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EMPLOYEE PAYROLL AND MANAGEMENT SYSTEM

[1]Ch.Teja Venkata Someswari, [2]P.Kiranmai, [3]K.Uma Durga Maheswari, [4]Dr.T.V.Krishna Moorthy

Original Article

Department of Electronics and Communication Engineering, Sasi Institute of Technology and Engineering, Tadepalligudem, AP, India.

*Corresponding Author's Email: krishna454@sasi.ac.in

Abstract

The architecture and execution of a complete Employee Payroll and Management System that combines essential administrative tasks with an AI-powered assistant are described in this article. The system manages vital HR functions like employee management, payroll processing, payroll calculation, attendance marking, messaging, report production through a full-stack online application with a Express.js backend and React-based interface. A specialized HR chatbot which makes use of a Retrieval-Augmented Generation (RAG) architecture is the main innovation in order to create the assistant, a company's HR policy document was indexed into a Pinecone vector database, and Google's Gemini models were used to understand queries and generate answers. By ensuring that the chatbot's responses are firm the based on the given policy papers, this method reduces the possibility of hallucinations and gives workers precise, context-aware information. The system ensures secure authentication, role-based access control, and efficient data management. This solution reduces manual work, improves efficiency.

Keywords: Full-stack application, Express.js, React, Retrieval Augmented Generation (RAG), HR chatbot, Pinecone vector database, Google Gemini models, Secure authentication, Role-based access control, Efficient data management.

Introduction

Organizations are increasingly implementing automated solutions to boost productivity and improve employee experience in the fast-paced digital environment of today. Human resource (HR) departments, which have historically deal with a variety of employee enquiries, frequently struggle to handle recurring enquiries about policy, payroll, attendance, and leave administration. The creation of an intelligent HR FAQ chatbot offers a clever and scalable answer to this problem. Conventional HR procedures including keeping track of attendance, calculating payroll, maintaining personal records, creative reports, Payrolls approvals.

The employee payroll and management system developed specifically for this project is an all-inclusive web-based system developed with the aim of managing various HR functions in an effective and consistent manner. This system comes with various critical HR functions, including registering and logging in team members, attendance tracking, payroll generation, payroll approval, reporting generation, and communication through messaging and an intelligent chatbot to answer employee questions.

Administrators can keep track of attendance records, add and maintain employee records and attendance records, and create accurate payroll using pre-established criteria with this program. This ensures accurate validation and minimizes inaccuracies in the payroll process. The program makes it possible to create accurate staff reports, which can be done with the help of that program.

A chatbot that assists the team members by answering their frequently asked questions about Company and HR regulations and procedures is an essential feature of this system. This will provide immediate assistance to the employees and reduce the burden on managers.

The system has an efficient backend and an interface that is user-friendly, safe, and fast. The goal of the project is to bring various HR functions together with a single system. This project aims to make the operation efficient, reduce manual work, and provide a better employee experience.

Literature Survey

A complete overview of the development and application of automated payroll and management system is given by the literature review. A survey of Automated payroll processing systems used in corporations and educational institutions is presented by Rutuja Meher et al. [2025], who examine contemporary automated alternatives with conventional manual techniques. Although it needs the right training and technological know-how to be used effectively, their study shows increased accuracy, decreased processing time and fewer human errors. Chennupati Pavan Sanjay et al. [2023] investigate automated payroll systems that incorporate report generating, attendance, monitoring and tax computations. In addition to tracking issues like high implementation costs and worries about data security and privacy, their work stresses efficiency, transparency and time-saving capabilities. The integration cloud-based payroll management system with HR modules is reviewed by Priyanka Sharma, Rahul Verma, and N. Gupta [2022]. Benefits like scalability, remote accessibility, real-time data processing and enhanced transparency are the main topics of their research. They high let out several limits though, such as the lack of scalability validation and real-world testing. A payroll system for universities that manages wage structures, allowances, deductions, and report generation is introduced by the Samarth Platform [2021]. Although it provides a complete solution for major institutions, it has limited adaptability for smaller businesses and complicated configuration. Furthermore, J. Thomas, V. Anitha, and R. Joseph's(2020) study on integrated HR and Payroll Management systems emphasizes the advantages of integrating hiring, performances review, and payroll processing into a single platform. Whereas their results hint to increased system complexity and higher development and maintenance costs, they also suggest increased efficiency in the organization. A case study on employee payroll management in a real-time manufacturing setting is presented by Divya Bharathi and N. Isvaraya, with an emphasis on labour law compliance, organized salary processing and deduction procedures. Nevertheless, their solution is restricted to a single organizational configuration and lacks sophisticated automation. In order to uncover trends, research gaps, and growth patterns in payroll technologies, Fariza Hanim Rusly et al.[2018] conducted a bibliometric analysis of payroll system research, looking at a significant number of international publications. Despite offering insightful information about the field's evolution, their work is still analytical and does not offer a workable implementation plan. Lastly ,Sampada A. Chavan et al.[2017] investigate automated payroll systems with GPS and attendance tracking linked into web and Android platforms. In along with underlining the pros of employee tracking, real-time monitoring, and salary calculation automation, their study also points out drawbacks such system reliability, device security threats and reluance on internet access.

