

1. The primary objective of the Intelligent Staff Reallocation System is to ensure the effective utilization of human resources within an organization. By analyzing employee skills, experience, and availability, the system helps assign the most suitable staff members to appropriate tasks or departments. This ensures that employees are neither overworked nor underutilized, leading to improved productivity and efficient workforce management.
2. Another important objective is to maintain a balanced distribution of work among different departments. The system monitors the workload of each department and identifies areas where additional staff support is required. Based on this analysis, it recommends the reallocation of employees from departments with lower workloads to those experiencing higher demand, ensuring smooth and efficient operations.
3. The system aims to assist managers and administrators in making informed decisions regarding staff allocation. By using intelligent algorithms and analyzing employee data, the system provides reliable suggestions for staff reassignment. This reduces manual effort and helps management make quicker

and more accurate workforce planning decisions.

4. The Intelligent Staff Reallocation System also focuses on improving the overall efficiency of the organization. By automating staff allocation processes and reducing delays in task assignment, the system ensures that projects and responsibilities are completed on time. This ultimately enhances organizational productivity and contributes to better resource management. his dynamic approach ensures that critical tasks are completed on time while preventing employee overwork or underutilization. Additionally, the system can maintain a historical record of staff movements and performance data, which helps organizations evaluate workforce efficiency and improve future planning.

CHAPTER 2 LITERATURE SURVEY

J. Van den Bergh et al. (2013) presented a comprehensive review of personnel scheduling problems and classification methods used in workforce allocation systems. Their work highlights the complexity of scheduling employees while considering constraints such as availability, workload, and operational requirements. This study provides foundational knowledge for designing automated staff scheduling and reallocation systems.

A. Karimi-Majd et al. (2017) proposed a reinforcement learning approach for workforce planning under uncertain demand. The model learns optimal staffing policies by analyzing past decisions and environmental changes, enabling adaptive workforce management. This concept supports the development of intelligent systems capable of automatically reallocating employees based on dynamic organizational requirements.

F. N. Kiwanuka et al. (2021) introduced a machine learning-based employee scheduling model that converts staff scheduling into a classification problem using availability and preference data. The model automatically generates schedules by learning from employee constraints and historical information. This concept contributes to the intelligent decision-making framework used in staff reallocation systems.

H. Gu et al. (2022) developed an optimization algorithm for the Workforce Scheduling and Routing Problem (WSRP) using Lagrangian relaxation and iterative search techniques. The study focused on efficiently assigning workers to tasks across multiple locations while minimizing travel time and cost. This research highlights optimization strategies relevant to staff allocation and resource distribution systems.

F. L. Burgert et al. (2024) conducted a literature review on workforce scheduling approaches in manufacturing environments. Their study examined various algorithmic methods used to optimize workforce deployment and improve production efficiency. The findings emphasize the importance of automated scheduling solutions in managing complex workforce systems.

Y. Li et al. (2024) explored machine learning techniques for online scheduling in manufacturing systems. The research showed how machine learning models can adapt scheduling decisions in real time by analyzing operational data. This concept supports the development of intelligent staff reallocation systems capable of responding to changing workload conditions.

H. T. Sakamoto et al. (2024) proposed an AI-supported workforce scheduling framework designed to improve employee performance and reduce idle time. The system uses intelligent algorithms to match workers with tasks based on their skills and availability. This research demonstrates the potential of AI-driven workforce management solutions in modern organizations.

A. Nasirian et al. (2025) introduced a stochastic optimization model for multi-skilled workforce

scheduling under uncertain demand. The model allocates employees with different skill sets to tasks while considering future demand fluctuations. This study is relevant to intelligent staff reallocation systems where skill matching plays a critical role.

A. Tripathi et al. (2025) investigated machine learning applications in workforce management for improving employee engagement and productivity. Their research demonstrated how reinforcement learning techniques can enhance task allocation accuracy and reduce scheduling conflicts. These findings highlight the importance of AI-based solutions in workforce optimization.

J. Peng et al. (2025) developed a multi-objective staff scheduling model that balances project performance with employee well-being. The system considers both organizational productivity and worker satisfaction when assigning tasks. This concept supports fair and efficient workforce allocation strategies in intelligent HR systems. Along with **A. Ogungbire et al. (2025)** proposed machine learning models for forecasting workforce requirements in large organizations. Their study emphasized the importance of predicting future staffing needs to support better planning and resource allocation..

