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NIRNAYA: An AI-Driven Intelligent Support Ticketing and Decision System

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***Abstract*—Internal IT support is an essential part of the daily operation of modern organizations. However, a considerable portion of the support process still depends on manually reading requests, identifying their type and urgency, selecting the appropriate department, and assigning them to suitable support personnel. These activities can become time-consuming when ticket volumes increase and may also result in inconsistent decisions for similar requests.**

The proposed system, NIRNAYA, is an AI-driven internal IT Service Management (ITSM) platform designed to assist support teams during the decision-intensive stages of ticket handling. The system uses natural language processing to analyze employee requests and generate recommendations for ticket classification, priority, department routing, and agent assignment. It also provides ticket summarization and initial resolution assistance. The platform combines a React-based user interface, Node.js/Next.js application services, PostgreSQL for persistent data storage, AI-based language processing services, and WebSocket-based real-time communication. SLA monitoring, notifications, ticket history, and operational analytics are integrated into the same workflow.

A key aspect of NIRNAYA is its human-in-the-loop design. AI-generated recommendations are presented to support personnel for validation rather than being treated as final decisions. This allows the proposed system to reduce repetitive triage work while preserving human control over ticket handling. The proposed architecture incorporates AI-assisted ticket processing, structured data management, SLA monitoring, real-time communication, and operational analytics within a unified IT support workflow. NIRNAYA is presented as a system design and prototype; quantitative evaluation of prediction accuracy and operational performance is identified as an area for future work.

***Index Terms*—IT Service Management, intelligent help desk, artificial intelligence, natural language processing, ticket classification, priority prediction, intelligent routing, SLA monitoring, decision support.**

I. Introduction

Information technology support plays an important role in keeping organizations productive. Employees may encounter a wide range of technical problems, including VPN failures, Wi-Fi connectivity issues, email problems, password and access requests, hardware failures, software errors, database issues, and security-related incidents. In a conventional support environment, an employee submits a request and a support coordinator or agent manually interprets the description before deciding how the ticket should be handled.

The initial interpretation of a ticket often involves several decisions. Support personnel must determine what type of problem has been reported, how urgent it is, which department should handle it, and which available agent is most appropriate. Only after these decisions have been made can the ticket move effectively toward resolution.

Previous research has investigated automated approaches for classifying customer and IT support tickets. Truss and Böhm studied AI-based customer support ticket classification using AutoML and examined the applicability of automated machine-learning approaches to support-ticket classification [**?**].

Similarly, Paramesh *et al.* investigated the classification of unstructured IT service-desk tickets using ensemble learning techniques. Their work examined bagging, boosting, and voting approaches for improving ticket classification [**?**].

Al-Hawari and Barham developed a machine-learning-based help desk system for IT service management in which ticket classification is used to associate tickets with appropriate services [**?**]. Benitez Pereira *et al.* also investigated machine-learning classification of IT support tickets and developed a prototype for assisting IT analysts [**?**].

Consequently, the challenge in IT support is not limited to storing tickets and tracking their status. A significant amount of effort is spent during the early stages of the workflow, particularly when requests are received in free-form natural language. Similar problems may also be classified differently by different support personnel, resulting in variation in routing and prioritization.

The proposed system, NIRNAYA, is designed to assist with this decision-making process. The system analyzes an employee's request and generates structured recommendations that can be reviewed by support personnel. These recommendations include the likely category of the issue, its priority, the responsible department, and a suitable support agent. The system can additionally generate a concise summary and provide initial troubleshooting guidance.

The proposed architecture combines AI-assisted triage with other components commonly required in an internal IT support environment, including SLA monitoring, notifications, ticket history, real-time communication, and operational analytics. Rather than treating AI as an independent chatbot, NIRNAYA places AI within the ticket-processing workflow.

The major contributions of the proposed system are:

- An AI-assisted workflow for internal IT support in which ticket triage is treated as a core system function.