Overall, the literature study shows that automated and cloud-based solutions have significantly replaced manual payroll methods. These solutions lessen human labour while increasing productivity, accuracy and transparency. However, high implementation costs, security issues, system complexity, and the requirement for dependable infrastructure are similar issues across research. This study offers a solid basis for creating a better payroll administration system that overcomes these constraints and improves security, scalability and usability.

Limitations

Despite its efficiency, the AI HR FAQ Chatbot has some limitations that must be addressed.

The chatbot can answer only the questions stated in the document regarding the HR policy. The chatbot will be unable to answer any question regarding information not provided in the policy document. Secondly, the chatbot does not have access to any personal information of employees like their salary details, leave status, or attendance record, and thus, it will be unable to answer any questions on such matters. Thirdly, the chatbot is purely an information-providing tool and cannot make any changes or do any activities for the benefit of the employee. Fourthly, the AI HR FAQ Chatbot works in English, and questions in any other language may not be processed correctly.

Lastly, the context window of the chatbot is determined by the length of the policy document. Therefore, any long questions involving information from diverse sections may not be answered by the chatbot.

Problem Statement

HR-related activities such as record keeping, attendance monitoring, salary processing, informing employees about HR policies, and reporting are carried out through manual or semi-automatic processes. The main problems with this

approach are errors in payroll processing, delays in approving changes, a lack of transparency, and heavy loads for HR staff. The other issue involves the need to provide answers to frequently asked questions related to employees' payroll, attendance, and HR policy within the organization. These factors adversely affect the quality of the process.

There are no existing solutions to integrate the above-mentioned functionalities into payroll and employee management systems. The absence of intelligent automation, role-based access, and AI-related features results in low efficiency of the software available on the market.

Therefore, the challenge is to develop and implement an integrated Employee Payroll and Management System. This system should unite all HR-related tasks into one web-based platform, have smart capabilities, and have a chatbot powered by artificial intelligence to give immediate answers to employees' questions.

Methodology

The Employee Payroll and Management System with AI Integrated Chatbot was developed following a planned and systematic approach. Features such as personnel management, attendance management, payroll processing, role-based access control, and AI integrated chatbot among others are initially determined using requirement analysis. After that, a safe three-layer architecture of display layer, application layer, and data layer are developed according to these requirements. To enhance the ease of maintenance, the software is developed following modularization, where different modules of personnel management, attendance, payroll, authentication, and chatbots respectively are built. Once the modules are successfully developed, APIs are applied to integrate all these modules into one system. To confirm whether the system works correctly and efficiently, the software undergoes various forms of testing. Once it passes the test and proves itself efficient, it is configured at the right environment and made accessible through a web interface. For the purpose of ensuring its efficiency and effectiveness over the long run, regular maintenance and upgrading is performed to remove defects and improve efficiency.

