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Unified AI For Enterprise Automation

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ABSTRACT :

Unified AI for Enterprise Automation is a web-based application designed to improve enterprise operations by integrating Artificial Intelligence (AI) with customer support workflows. Traditional customer support systems often require users to search through multiple documents, wait for responses from support personnel, and manually track service requests. These limitations can increase response time and make it difficult to provide consistent and relevant information.

The proposed system focuses on an AI-assisted Customer Support Module that combines intent detection, BM25-based knowledge retrieval, and AI-generated responses. The system uses a React-based frontend and a FastAPI backend to process customer queries and coordinate the response-generation workflow. Relevant knowledge passages are retrieved and used as context to support more appropriate answers. A configurable AI provider and a fallback response mechanism are included in the system design to handle different response-generation conditions.

The module also provides support-oriented features such as conversation management, knowledge-base access, ticket handling, user feedback, and human-agent escalation. The proposed approach aims to simplify customer interactions, improve access to support information, and provide a foundation for integrating additional enterprise automation modules. Further testing is required to measure retrieval relevance, answer correctness, response time, and overall system reliability.

Keywords*:* Unified AI for Enterprise Automation, Artificial Intelligence, Customer Support, Intent Detection, BM25, Retrieval-Augmented Generation, FastAPI, React.

INTRODUCTION:

In the modern digital environment, organizations depend on efficient information management and automated services to improve productivity and customer satisfaction. Enterprise operations involve several activities, including customer support, issue handling, employee coordination, information sharing and service management. When these activities are handled through separate applications and manual processes, users may experience delays, repeated work and difficulties in accessing the information they require. Artificial Intelligence (AI) provides opportunities to simplify these processes by supporting automated responses, intelligent information retrieval and workflow assistance.

Customer support is an important part of enterprise operations because customers expect accurate information and timely solutions to their problems. Traditional support systems often depend on support personnel manually searching documentation, answering frequently asked questions and recording customer complaints. As the number of customer queries increases, these tasks can become time-consuming. Rule-based chatbots may respond to predefined questions, but they can have difficulty handling variations in natural-language queries or identifying the correct information from a large knowledge base.

The proposed project, *Unified AI for Enterprise Automation*, is designed as a modular web-based platform for supporting enterprise activities through AI-assisted functionality. The Customer Support Module is the primary focus of this paper. It integrates a React-based frontend with a FastAPI backend to manage customer conversations and coordinate the query-processing workflow. It also includes support-oriented functions such as knowledge-base access, ticket handling, feedback and human-agent escalation.

The main purpose of the proposed system is to bring customer interaction and support-related workflows into a unified environment. Instead of relying only on fixed responses, the system is designed to use relevant knowledge when answering information-seeking queries and provide alternative support paths when automated assistance is insufficient. This approach aims to improve access to support information and establish a foundation for further enterprise automation.

The current work focuses on the system's architecture, methodology and implemented customer-support functionality. Its effectiveness must be evaluated through systematic testing of retrieval relevance, answer correctness, response time and workflow reliability. Future development may extend the platform to other enterprise functions, including incident management, recruitment, meeting intelligence, employee management and analytics, after those modules are implemented and validated.

OBJECTIVE

1. *To identify user intent:* Analyze customer queries to determine their purpose and select an appropriate processing approach.
2. *To retrieve relevant information:* Implement BM25-based information retrieval to identify useful passages from the available knowledge base.
3. *To generate context-aware responses:* Use retrieved information as context for AI-assisted response generation, helping the system provide relevant answers to customer queries.
4. *To provide a unified support interface:* Develop a React-based frontend integrated with a FastAPI backend for managing customer conversations and support-related activities.
5. *To support issue management:* Incorporate features such as conversation history, support ticket handling, feedback collection and human-agent escalation, where supported by the implementation.
6. *To improve extensibility:* Design the Customer Support Module so that it can serve as a foundation for integrating additional enterprise automation functions in future development.