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- A processing pipeline covering ticket classification, priority prediction, department recommendation, agent recommendation, summarization, and resolution assistance.
- Integration of AI recommendations with SLA monitoring, notifications, ticket history, and operational analytics.
- A human-in-the-loop mechanism that allows support personnel to review, accept, or modify AI-generated recommendations.
- A clear distinction between an ITSM-focused platform such as NIRNAYA and general-purpose project and issue-management systems.

II. Problem Definition and Motivation

A conventional IT support workflow can be represented as

$$T \rightarrow C \rightarrow P \rightarrow D \rightarrow A \rightarrow R, \tag{1}$$

where T represents the submitted ticket, C represents classification, P represents priority selection, D represents department selection, A represents assignment, and R represents resolution.

In this workflow, several stages depend directly on human interpretation. Although human judgment remains important, repetitive manual processing can become inefficient when the number of incoming requests increases.

The proposed system introduces an AI-assisted version of this workflow:

$$T \rightarrow AI \rightarrow \{C, P, D, A, S\} \rightarrow H \rightarrow R, \tag{2}$$

where S represents resolution assistance and H represents human validation.

The purpose of this approach is not to remove human involvement. Instead, the AI layer is intended to reduce repetitive interpretation and provide support personnel with useful information before they begin working on a ticket. The final decision remains with the human agent.

This approach is particularly relevant for requests that contain enough contextual information to identify their likely category, urgency, or routing requirements. At the same time, ambiguous requests can still be reviewed and corrected by support personnel.

III. Related Work

Existing research has investigated the use of artificial intelligence and machine learning for automated support-ticket processing. The base paper, "AI-based Classification of Customer Support Tickets," focuses on the application of AI techniques for classifying customer support requests [1].

Automated prioritization and routing have also been investigated as important components of IT support workflows. Such approaches aim to reduce manual effort in determining the urgency of tickets and directing them to suitable support resources [2].

Another area of research focuses on the classification of unstructured IT service-desk tickets. These approaches analyze free-form ticket descriptions and attempt to assign them to predefined categories [3].

Machine-learning-based help desk systems have been proposed to support ticket processing and service management activities [4]. Similarly, AI-based approaches have been investigated for improving the efficiency of ticket classification [5].

Research surveys on ticket automation have examined the broader use of automation in ticket classification, routing, and management [6]. Customer-support ticket categorization and prioritization have also been considered as important tasks for improving support workflows [7].

AI-enhanced ticket management systems extend automated classification by integrating AI capabilities into the broader ticket-management process [8]. Machine-learning approaches have additionally been applied specifically to IT support ticket classification [9].

Based on these research directions, NIRNAYA combines ticket classification, priority prediction, department routing, agent recommendation, SLA monitoring, and human validation within a unified internal IT support workflow. Unlike approaches that focus on individual ticket-processing tasks, the proposed system integrates multiple decision-support functions within a single internal IT support workflow while retaining human validation before final ticket-handling decisions.

IV. NIRNAYA System Overview

NIRNAYA is designed for two primary categories of users: employees and IT support personnel. Employees use the system to submit requests and monitor their progress. Administrators and support agents use it to review incoming requests, examine AI-generated recommendations, manage tickets, communicate with employees, monitor SLA conditions, and analyze operational information.

The proposed architecture is divided into five logical layers:

1) **Presentation Layer:** React-based interfaces through which employees and support personnel interact with the platform.
2) **Application Layer:** Node.js/Next.js services responsible for authentication, ticket operations, business rules, and workflow orchestration.
3) **AI/NLP Layer:** AI-based services used to interpret ticket descriptions and generate recommendations.
4) **Data Layer:** PostgreSQL used to store users, tickets, ticket history, SLA information, AI predictions, notifications, and agent activity.
5) **Real-Time Communication Layer:** WebSocket-based communication for live status updates, notifications, assignment changes, and SLA alerts.