CHAPTER 3 SYSTEM ANALYSIS

3.1 EXISTING SYSTEM

In many organizations, the process of staff allocation and reallocation is traditionally handled through manual methods by managers or human resource departments. Staff members are assigned to departments or tasks based on managerial judgment, previous experience, or simple availability checks. Communication gaps and lack of transparency may also occur in the current system. Employees may feel that staff assignments are unfair or biased since the decision-making process is not always clearly explained.

Another limitation of the existing system is the lack of real-time monitoring of departmental workload and employee performance. Managers may not have accurate information about which department requires additional staff or which employees are underutilized. Therefore ,the traditional staff allocation approach often results in inefficient resource utilization, slower decision-making, and reduced organizational efficiency.

Limitations of the Existing System:

1. It totally depends on accurate employee data input.
2. Does not consider employee personal preferences.
3. Limited real-time workload monitoring.
4. May not handle sudden staff availability changes.
5. Requires regular database updates for accuracy.

Hence, there is a strong need for an intelligent AI-based system that can efficiently analyze employee skills, workload, and availability to optimize staff allocation and improve overall organizational productivity.

3.2 PROPOSED SYSTEM

The proposed system, Intelligent Staff Reallocation System is designed to overcome the limitations of traditional staff allocation methods by introducing an automated and data-driven approach for workforce management. The proposed system uses intelligent algorithms to analyze employee information such as skills, experience, availability, and current workload.

The system maintains a centralized database that stores all employee and departmental information. Administrators can easily update employee details, view workload distribution across departments, and

monitor staff availability through a user-friendly interface.

Furthermore, the system provides transparency in staff allocation decisions by basing recommendations on objective data rather than personal judgment. This ensures fair distribution of work and improves employee satisfaction.

Advantages of the Proposed System:

1. Improves efficient utilization of staff resources.
2. Balances workload across different departments.
3. Reduces manual effort in staff allocation.
4. Supports faster and data-driven decision making.
5. Enhances overall organizational productivity.

3.3 PROPOSED SOLUTION

The proposed solution is a **web-based Intelligent Staff Reallocation System** that developed to improve workforce management and staff distribution within an organization. The system accepts three main inputs from the user:

1. **Employee Details** (such as name, skills, experience, department, and availability)
2. **Department Workload Information** (number of tasks or workloads per department)
3. **Task or Project Requirements** (skills required)

Once the data is entered, the system performs multiple analyses:

Step 1: **Data Collection and Storage** – The system stores employee details and departmental workload information in a centralized database for easy access and management.

Step 2: **Data Analysis** – The system analyzes employee skills, availability, and workload levels of departments to identify staffing gaps and underutilized employees.

Step 3: **Skill Matching** – The system compares employee skill sets with task or departmental requirements to identify the most suitable candidates for reassignment.

Step 4**: Intelligent Staff Reallocation** – Based on the analysis, the system suggests appropriate staff members who can be reassigned to departments or projects with higher workload.

Thus, the proposed solution acts as an **intelligent workforce management assistant**, helping organizations optimize staff utilization, improves overall operational efficiency .

IDEATION & BRAINSTORMING

The ideation and brainstorming phase of the project began with identifying the major challenges faced by many educational institutions in validating their business ideas. The team discussed common questions such as:

- How can organizations ensure that the right employee is assigned to the right task?
- How can organizations quickly identify departments that require additional staff support?
- How to balance workload across departments?
- How can employee skills help in better allocation?

Through these discussions, the idea of developing an Intelligent Staff Reallocation System was formed — a system capable of automatically analyzing employee information and departmental workload to recommend the most suitable staff allocation. The goal was to design a system that can assist managers in making faster and more accurate workforce management decisions.

Based on these challenges, the idea of an intelligent system was proposed to automatically analyze employee data and recommend optimal staff allocation. The system would consider factors such as employee skills, current workload, availability, and project priorities to determine the most suitable staff

distribution across departments. By using data-driven decision making, the system can help ensure that the right employees are assigned to the right tasks, improving efficiency and reducing delays in project completion.

During the brainstorming process, several features were discussed, including skill-based task matching, real-time workload monitoring, and automated reallocation suggestions. The system can also include analytics to help managers understand workforce utilization and identify departments that require additional support.

PROBLEM-SOLUTION FIT

Problem:

Many organizations struggle to allocate their workforce efficiently across departments and projects. Often, some employees are overloaded with tasks while others remain underutilized due to limited visibility of skills, availability, and workload. Traditional staff allocation mainly depends on manual decisions by managers. This process is time-consuming, error-prone, and inefficient in dynamic work environments**.**

Solution:

The Intelligent Staff Reallocation System provides an automated and data-driven approach to optimize workforce allocation within an organization. The system collects and analyzes employee information such as skills, current workload, availability, and departmental requirements. Using intelligent algorithms and data analytics, the system identifies workload imbalances and recommends the most suitable employees for tasks or departments. It also monitors real-time staffing needs and suggests reallocation when certain teams require additional support.