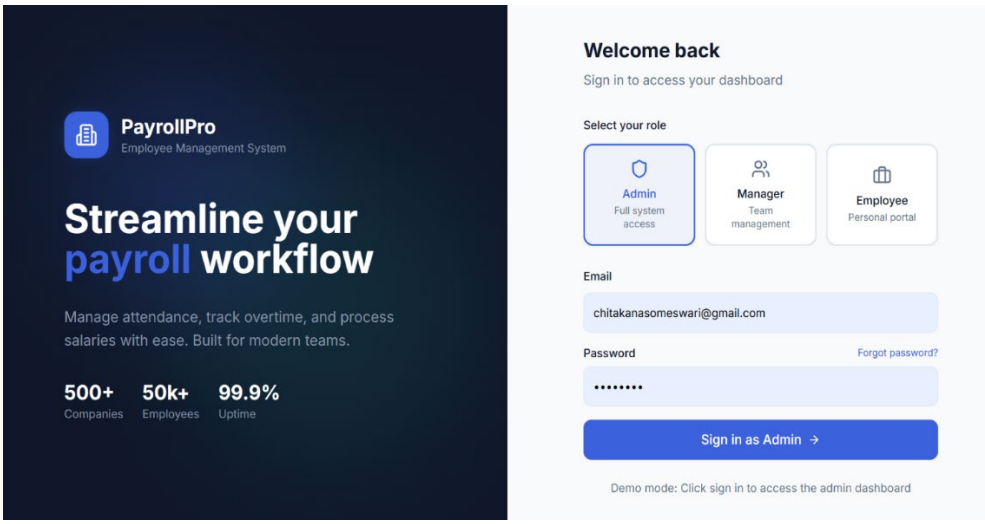
Implementation

The Employee Payroll and Management System with AI-Integrated Chatbot is designed as a full-stack web application that utilizes a three-tiered architecture comprising a React and Tailwind CSS based frontend, Node.js and Express.js backend, and MongoDB database for safe data storage. The role-based authentication module with JWT functionality helps to ensure the security of transactions made by different employees. The following components are present within the software solution: employee management, attendance, payroll, reports, messaging, and notifications. In addition, the RESTful APIs facilitate smooth frontend-backend interaction. Moreover, automation tools minimize the involvement of humans in the process of salary calculation, attendance analysis, and reports generation, which contributes to better accuracy. A novel aspect of the system is the incorporation of the AI chatbot using the RAG approach where HR policies are stored in the vector database and accessed via a generative AI model that provides relevant answers to questions from employees. Testing and deployment processes include unit, integration, and user acceptance testing and cloud-based deployment. Thus, the proposed software offers increased transparency, helps to save time spent on payroll and attendance analysis, and allows employees to easily access payroll and attendance data via their personal profiles whenever needed.

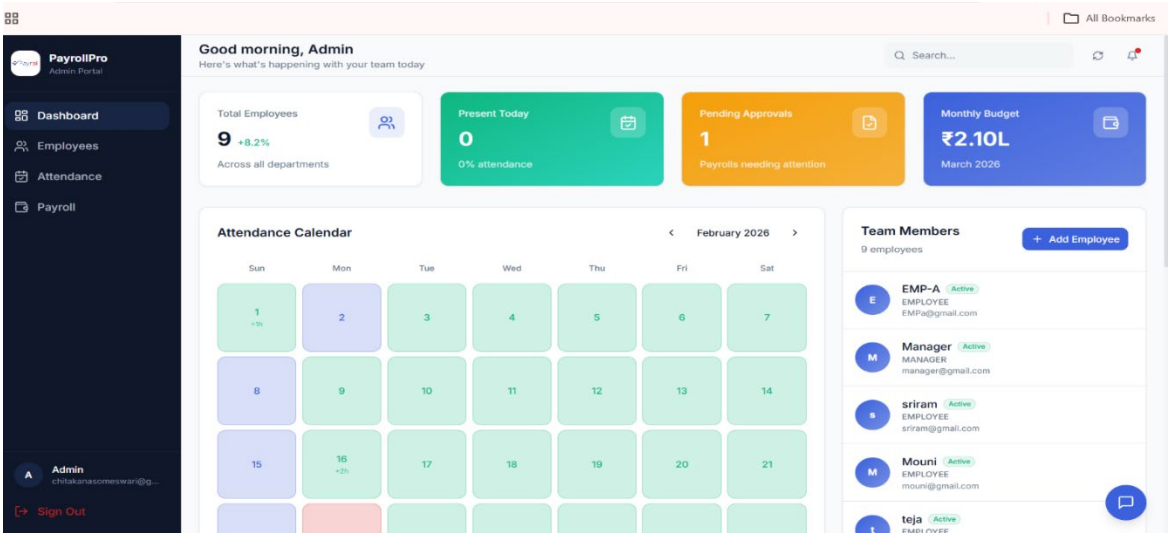
Results

The proposed automation system, namely the Employee Payroll and Management System with AI-Integrated Chatbot, was implemented and tested with respect to automation efficiency and effectiveness as well as user experience. According to the results of the experiments conducted, it was possible to improve the efficiency of operations related to payroll calculation and payslip issuance through automation, thereby cutting the payroll process time by around 50%. This has been facilitated by minimizing repetitive actions and using the attendance management module for automating payroll calculations. As a result, errors associated with manually calculated salaries have been minimized. In addition, thanks to the attendance module, it has become possible to ensure high attendance levels exceeding 90%.