V. AI-Driven Ticket Processing

A. Ticket Understanding

The processing pipeline begins when an employee submits a request in natural language. The application validates the request and forwards the relevant information to the AI layer.

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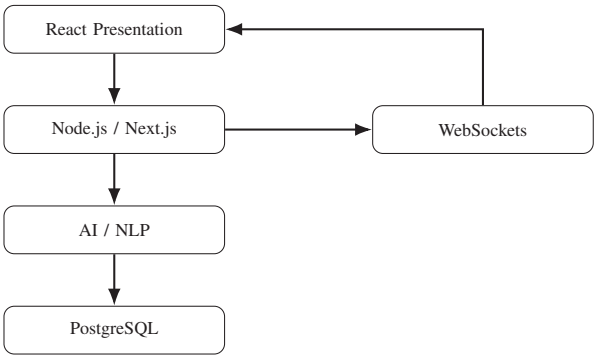


Fig. 1. Logical architecture of the proposed NIRNAYA system.

The AI output is then converted into a structured representation that can be used by the remaining components of the system.

A conceptual representation of the proposed processing approach is

$$Y = f(X, H, O), \tag{3}$$

where X represents the ticket text, H represents available history and contextual information, O represents organizational constraints, and Y represents the structured output generated by the AI layer.

This formulation reflects the fact that ticket interpretation may depend not only on the text of the current request but also on available contextual and organizational information.

B. Ticket Classification

The classification component identifies the operational area associated with a ticket. Example categories include network, hardware, software, access, security, database, and email-related issues.

The purpose of this stage is to transform a free-form employee description into structured information that can be used by the subsequent routing and prioritization stages.

C. Priority Prediction

NIRNAYA provides a recommended priority based on the information contained in the request and its available context. For example, a problem preventing an employee from accessing an essential organizational resource may require more immediate attention than a minor configuration request.

The predicted priority is treated as a recommendation rather than an automatic final decision. This distinction allows the support agent to consider additional circumstances that may not have been available to the AI system.

D. Department and Agent Recommendation

After interpreting the nature of a request, NIRNAYA recommends a suitable department and support agent. A conceptual suitability function is represented as

$$S(a,t) = w_1 K(a,t) + w_2 W(a) + w_3 D(a,t) + w_4 E(a,t), \tag{4}$$

where K represents skill or category compatibility, W represents workload suitability, D represents department compatibility, and E represents other relevant experience signals.

The weights in this formulation are design parameters and are not claimed to be experimentally optimized in the current study. The formulation instead illustrates how multiple factors can be considered when generating an agent recommendation.

E. Summary and Resolution Assistance

In addition to classification and routing, the proposed system can generate a concise summary of the reported problem. It can also provide an initial troubleshooting direction based on the information contained in the ticket.

For example, if an employee reports that a VPN stopped working after an operating-system update, the system may suggest checking the VPN certificate or restarting the VPN service.

Such suggestions are intended to help the support agent begin the investigation. They are not intended to replace technical expertise or guarantee a successful resolution.

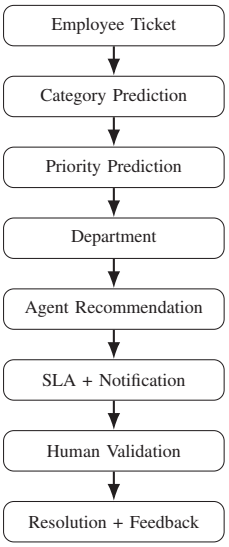


Fig. 2. AI-assisted ticket decision workflow of the proposed system.

VI. Human-in-the-Loop Decision Model

An AI response generated by NIRNAYA may contain the predicted category, priority, department, recommended agent, confidence value, summary, and resolution guidance.

Rather than automatically applying these recommendations, the proposed system presents them to the support agent. The agent can accept the recommendations or modify them according to the actual situation.