This combination of technologies makes the system a perfect fit for solving the problem by offering:

1. **Automation:** Reduces manual decision making through intelligent recommendations.
2. **Accessibility:** Balances workload by reallocating underutilized staff to high-demand areas.
3. **Visibility:** Balances workload by reallocating underutilized staff to high-demand areas.
4. **Scalability:** Handles workforce management efficiently even as the organization grows.

Overall, the proposed solution bridges the gap between workforce demand and employee availability, enabling organizations to optimize resource utilization, improve productivity, and ensure smoother project execution.

ARCHITECTURE DESIGN

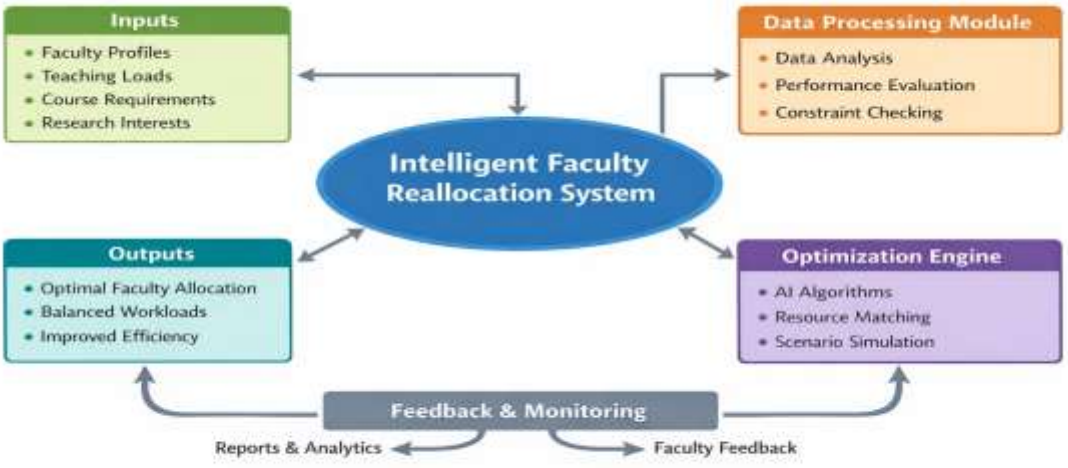

Figure 3.1: Architecture Diagram

1. **User Interface Layer (Web Application):**
- Administrators or department heads enter faculty details, course requirements, and workload information
- It also displays allocation results, workload reports, and system recommendations.
2. **Data Processing Layer:**
- The system collects and analyzes faculty data such as expertise, workload, and course requirements
- It performs performance evaluation and checks constraints like maximum teaching hours and availability.
3. **Optimization Layer (AI Algorithm):**
- Matches suitable faculty to courses based on expertise.
- Simulates multiple scenarios to determine optimal allocation
4. **Monitoring and Feedback Layer:**
- Continuously monitors faculty workload and allocation performances.
- Generates analytics reports for improved management decisions.