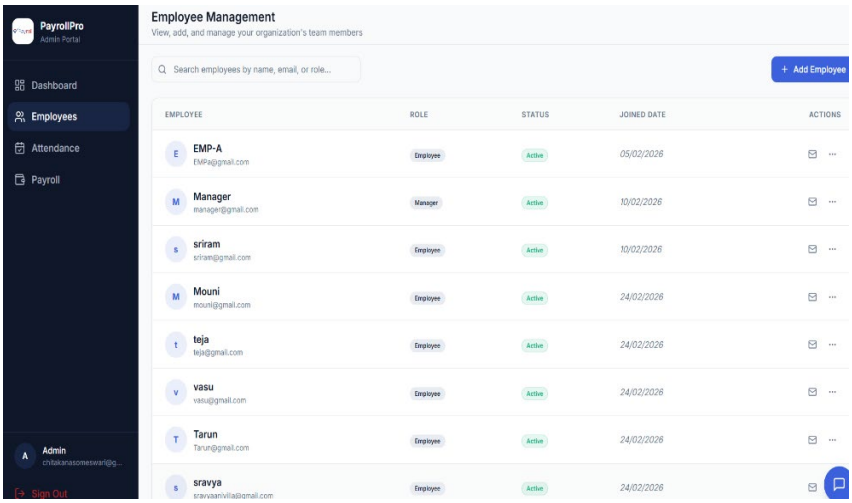
1.Login Page:

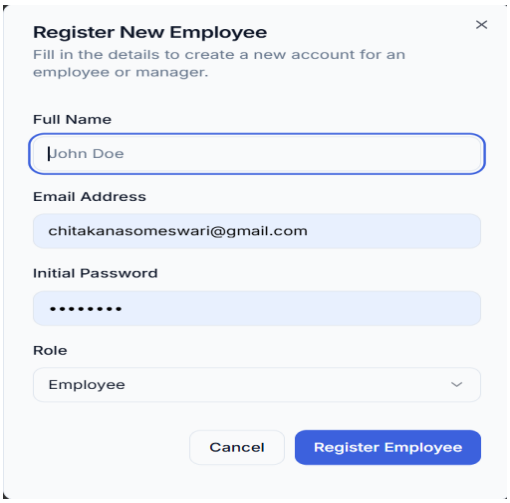


2.Admin Portal(Admin Dashboard):



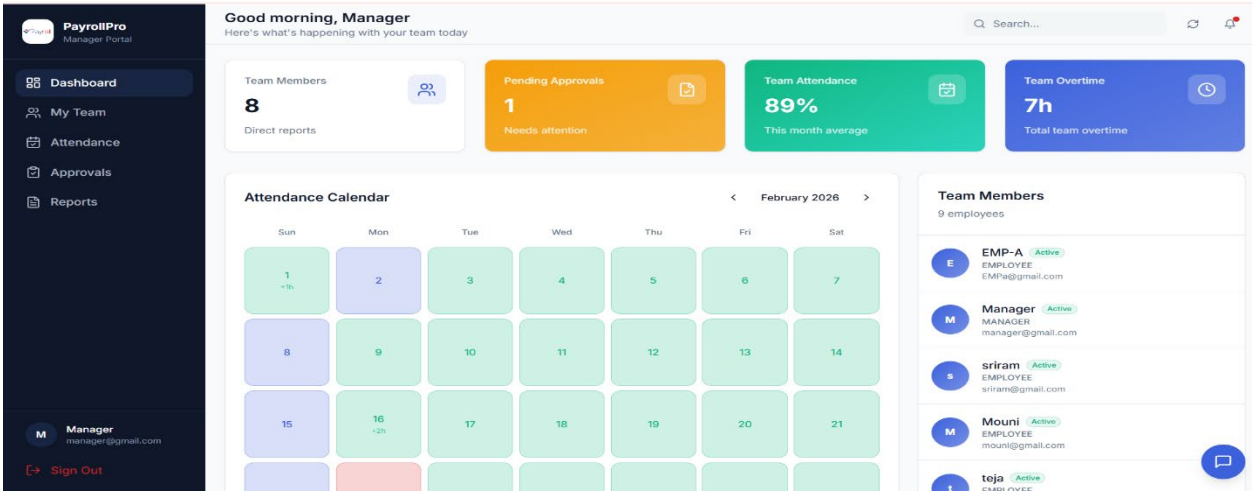
3. Employees and Add employee page:



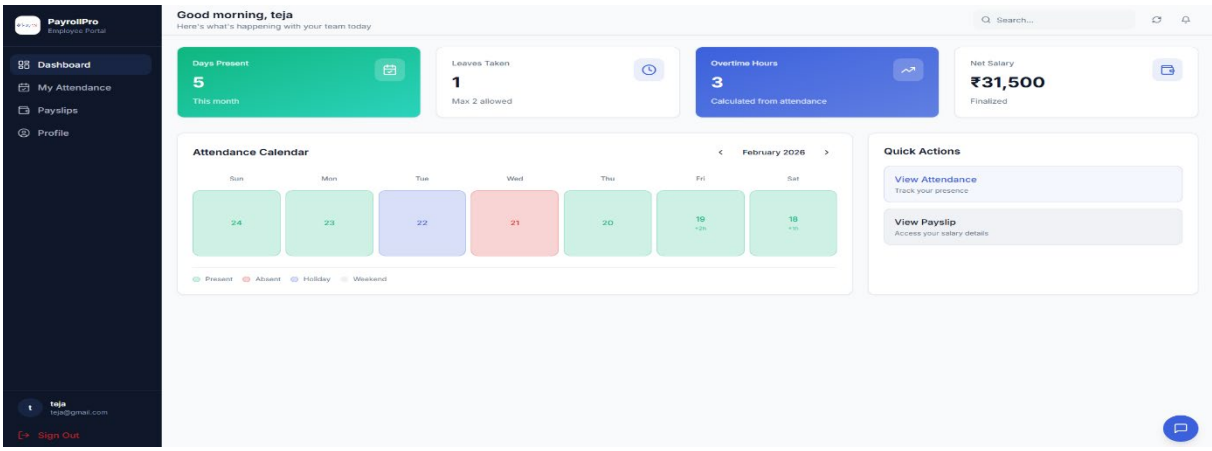


The chatbot integrated into the system turned out to be one of the most critical components because of its ability to provide immediate answers to the commonly asked questions by the employees about payroll, attendance, and corporate policies. It managed to resolve around 92% of queries, making it easier for the staff to communicate with the managers and saving HR specialists some time since they no longer had to deal with the same questions all the time. Moreover, thanks to the friendly user interface and self-service capabilities, the employees were able to view their payslips and attendance information anytime they wanted, resulting in user satisfaction rates reaching almost 95%.

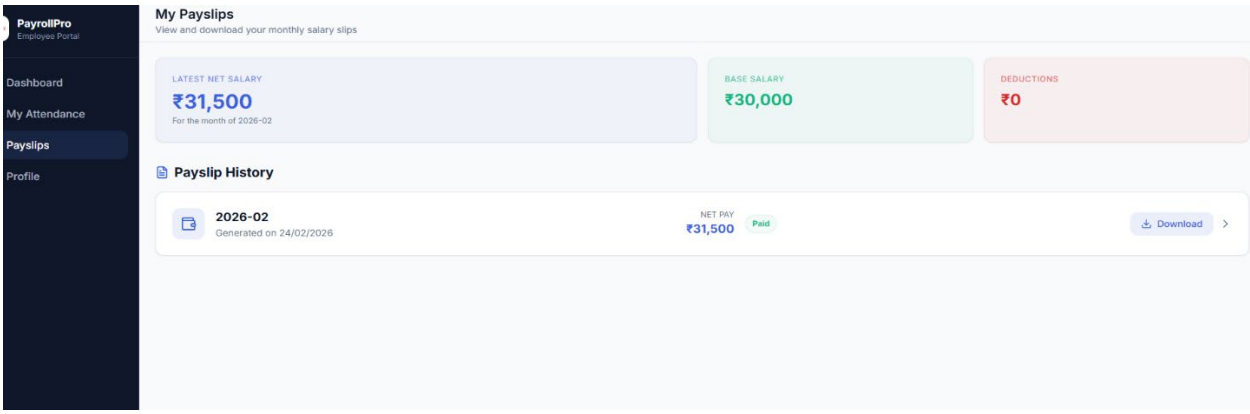
4.Manager Portal (Manager Dashboard):



