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Smart Campus Complaint & Resolution System

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Abstract—Complaint handling across a university campus typically spans maintenance, hostel, academic, IT, and grievance-redressal concerns, each routed through a different office, register, or informal contact, so that a student or staff member raising a genuine issue frequently cannot tell whether it was received, who is responsible for it, or when it will be resolved. This paper presents the design, implementation, and evaluation of a Smart Campus Complaint & Resolution System that unifies complaint intake, automatic categorisation, priority-aware routing, and resolution tracking within a single coordinated platform. The system integrates four components — a natural-language complaint categorisation engine that classifies free-text submissions into department-specific categories, a priority prediction module that estimates urgency from complaint text and historical resolution patterns, a routing and escalation engine that assigns each complaint to the responsible department and automatically escalates unresolved cases past a service-level threshold, and a transparency dashboard that lets complainants track status and lets administrators monitor departmental performance. A dataset of 12,500 historical complaint tickets across eight categories, annotated with department labels, priority levels, and resolution outcomes and collected over three academic years, was used to develop and evaluate the categorisation and prioritisation components. The categorisation engine achieved a classification accuracy of 93.8% and an F1 score of 0.91 against held-out tickets, and the priority predictor achieved 88.5% agreement with staff-assigned urgency labels. A ten-week pilot across three campus hostels and departments processed 640 complaints, reducing the average resolution time from 6.2 days to 1.8 days and raising the proportion of complaints resolved within service-level targets from 54.0% to 89.0% relative to the prior manual register-based process. The paper documents the system architecture, module design, evaluation methodology, observed limitations relating to category ambiguity and escalation tuning, and the future scope of the work.

Index Terms—Campus Complaint Management, Grievance Redressal, Natural Language Processing, Text Classification, Priority Prediction, Service-Level Escalation, Higher Education Informatics, Decision Support System, Complaint Routing, Resolution Tracking.

I. INTRODUCTION

Complaint handling on a university campus spans a wide range of concerns — hostel maintenance, academic grievances, IT support, harassment reports, and administrative issues — each conventionally routed through a different office, notice board, or informal contact, so that a genuine complaint can be lost, misrouted, or left unacknowledged for weeks [1], [2].

This burden falls disproportionately on students and staff without established contacts in the relevant department, and is particularly acute for sensitive categories such as harassment or safety concerns, where an unclear or slow response can discourage future reporting altogether. Manual, register-based complaint tracking also gives campus administration little visibility into which departments are underperforming against resolution expectations [3].

Two complementary strands of prior work are relevant here: campus helpdesk and ticketing systems, which digitise complaint intake but rarely categorise or prioritise submissions automatically, and text classification research in service-desk settings, which demonstrates that free-text tickets can be reliably routed by category, but has seen limited application to the

II. RELATED WORK

A. Campus Helpdesk and Ticketing Systems

Early campus helpdesk software digitised complaint intake and assigned tickets to a fixed department chosen by the complainant, improving record-keeping but leaving misclassification and consequent delay unresolved when a complainant selected the wrong category [5].

B. Grievance Redressal in Higher Education

Regulatory guidance on institutional grievance redressal mandates defined resolution timelines and escalation paths, but implementation in most institutions remains paper-based or spreadsheet-tracked, with no automated means of verifying that timelines are being met [6], [7].

C. Text Classification for Service-Desk Routing

Machine learning approaches to IT service-desk ticket routing have shown that free-text classification can match or exceed manually selected categories in accuracy, reducing misrouted tickets and the resulting reassignment delay in enterprise helpdesk settings [8].

D. Priority and Urgency Prediction

specific mix of academic and grievance-redressal categories found on a campus [4].

This paper proposes a Smart Campus Complaint & Resolution System that combines automatic complaint categorisation with priority-aware routing and escalation, producing a transparent, trackable resolution pipeline for every complaint raised on campus.

The principal contributions of this work are: (1) a natural-language categorisation engine that classifies complaints into department-specific categories; (2) a priority prediction module that estimates urgency from complaint text and historical resolution patterns; (3) a routing and escalation engine enforcing service-level thresholds per category; (4) a transparency dashboard for complainants and administrators; and (5) an empirical evaluation covering categorisation accuracy, priority prediction quality, and a ten-week multi-hostel pilot.

Urgency prediction models trained on historical ticket resolution data have been used in customer-support contexts to flag time-sensitive cases ahead of manual triage, motivating a similar approach for campus complaints where sensitive or safety-related categories warrant expedited handling [9], [10].

Fig. 1 — Layered System Architecture of the Proposed Smart Campus Complaint & Resolution System

Layer	Principal Components and Responsibilities
Presentation Layer	Complaint form & status tracker, department queue, admin dashboard
Routing Layer	Routing & escalation engine, notification module
Classification Layer	Complaint categorisation engine, priority prediction module
Data Layer	Complaint register, department directory, resolution history

TABLE I — Comparative Analysis: Manual Register vs. Generic Helpdesk Software vs. Proposed System

Feature	Manual Register	Generic Helpdesk Software	Proposed SCCRS	Benefit to User
Complaint Intake	Paper register / notice board	Web form, fixed category	NLP auto-categorised intake	No misrouted complaints
Priority Handling	First-come, first-served	Manual staff triage	Predicted urgency ranking	Faster sensitive-case handling
Escalation	Not available	Manual follow-up only	Automatic SLA-based escalation	Fewer missed deadlines
Status Visibility	None for complainant	Ticket number only	Live status tracker	Reduced follow-up queries
Admin Oversight	No aggregate reporting	Basic ticket counts	Department performance dashboard	Data-driven accountability
Scale of Coordination	Single office	Single helpdesk	Multi-department network	Consistent campus-wide handling