3.2 DATA FLOW DIAGRAMS

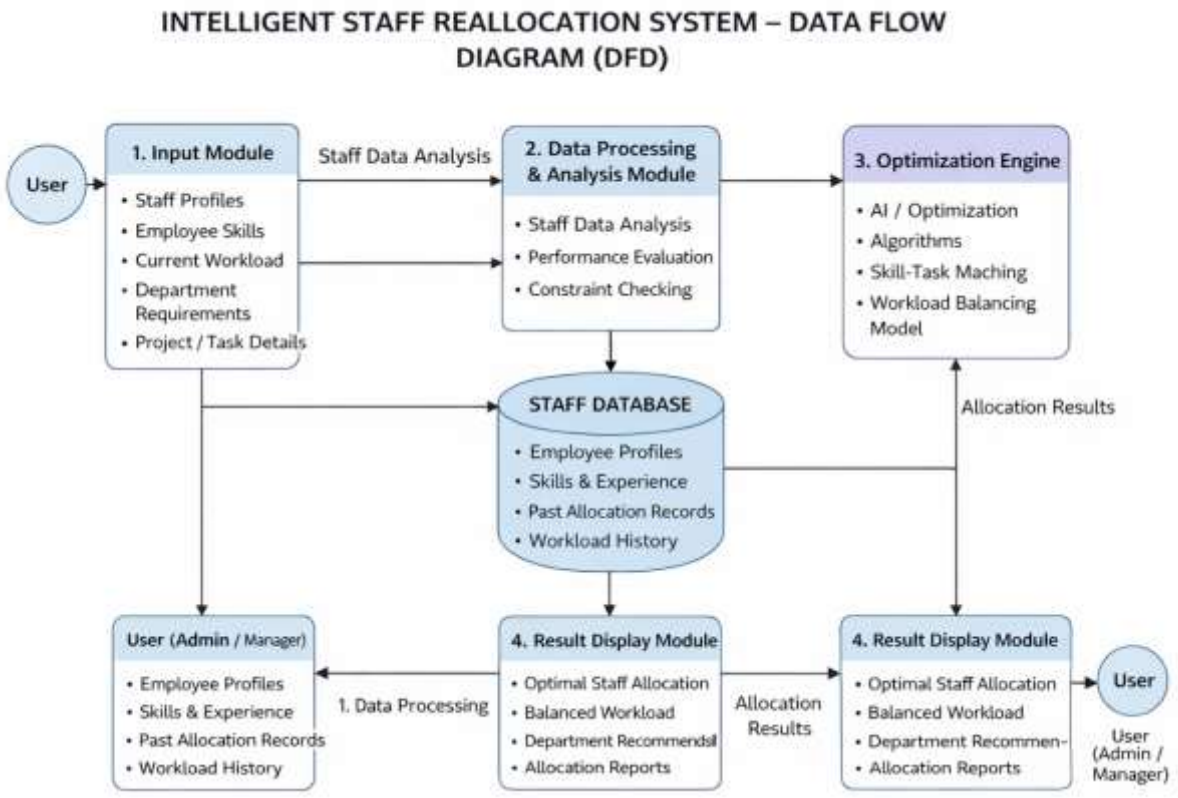

Figure 3.2: Data Flow Diagram

1. **Input Phase:** Admin enters staff profiles, skills, workload, and department requirements.
2. **Processing Phase:** System analyzes staff data, workload distribution, and availability.
3. **Optimization Phase**: AI algorithms perform skill matching and workload balancing.
4. **Output Phase:** Optimal staff allocation and workload reports are displayed.

CHAPTER 4 SYSTEM REQUIREMENT

4.1 HARDWARE REQUIREMENTS

Minimum Requirements:

- Processor: Intel Core i3 or above
- RAM: 4 GB (8 GB recommended)
- Hard Disk: 250 GB or more
- Monitor: 1024×768 resolution or higher
- Input Devices: Keyboard and Mouse
- Internet: Required for System Access and Updates.

Recommended Requirements:

- Processor: Intel Core i5 or higher
- RAM: 8 GB or more
- Storage: 500 GB SSD
- Network: Stable internet connection

4.2 SOFTWARE REQUIREMENTS

Operating System:

- Windows 10/11 or Linux (Ubuntu) Programming Language:
- Python 3.10 or above

Frameworks and Libraries:

- Flask (for web application interface)
- Scikit-learn (for AI and optimization algorithms)
- Pandas and NumPy (for data processing and analysis)
- Matplotlib / Seaborn (for reports and visualization)

Database:

- MySQL or SQLite (for storing staff profiles and workload data)

Development Tools:

- VS Code or PyCharm (IDE)
- Anaconda or Pip (package manager)
- Google Chrome or Mozilla Firefox (web browser)

Implementation is the most crucial stage in the system development life cycle (SDLC), where the theoretical design is converted into a functional and efficient application. It involves actual coding, integration of components, model training, testing, and real-time performance.

In the Intelligent Staff Reallocation System, the implementation phase focuses on developing a system that can analyze employee skills, workload distribution, and departmental requirements to optimize staff allocation. The system processes staff information and applies intelligent techniques to recommend suitable task assignments and balance workloads across departments.

The implementation integrates multiple areas such as data analysis, artificial intelligence, and web development to build an efficient workforce management platform. Technologies such as Python, Flask, and Scikit-learn are used to develop the system, while data processing libraries like Pandas and NumPy handle employee data analysis

AI-based optimization algorithms help in matching employee skills with tasks and ensuring balanced workload distribution, enabling organizations to improve productivity and resource utilization.

CHAPTER 5 IMPLEMENTATION

5.1 DATA COLLECTION

Data collection is the essential for the Intelligent Staff Reallocation System to analyze skills and workloads, both structured and unstructured data sources were used.