The prediction record can be represented as

$$P = (t, \hat{y}, q, \delta), \tag{5}$$

where t represents the ticket, $\hat{y}$ represents the AI recommendation, q represents its confidence or score, and δ records the human decision when available.

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Maintaining both the AI recommendation and the final human decision provides useful information for later analysis. It can also help identify situations in which the AI system requires improvement.

The decision process can therefore be summarized as:

AI recommendation → human validation → final decision

This design keeps human judgment at the center of the final support decision while allowing AI to handle repetitive analytical tasks.

VII. SLA Monitoring and Real-Time Communication

Service Level Agreements (SLAs) are important in IT support because they define expected response or resolution timelines. NIRNAYA associates SLA information with ticket processing and can alert support personnel when a ticket requires attention.

If D represents the SLA deadline and t represents the current time, the remaining SLA time can be represented as

$$R_{\text{SLA}} = \max(0, D - t). \tag{6}$$

This value can be used to identify tickets that are approaching their SLA deadline and support timely escalation.

Real-time communication is implemented using WebSockets. This allows status changes, ticket assignments, comments, notifications, and SLA-related alerts to be communicated without requiring users to repeatedly refresh the application.

VIII. Database and Analytics

PostgreSQL is used to maintain the structured operational information generated by the proposed system. The major entities considered in the design are shown in Table I.

TABLE I
Representative NIRNAYA Data Entities

Entity	Purpose
User	Employee, administrator, or support-agent information.
Ticket	Description, category, priority, status, assignment, and timestamps.
AIPrediction	AI outputs, confidence scores, and recommendation context.
Ticket History	Status changes, assignments, comments, and workflow events.
SLA Record	SLA target, elapsed or remaining time, and escalation state.
Notification	Workflow and real-time alerts.
Agent Activity	Assignment and support-operation information for analytics.

The structured information stored by NIRNAYA can also support operational analytics. Examples include ticket volume, the number of open and resolved requests, category and priority distributions, SLA status, agent activity, and resolution trends.

This creates a connection between day-to-day ticket processing and longer-term service analysis. Support administrators can use these insights to understand recurring categories of requests and identify areas that may require additional attention.

IX. Comparison With General-Purpose Issue Management

NIRNAYA is not intended to be positioned as a replacement for general-purpose issue-management platforms. Platforms such as Jira are designed to support a broad range of activities, including software development, project planning, backlog management, boards, and team workflows.

NIRNAYA instead focuses specifically on internal IT service operations. The difference is primarily in workflow emphasis rather than the presence or absence of individual features.

TABLE II
Conceptual Comparison

Dimension	General Work Management	NIRNAYA
Primary purpose	Projects and work items	Internal IT support
Core object	Issue/work item	IT support ticket
AI role	Assistive capability	Core triage layer
Classification	Configurable	Central AI function
Priority	Workflow attribute	AI-assisted prediction
Department routing	Configuration-dependent	Core recommendation
Agent recommendation	Not central	Core recommendation
IT SLA	Configurable	Central workflow
Resolution assistance	Possible through extensions	Integrated design goal
AI feedback	Not central	Explicit feedback concept
Software development	Strong focus	Not primary focus
Sprint/backlog	Core concepts	Not intended focus
IT analytics	Configurable	Core dashboard objective

The comparison therefore reflects a difference in intended use. General work-management systems organize and track work across many types of projects, whereas the proposed NIRNAYA system is designed around the specific decision-making requirements of internal IT support.

X. Illustrative Scenario

Consider the following employee request:

> "My VPN stopped working after the Windows update, and I cannot access company resources."

NIRNAYA can transform the free-form request into structured information that may resemble the following:

- Category: Network
- Priority: High
- Department: IT Support
- Recommended Agent: Rahul Sharma
- Confidence: 94% (illustrative)
- Summary: VPN connectivity failed after a Windows update.
- Resolution assistance: Verify the VPN certificate and restart the VPN service.

The values in this example are illustrative and are not presented as measured benchmark results. The purpose of

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the example is to demonstrate how an unstructured employee request can be converted into actionable information for review by a support agent.