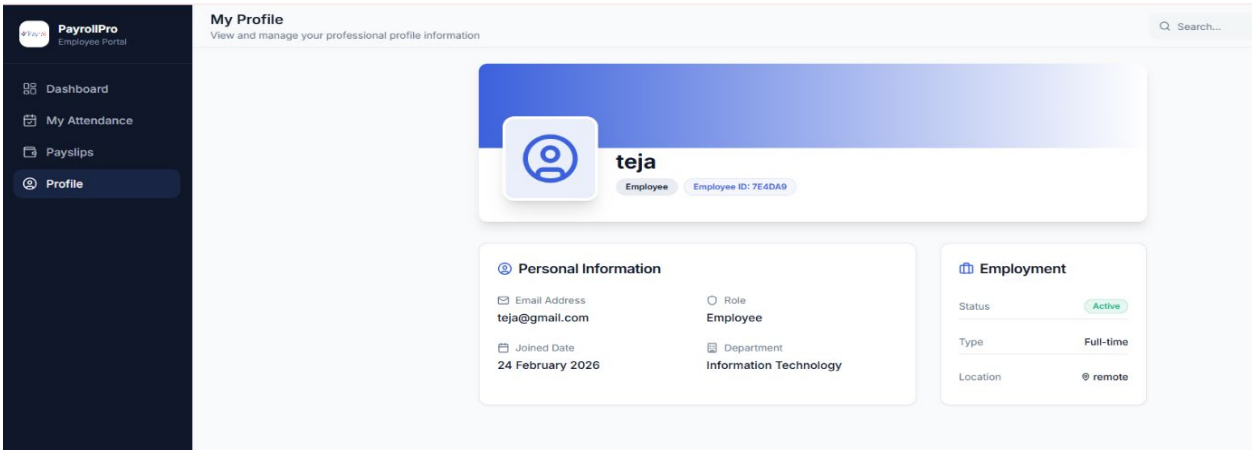
4. Employee Portal (Employee Dashboard):



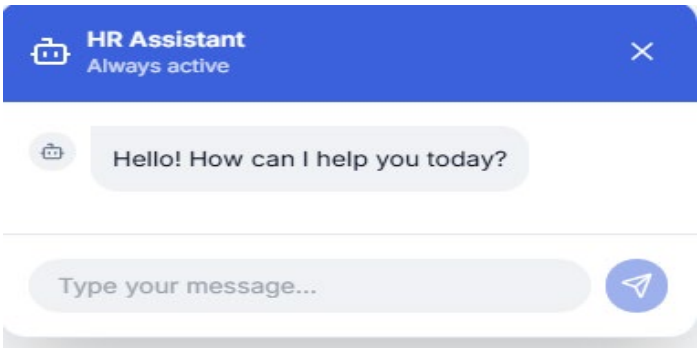
5. Employee Payslip Page:



6. Employee Profile Page:



5. HR Chatbot:



Conclusively, the findings have proven that the system developed has succeeded in improving the functioning of the HR department through its incorporation of technology. Increased efficiency, minimized costs associated with administration, and a reliable system have been achieved. Future developments such as the use of biometrics, increased mobility features, and better analytics can be considered when implementing the system within the organization.

Conclusion

The AI-powered HR FAQ chatbot is a great and intelligent component of the Employee Payroll and Management System. Thanks to the implementation of Google's Gemini AI and Retrieval-Augmented Generation capabilities, the chatbot succeeds in delivering immediate, precise, and consistent answers to all employee inquiries.

Thus, the development showcases how AI can be incorporated into conventional HR management solutions to make them even more effective and convenient to use. The chatbot helps to relieve HR teams of routine work, respond promptly, provide consistency of information and round-the-clock access to it.

The integration of React frontend, Node.js backend, Gemini AI models, and Pinecone vector database allows to build a highly scalable and resourceful tool that will cater to the needs of companies of different scales. The careful creation of prompts guarantees the complete compliance of answers with the official HR policy.

In conclusion, the AI HR FAQ Chatbot becomes a significant advantage for both employees and HR personnel. The former can easily get all needed information from their computer screen anytime they want, whereas the latter receive an opportunity to optimize their daily work.

Future Scope:

In the future, the system may be improved by incorporating sophisticated AI and NLP technologies to make the HR chatbot smarter and capable of processing complex inquiries that are not restricted to FAQs. Functions like real-time alerts, mobile app connectivity, and voice chatbot communication may make the system more accessible and engaging

for users. The system may be further extended by adding biometric/GPS-based attendance tracking for increased accuracy. Analytics and reporting may be improved through the inclusion of sophisticated analytics and reporting dashboard for deeper analysis of employee performance and payroll patterns.

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