1. Staff Dataset Preparation

A dataset was created containing information about employees and their work assignments. Each idea was classified under:

- **Employee Profile (**Name, Department, Experience**)**
- **Skill Set** (Programming, Management, Data Analysis, etc.)
- **Current Workload (**Number of tasks or hours assigned)
- **Department Requirements** (Tasks or projects needing staff)

These attributes simulate real organizational workforce data. The dataset helps the system analyze employee capabilities and determine the most suitable allocation for different tasks or departments.

2. Data Preprocessing

Before the allocation process begins, the collected data is preprocessed to ensure accuracy and consistency.

- **Data Cleaning:** Removed incomplete or duplicate employee records.
- **Data Normalization**: Standardized workload values and skill categories.
- **Feature Extraction:** Converted staff skills, availability, and workload into structured numerical data.
- **Data Structuring:** Organized the data into tables or datasets for efficient processing and analysis.

5.2 COMPONENT DESIGN

An architecture of the **Intelligent Staff Reallocation System** follows a modular structure where each component performs a specific function. This design improves system maintainability, scalability, and efficiency.

1. User Interface (Frontend)

The user interface allows administrators or managers to interact with the system. It is developed using **Flask-based web pages (HTML, CSS, and Bootstrap)** to provide a simple and user-friendly interfaces .The interface includes:

- Forms for entering staff profiles, skills, and workload details.
- Input fields for department requirements and project tasks.
- Dashboard displaying allocation results and workload reports

This ensures that managers can easily provide inputs and view staff allocation recommendations.

2. Data Processing Module

This module processes the input staff data and prepares it for intelligent allocation. It performs several tasks such as:

- **Staff Data Analysis:** Evaluates employee skills, experience, and availability
- **Performance Evaluation:** Assesses staff performance and suitability for tasks.

The processed data is then forwarded to the optimization module for decision making.

3. Optimization and Allocation Module

This component uses intelligent algorithms to determine the best staff allocation strategy.

The system performs:

1. **Skill–Task Matching:** Matches employee skills with project requirements.
2. **Workload Balancing:** Ensures tasks are distributed evenly among employees.
3. **Resource Optimization:** Identifies underutilized staff and reallocates them to departments with higher demand.

These techniques help the system generate an **optimal staff allocation plan** that improves productivity and resource utilization.

4. Staff Database

The database stores all staff-related information required by the system. It includes:

- Employee profiles.
- Skill sets and experiences.
- Past allocation records.
- Workload history

The system continuously updates the database as new staff information and allocation results are generated.

5. Monitoring and Reporting Module

This component monitors the performance of staff allocation and provides analytical insights to management.

The system generates:

- Workload distribution reports
- Department staffing analysis
- Employee utilization reports

These reports help managers evaluate staff performance and make better workforce management decisions.

6. Decision Support and Recommendation Engine

After analyzing staff data and workload distribution, the system provides recommendations for improving workforce efficiency.

For example:

- If a department has excess workload, the system recommends reallocating staff from less busy departments.
- If an employee has specialized skills, the system suggests assigning tasks that match their expertise.
- If workload imbalance is detected, the system recommends redistributing tasks among employees.

This intelligent recommendation system helps organizations achieve balanced workload distribution, better productivity, and efficient staff utilization.

5.3 SOFTWARE DESCRIPTION

The Staff Reallocation System is developed using Python 3 due to its flexibility, scalability, and powerful data processing libraries.

Key Software Components

1. **Flask Framework**

- Flask provides a lightweight and efficient web framework for connecting frontend templates with backend models.
- It handles user requests, routing, and dynamically displays staff allocation results through web pages.

2. **Scikit-learn Library**

- Used to implement intelligent algorithms for staff allocation and workload optimization.
- Provides tools for data preprocessing, feature extraction, and machine learning model implementation.

3. **NumPy and Pandas**

- Essential and used for handling and analyzing staff data efficiently.
- Pandas manages employee datasets, while NumPy supports numerical computations and data processing.

4. **SQLite / MySQL Database**

- Used to store staff profiles, skill sets, workload details, and allocation records.
- Ensures efficient data storage and retrieval for workforce management.

5. **HTML, CSS, and Bootstrap**

- Used to design the web interface and structure the application pages.
- Bootstrap improves responsiveness and creates a clean and user-friendly dashboard for administrators.