LITERATURE SURVEY

1.Information Retrieval Using BM25: Robertson and Zaragoza [1] explained the probabilistic relevance framework and BM25 ranking algorithm. BM25 ranks documents based on query-term relevance and helps retrieve useful information from a knowledge base.
2.Retrieval-Augmented Generation (RAG): Lewis et al. [2] introduced RAG, which combines information retrieval with text generation. This approach enables AI systems to use external knowledge as context when generating responses.
3.Intent Detection in Conversational Systems: Intent detection helps identify the purpose of a user's query, such as requesting information or reporting a problem. It enables customer support systems to select an appropriate processing path for different requests.
4.AI-Based Customer Support: AI-powered support systems can automate responses to common customer queries and reduce dependence on manual assistance. However, response quality depends on the relevance of the available information and the capability of the AI model.
5.Research Gap: Existing retrieval and generation techniques address individual parts of customer support. The proposed system integrates intent detection, BM25-based knowledge retrieval and AI-assisted response generation with a React frontend and FastAPI backend to provide a unified customer support framework.

METHODOLOGY

1. System Architecture

The proposed system uses a modular architecture consisting of a React-based frontend and a FastAPI backend. The frontend accepts customer queries, while the backend manages query processing, knowledge retrieval and AI-assisted response generation.

2. Query Input and Processing

The user enters a question or support request through the web interface. The request is sent to the backend through an API, where the input is processed and directed to the appropriate component.

3. Intent Detection

The system identifies the purpose of the customer's query, such as requesting information or reporting an issue. Intent detection helps determine the suitable processing path for the incoming request.

4. Knowledge Retrieval Using BM25

For information-seeking queries, the BM25 algorithm ranks available knowledge-base content according to its relevance to the user's query. Relevant passages are selected to provide supporting context for response generation.

5. AI Response Generation and Support Handling

The retrieved information can be supplied to the configured AI provider to generate a context-aware response. A fallback mechanism is included in the system design for situations where AI response generation is unavailable. Support workflows may also include ticket handling, feedback and human-agent escalation.

6. Integration and Testing

The frontend and backend are integrated through API endpoints. The system should be tested for query processing, retrieval relevance, response correctness, API functionality and support workflow reliability. Performance results should be recorded after conducting actual tests.

EXISTING SYSTEM:

1. Manual Customer Support

Traditional customer support systems depend heavily on human agents to answer questions, search documentation and resolve customer issues. This process may require considerable time when the number of queries increases.

2. Rule-Based Chatbots

Existing chatbot systems often use predefined rules and responses to answer frequently asked questions. They can handle common queries but may struggle with unfamiliar questions or variations in natural-language input.

3. Keyword-Based Information Search

Some support applications rely on keyword matching to locate relevant documents. Such methods may fail to identify useful information when the query uses different words from those present in the knowledge base.

4. Limited Contextual Understanding

Traditional support systems may not effectively combine the intent of a query with relevant knowledge when preparing a response. Consequently, users may receive generic or incomplete answers for complex questions.

5. Separate Support Workflows

Customer conversations, issue tracking, feedback and escalation may be managed through separate tools or manual processes. This can make support activities more difficult to coordinate and monitor.

PROPOSED SYSTEM

1. Unified Customer Support Platform

The proposed system provides a unified web-based platform for managing customer queries and support activities. It uses a React frontend and a FastAPI backend to coordinate user interactions and backend processing.

2. Intent-Based Query Processing

The system identifies the purpose of incoming customer queries and directs them to the appropriate processing workflow. This helps organize information requests and support-related issues.

3. BM25-Based Knowledge Retrieval

The proposed system uses the BM25 ranking algorithm to retrieve relevant information from the knowledge base. The retrieved passages provide supporting context for answering customer questions.

4. AI-Assisted Response Generation

The system integrates a configurable AI provider to generate responses using the customer query and relevant retrieved information. A fallback mechanism can provide an alternative response when AI generation is unavailable.

5. Integrated Support Management

The platform is designed to support conversation management, knowledge-base access, ticket handling, user feedback and human-agent escalation. These features help organize customer interactions and provide alternative support paths when necessary.

6. Modular and Extensible Architecture

The proposed architecture separates the frontend, backend, retrieval and response-generation components. This modular design simplifies maintenance and provides a foundation for extending the platform with additional enterprise automation modules.