XI. Security and Privacy Considerations

Internal IT support tickets can contain sensitive operational information, including employee identities, device details, access requests, and information about organizational systems. Access to such information should therefore be controlled according to user roles and responsibilities.

A practical deployment of the proposed system should include secure API communication, input validation, appropriate credential protection, audit logging, and controlled access to ticket information.

The use of external AI services introduces an additional privacy consideration. Information sent to an external model provider should comply with organizational security policies and data-minimization requirements. For highly sensitive deployments, organization-controlled or locally hosted models could be considered to reduce dependence on external AI services.

XII. Discussion

The central idea behind the proposed system is to reduce the manual effort involved in the early stages of IT support. Instead of waiting for a support agent to manually interpret every incoming request, NIRNAYA provides an initial structured assessment that can be reviewed before further action is taken.

An important aspect of the proposed architecture is the integration of AI with the broader ticket lifecycle. Classification and recommendation are connected with routing, SLA monitoring, communication, and analytics rather than being isolated as a separate conversational feature.

The human-in-the-loop approach also provides a practical balance between automation and human judgment. Support agents remain responsible for the final decision, while the AI system acts as a decision-support mechanism.

However, the effectiveness of such a system depends on the quality of the input data, the AI model, organizational policies, and the quality of the available contextual information. These factors need to be considered when evaluating the proposed system in a real operational environment.

XIII. Limitations

The proposed system has several limitations.

First, AI recommendations may be inaccurate when a ticket is ambiguous, incomplete, or poorly described. Second, dependence on external AI services may introduce latency, cost, availability, and privacy concerns. Third, organizational categories, support procedures, and SLA policies can change over time and may require corresponding updates to the system.

Another important limitation is the absence of a large-scale quantitative evaluation in the current study. Therefore, the proposed system does not claim specific improvements in response time, resolution time, classification accuracy, or SLA compliance.

These measures require controlled experiments using representative IT support ticket datasets and clearly defined evaluation criteria.

XIV. Future Work

Several areas can be explored in future versions of the proposed system.

1) **Empirical evaluation:** Measure classification, priority prediction, department recommendation, and agent recommendation using representative datasets.
2) **Human feedback integration:** Analyze agent corrections to identify common AI errors and use the feedback to improve future recommendations.
3) **Workload-aware assignment:** Incorporate current agent workload, availability, and skill profiles into the assignment process.
4) **Knowledge-base integration:** Connect the system with an approved organizational knowledge base to provide more context-aware troubleshooting assistance.
5) **Explainable recommendations:** Provide explanations for why a particular category, priority, department, or agent was recommended.
6) **Privacy-preserving AI:** Investigate locally hosted or organization-controlled models for sensitive IT support environments.
7) **Advanced SLA analytics:** Extend the system to provide escalation prediction, SLA-risk analysis, and service-quality trends.

XV. Conclusion

The proposed system, NIRNAYA, is an AI-driven internal IT Service Management platform designed to assist with the decision-intensive stages of employee IT support. It combines natural-language analysis with ticket classification, priority prediction, department and agent recommendation, summarization, resolution assistance, SLA monitoring, real-time communication, and operational analytics.

The primary contribution of the proposed system is the integration of these capabilities into a single support workflow. AI is used as a decision-support component rather than as a replacement for support personnel. Human agents can review and modify recommendations before the final action is taken.

The proposed architecture is specifically oriented toward internal IT operations, which distinguishes its workflow from general-purpose project and issue-management platforms. Rather than attempting to replace such platforms, NIRNAYA focuses on the particular challenges of understanding, prioritizing, routing, and assisting with employee IT requests.

The proposed work establishes the architecture and workflow for the NIRNAYA platform. Future evaluation using representative ticket datasets will be necessary to measure its classification performance, routing accuracy, operational efficiency, and impact on SLA-related outcomes.

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