6. **Matplotlib / Seaborn**

- Used for data visualization and graphical representation of staff workload distribution.
- Helps generate charts and reports for better managerial understandin

5.5 RESULT

The Intelligent Staff Reallocation System was tested using different staff profiles, departmental requirements, and workload scenarios to evaluate its efficiency and accuracy. The results showed that the

system can effectively analyze employee skills, availability, and workload to generate optimal staff allocation recommendations. The system successfully balanced workload among employees and improved resource utilization across departments.

Sample Test Case 1 Input:

- **Employee**: John
- **Department:** Software Development
- **Skills:** Python, Data Analysis
- **Current Workload:** 6 Tasks
- **Department Requirement:** Data Analytics Project

Predicted Output:

- **Recommended Allocation:** Data Analytics Team
- **Skill Match Level:** High
- **Workload Adjustment:** Reduced from Development Team
- **Department Support**: Data Analytics Department receives additional skilled staffs.

OUTPUT PAGES:

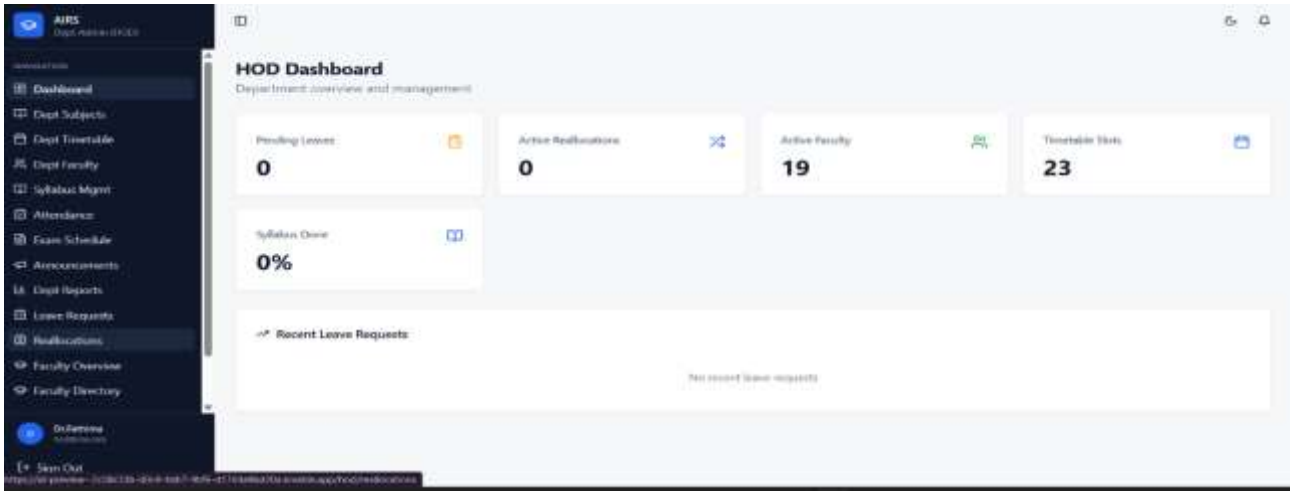

Figure 5.1: Home Page

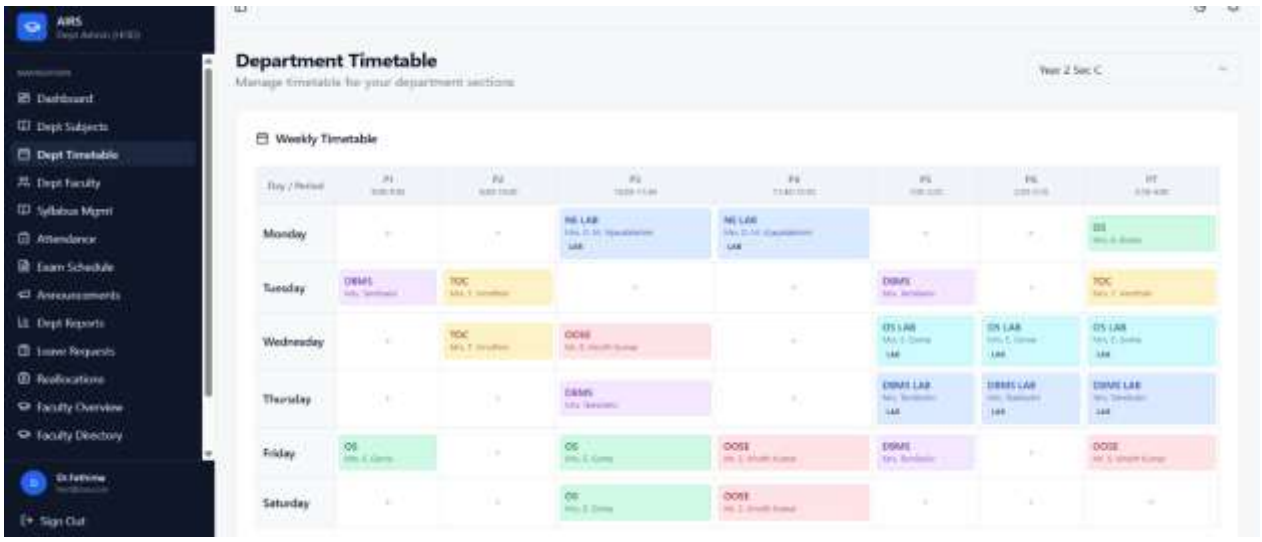

Figure 5.2: Timetable Page

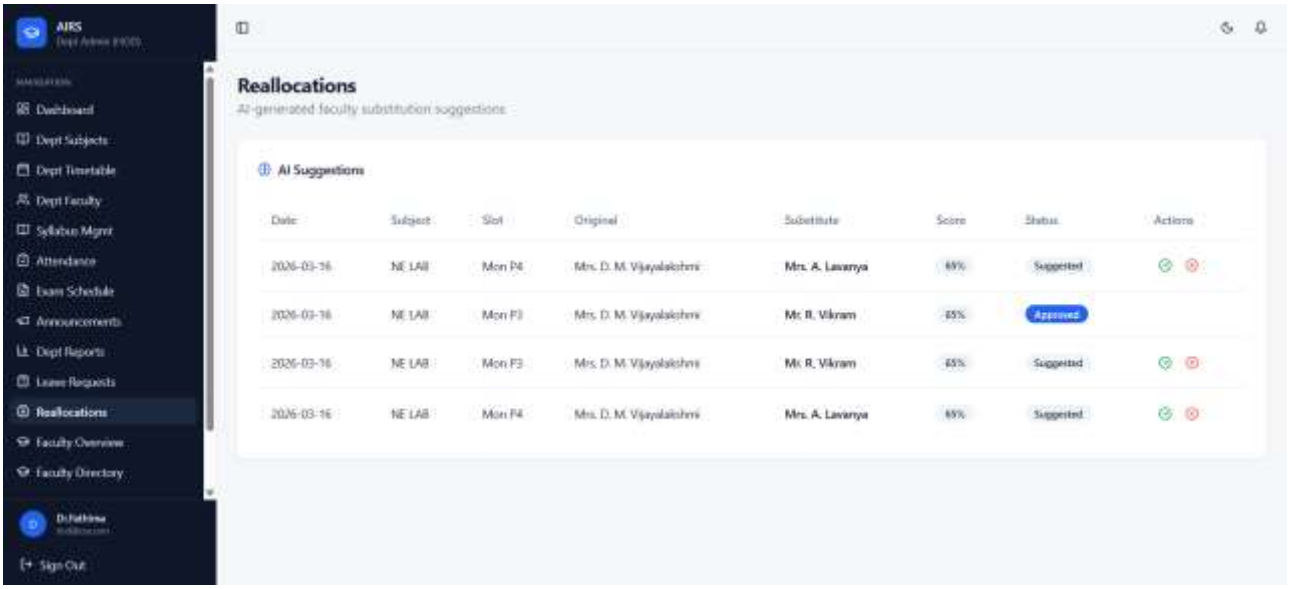

Figure 5.3: AI Reallocations Page

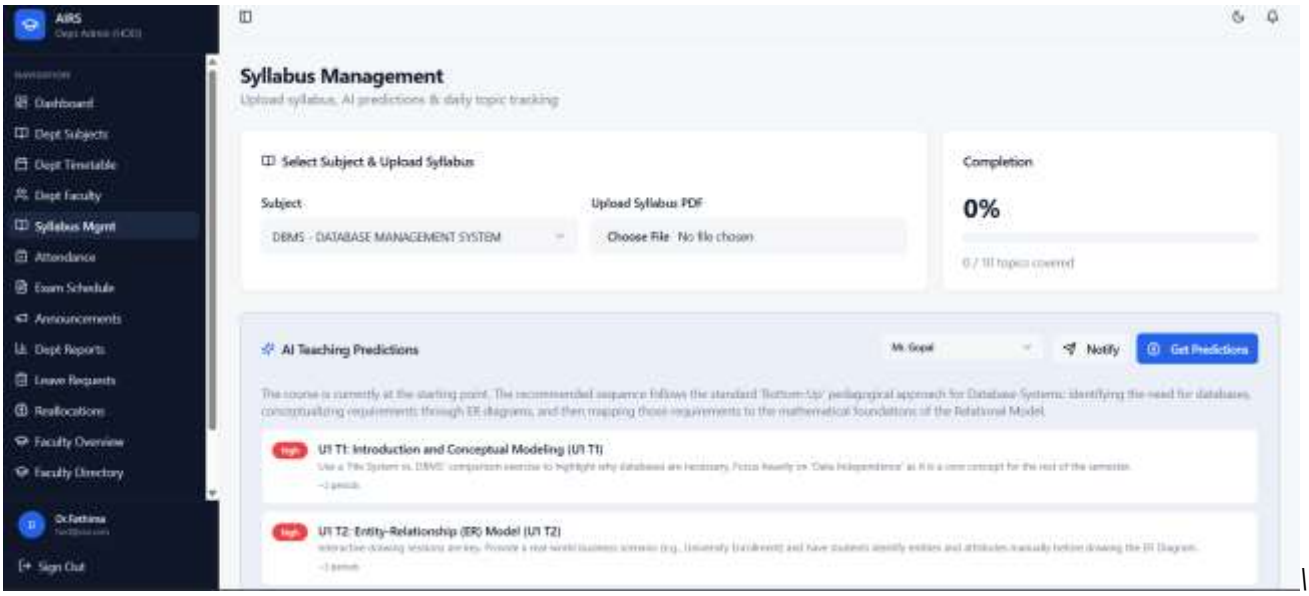

Figure 5.4: Syllabus Management Page

CHAPTER 6
CONCLUSION AND FUTURE ENHANCEMENT
6.1 CONCLUSION

The Intelligent Staff Reallocation System presents an effective solution for improving workforce management within organizations by utilizing intelligent algorithms, data analysis, and modern web technologies. The system is designed to analyze employee skills, workload distribution, and departmental requirements to ensure efficient staff allocation and balanced workload management.