SYSTEM REQUIREMENTS

1. Hardware Requirements

The development system requires a computer capable of running the frontend, backend and development tools simultaneously.

Processor: Intel Core i3 or equivalent and above

RAM: Minimum 4 GB; 8 GB or more recommended

Storage: Minimum 10 GB of available space

Internet connection: Required for accessing online AI services and downloading dependencies

2. Operating System

The application can be developed and tested on Windows 10 or Windows 11. Compatible environments may also support Linux or macOS, subject to dependency configuration.

3. Frontend Requirements

The frontend is developed using React and provides the interface for customer queries and support interactions.

- React.js
- HTML5 and CSS3
- JavaScript
- Node.js and npm
- A modern web browser

4. Backend Requirements

The backend handles API requests, query processing, knowledge retrieval and communication with the AI response provider.

- Python
- FastAPI
- Uvicorn
- Required Python packages and supporting libraries
- Configured AI provider credentials, when an external AI service is used

5. Knowledge Retrieval and Data Management

The system requires a knowledge base containing relevant support information. A BM25-based retrieval component searches this content and ranks potentially useful passages. Database requirements depend on the implemented storage and ticket-management features.

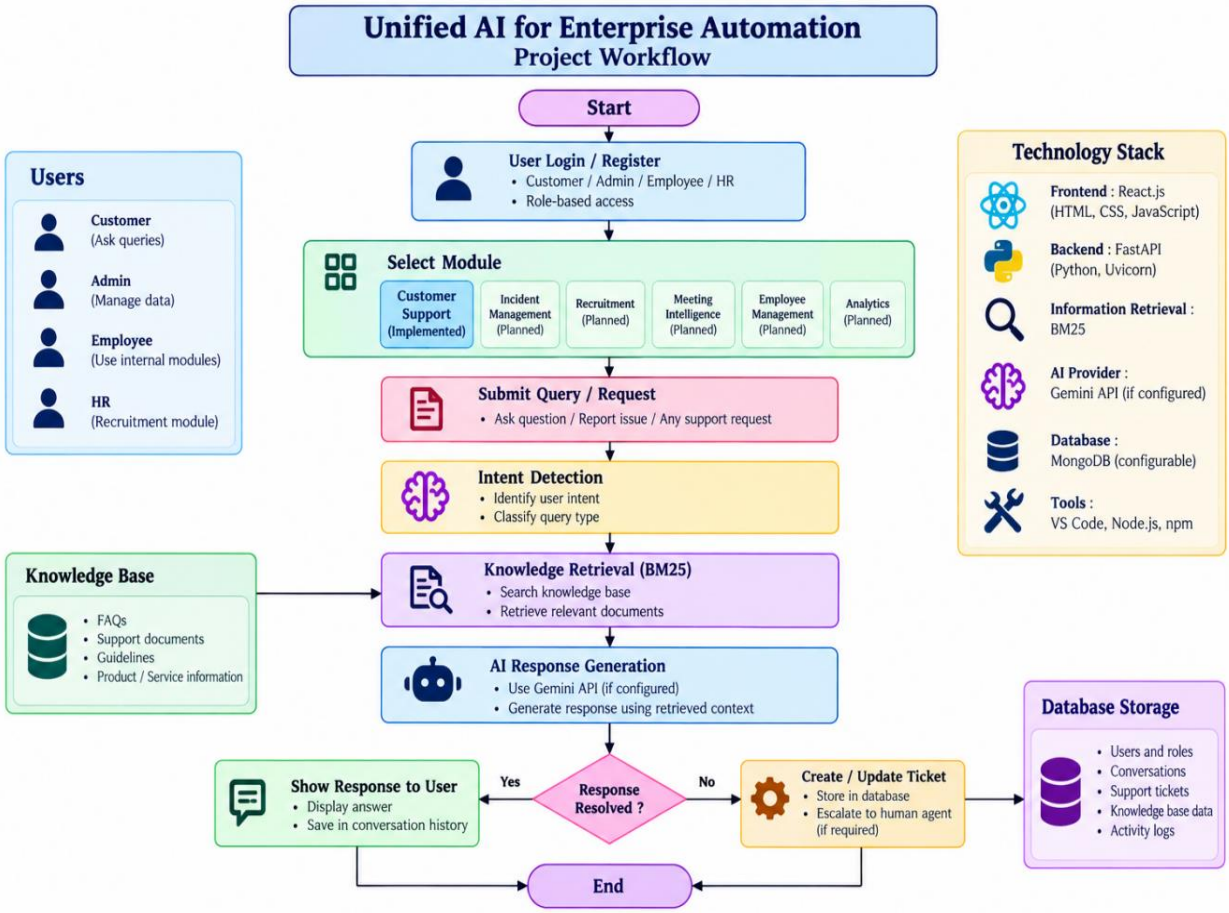
6. Network and Integration Requirements

The frontend and backend must be configured to communicate through the appropriate API endpoints. Internet access is required for external AI services, if enabled. Environment variables, API credentials and database connection settings must be configured correctly for the corresponding services to function.

7. Software Requirements

- Operating System: Windows 10/11
- Frontend: React.js
- Backend: Python and FastAPI

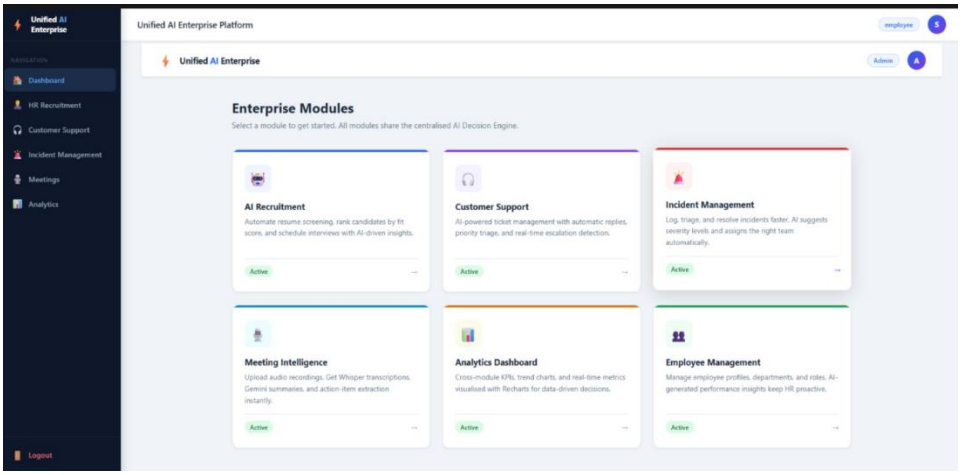
PROCESSING:



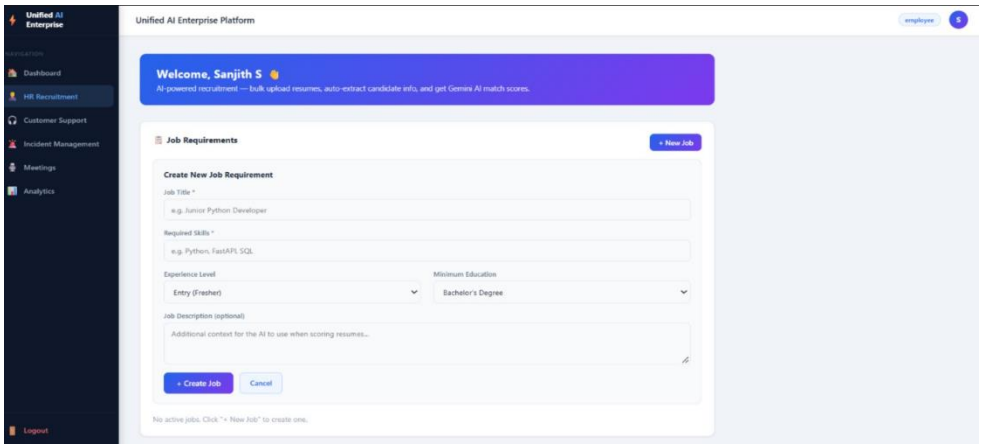
MODULES:

1. Customer Support Management: Handles customer queries, provides AI-assisted responses, and manages support requests.
2. Intent Detection: Identifies the purpose of customer queries and directs them to the appropriate processing workflow.
3. Knowledge Base Management: Stores and organizes FAQs, support documents, guidelines, and other relevant information.
4. AI-Based Response Generation: Generates context-aware responses using retrieved information and a configured AI provider such as Gemini.
5. Support Ticket Management: Creates, updates, and tracks support tickets for unresolved customer issues.
6. Conversation History: Stores and displays previous customer interactions for reference and continuity.
7. Feedback and Human-Agent Escalation: Collects user feedback and supports escalation to a human agent when automated assistance is insufficient.
8. 8. Dashboard and Analytics: Displays support activities, ticket status, service information, and available customer support statistcs.

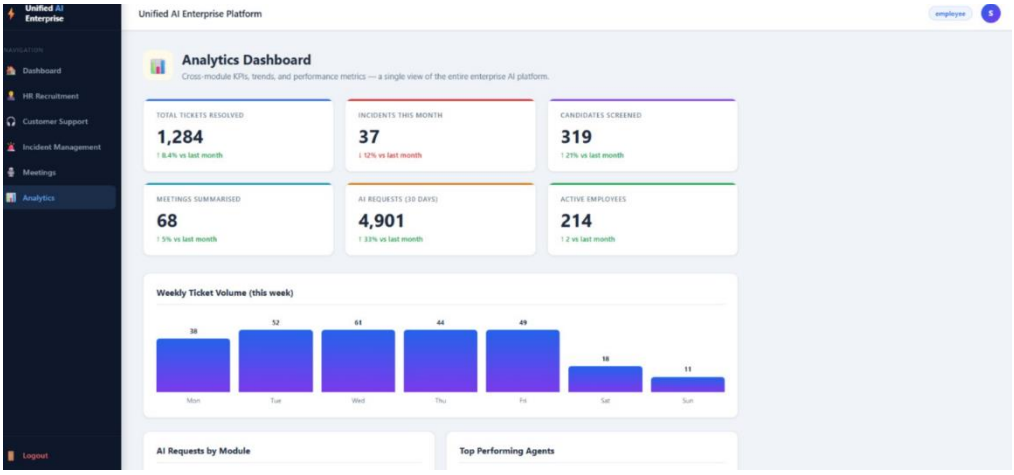