Throughout the development process, the system was implemented to process staff data, evaluate employee expertise, and perform intelligent matching between employee skills and task requirements. By analyzing workload levels and departmental demands, the system can identify underutilized employees and reallocate them to areas where additional support is required. This helps organizations optimize

resource utilization and improve overall operational efficiency.

The system was developed using Python with the Flask framework, along with libraries such as Pandas, NumPy, and Scikit-learn for data processing and intelligent decision-making. The modular architecture of the system allows easy maintenance and scalability, while the user-friendly interface enables administrators to manage workforce allocation without requiring advanced technical knowledges.

Testing and evaluation demonstrated that the system can successfully analyze staff information and generate effective allocation recommendations with minimal processing time. The system improved workload balance, reduced manual effort in workforce management, and supported better decision-making for managers.

In conclusion, the Intelligent Staff Reallocation System bridges the gap between traditional manual staff management and intelligent automated workforce optimization. By leveraging data-driven analysis and intelligent algorithms, the system helps organizations enhance productivity, improve employee utilization, and ensure efficient staff distribution across departments.

FUTURE SCOPE

Although the Intelligent Staff Reallocation System performs effectively in its current form, several improvements can be made in the future to enhance its intelligence, scalability, and practical usability in large organizations.

1. Integration of Advanced AI Models

Future versions of the system can incorporate advanced artificial intelligence techniques such as deep learning and predictive analytics. These models can analyze historical workforce data and predict future staffing requirements more accurately, improving the quality of staff allocation decisions.

2. Real-Time Workforce Monitoring

The system can be enhanced by integrating real-time monitoring tools that track employee performance, attendance, and task completion. This would allow the system to dynamically adjust staff allocation based on real-time workload and organizational needs.

3. Integration with HR Management Systems

In the future, the system can be integrated with existing Human Resource Management Systems (HRMS) to automatically retrieve employee data such as skills, experience, leave status, and performance records. This integration would reduce manual data entry and improve system efficiency.

4. Multi-Department and Large-Scale Support

The system can be extended to support large organizations with multiple departments and complex project structures. Advanced optimization techniques can be implemented to handle large datasets and allocate staff across multiple teams and projects simultaneously.

5. Cloud-Based Deployment

Deploying the system on cloud platforms such as AWS, Microsoft Azure, or Google Cloud can improve scalability, accessibility, and data storage capabilities. This would allow organizations to use the system as a centralized workforce management platform accessible from anywhere.

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