EnterpriseModules

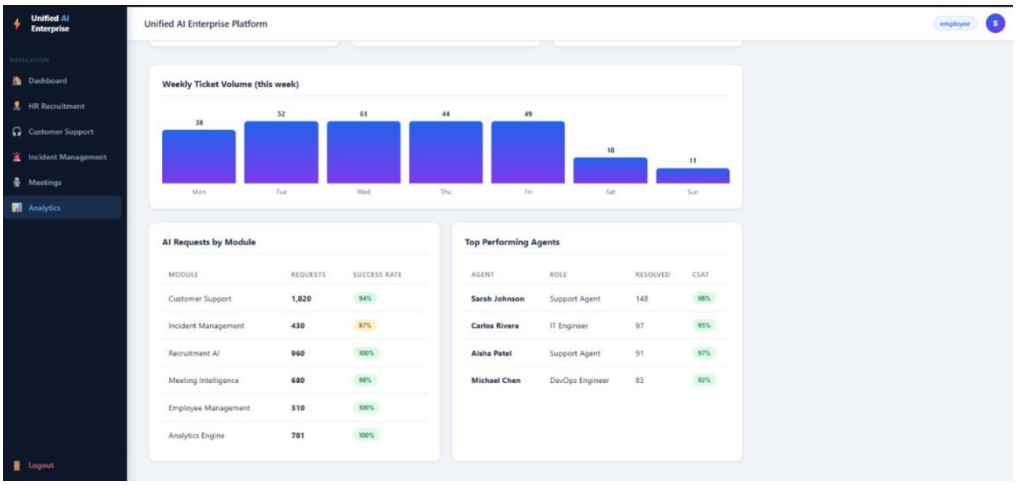


HR Module

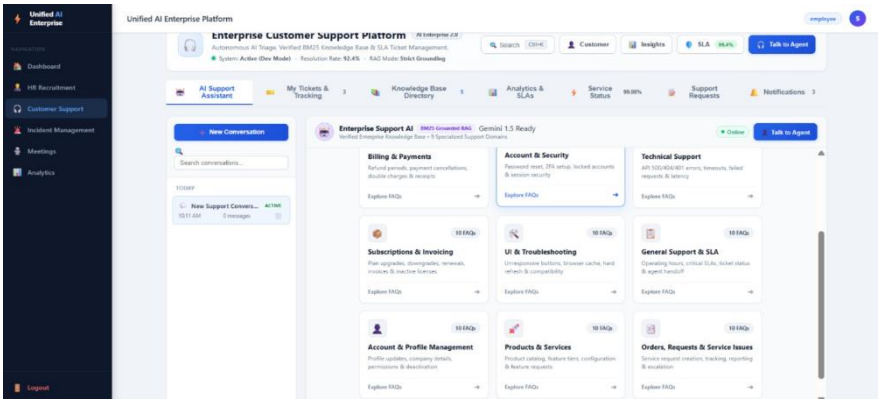


Analytics Dashboard

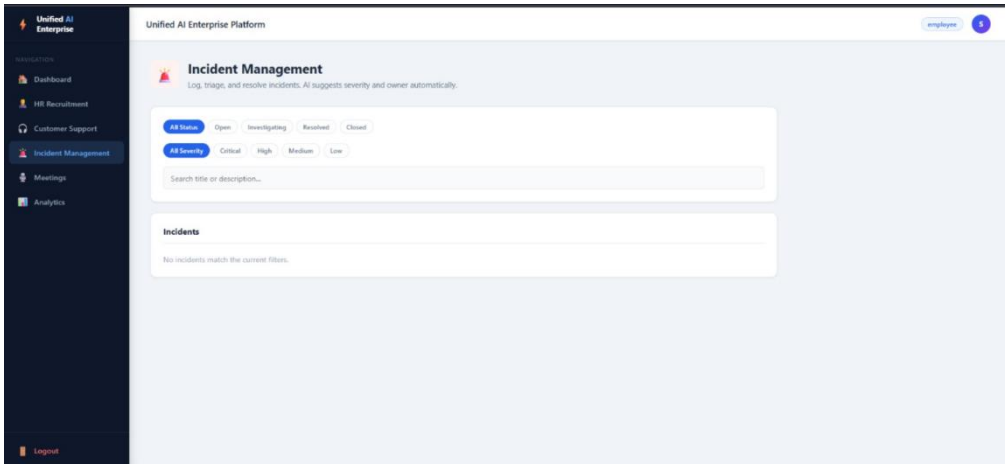




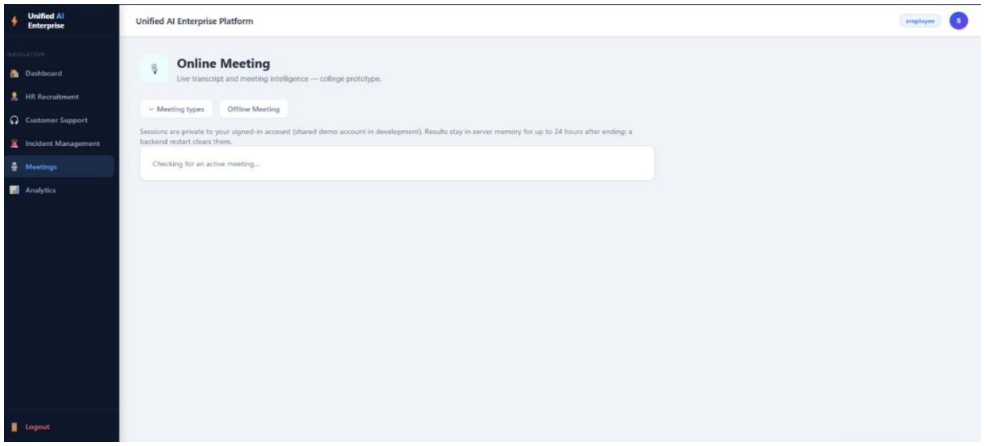
Customer Support



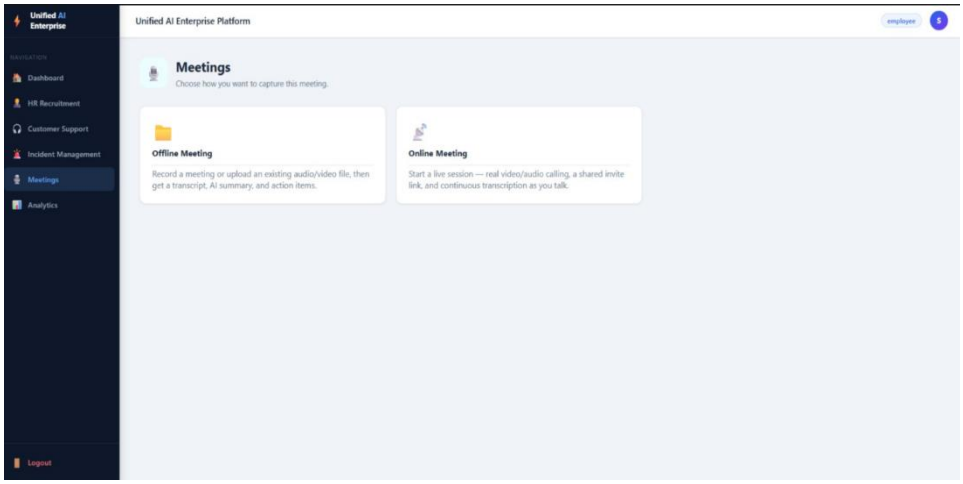
Incident Management



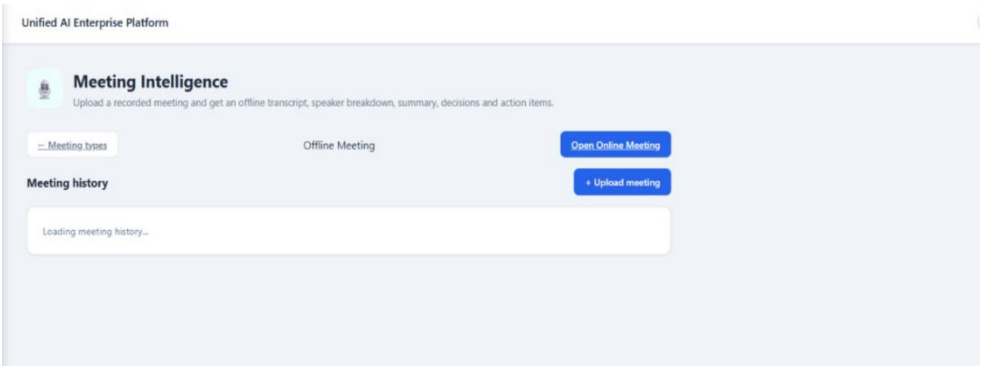
Online Meetings



Offline And Online Meeting



Meeting History



CONCLUSION

The *Unified AI for Enterprise Automation* project presents an intelligent and scalable approach to transforming traditional customer support into an AI-assisted service platform. By integrating intent detection, BM25-based knowledge retrieval, and AI-powered response generation, the proposed system aims to overcome the limitations of manual support processes and conventional rule-based chatbots. The combination of React and FastAPI establishes a modular architecture that supports efficient query processing, knowledge management, and seamless communication between users and the application.

Beyond automated responses, the system brings together essential customer support functions, including conversation history, ticket management, feedback collection, and human-agent escalation. This unified approach has the potential to reduce repetitive manual tasks, improve information accessibility, and deliver more consistent and contextually relevant customer assistance. Its actual effectiveness will be determined through systematic performance and reliability testing.

The significance of this project extends beyond customer support automation. Its modular architecture provides a foundation for future integration of intelligent incident management, recruitment, meeting intelligence, employee management, and enterprise analytics. With further development and validation, *Unified AI for Enterprise Automation has the potential to evolve into a comprehensive AI-driven enterprise platform, enabling smarter decision-making, streamlined operations, and more responsive customer experiences.*

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