TABLE II — Categorisation Accuracy, Priority Prediction Quality, and Pilot Study Results

#	Model / Metric	Result	Comparison	Observation
1	Keyword-matching baseline	71.3%	Baseline	Weak on ambiguous text
2	Self-selected-category baseline	79.5%	Baseline	Frequent complainant mislabelling

#	Model / Metric	Result	Comparison	Observation
3	Fine-tuned classifier (selected)	93.8%	Both baselines	Best categorisation accuracy
4	Priority prediction agreement	88.5%	Staff-assigned labels	Strongest for hostel, IT
5	Pilot — resolution time	6.2 → 1.8 days	-71.0%	Across 10-week pilot
6	Pilot — SLA compliance rate	54.0% → 89.0%	+35.0 pts	3 campus hostels

III. SYSTEM ARCHITECTURE

A. Architectural Overview

The proposed system follows a four-layer architecture consisting of a data layer, a classification layer, a routing layer, and a presentation layer, as summarised in Fig. 1. Layer separation allows the categorisation and priority models to be retrained or extended independently of the complaint database and the department-facing interface.

B. Data Layer

The data layer maintains a complaint register with submission text, attachments, complainant identity where disclosed, and status history, together with a department directory mapping categories to responsible offices and their configured service-level targets.

C. Complaint Categorisation Engine

The categorisation engine applies a fine-tuned text classifier to each submission's free-text description, assigning it to one of eight department-specific categories such as hostel maintenance, academic grievance, IT support, or harassment and safety, with a confidence score used to flag low-confidence cases for manual review.

D. Priority Prediction Module

The priority module estimates an urgency level of low, normal, or urgent from complaint text features and category-specific historical resolution patterns, with certain categories such as harassment and safety concerns assigned a minimum urgency floor regardless of predicted score, ensuring sensitive complaints are never under-prioritised by the model.

E. Routing and Escalation Engine

The routing engine assigns each categorised complaint to the responsible department queue according to the directory mapping, and monitors elapsed time against the category's configured service-level target, automatically escalating an unresolved complaint to the next administrative level when the threshold is exceeded.

F. Notification Module

This module sends status updates to the complainant at intake, assignment, and resolution, and alerts the responsible department and, on escalation, the next administrative level via email and in-app notification.

G. Presentation Layer

The presentation layer provides complainants with a submission form and status tracker, department staff with a prioritised complaint queue, and administrators with a performance dashboard summarising resolution time and service-level compliance by department.

IV. METHODOLOGY

A. Dataset Preparation

A dataset of 12,500 historical complaint tickets across eight categories was assembled from campus helpdesk archives spanning three academic years, annotated with department labels, staff-assigned priority levels, and final resolution outcomes and timestamps.

B. Experimental Protocol

The ticket dataset was partitioned into training, validation, and test subsets in a 70:15:15 ratio using a stratified split by category, so that classification performance could be assessed

D. Evaluation Metrics

Categorisation quality was measured using classification accuracy and macro-averaged F1 score against verified category labels. Priority prediction quality was measured as agreement with staff-assigned urgency labels. Operational impact was measured as average resolution time and the proportion of complaints resolved within service-level targets.

E. Implementation Environment

The prototype was implemented in Python 3.11 using scikit-learn and a fine-tuned DistilBERT model for text classification, PostgreSQL for the complaint register, and Django for the application layer. The interface was built with HTML5, CSS3,

separately for each complaint type. Categorisation and priority model parameters were tuned on the validation subset.

C. Baseline Models

Three approaches were compared for complaint categorisation: a keyword-matching baseline, a self-selected-category baseline reflecting the complainant's own manual category choice, and the fine-tuned classifier used in the final system. All approaches were evaluated against the same set of held-out test tickets with verified category labels.

V. RESULTS AND DISCUSSION

A. Categorisation and Priority Accuracy

As reported in Table II, the categorisation engine achieved a classification accuracy of 93.8% and a macro-averaged F1 score of 0.91 against held-out test tickets, exceeding the self-selected-category baseline at 79.5% and the keyword-matching baseline at 71.3%. The priority predictor achieved 88.5% agreement with staff-assigned urgency labels, with the strongest agreement observed for hostel maintenance and IT support categories, where historical ticket volume was largest.

The improvement over the self-selected-category baseline was most pronounced for categories complainants frequently mislabelled, such as distinguishing academic grievances from general administrative complaints.

B. Operational Impact

Across the ten-week pilot, average resolution time fell from 6.2 days under the manual register-based process to 1.8 days with the full system, and the proportion of complaints resolved within service-level targets rose from 54.0% to 89.0% over the same comparison, as summarised in Table II.

C. Pilot Study Outcomes

Department staff identified the prioritised complaint queue and the automatic escalation feature as the two most valued components, noting that both reduced the number of complaints that went unnoticed past their service-level deadline.

and Chart.js, and all experiments were executed on a machine with an Intel Core i5 processor and 8 GB of memory.

F. Pilot Study Design

A ten-week pilot was conducted across three campus hostels and their associated academic and administrative departments. Complaint handling was recorded for the first two weeks under the prior manual register-based process, and compared against the following eight weeks using the full system.

D. Discussion

The results indicate that combining automatic categorisation with service-level-aware escalation addresses a coordination gap that neither generic helpdesk software nor manual register tracking resolves well. The pilot cohort of three hostels and their associated departments is modest, so the reported resolution-time and service-level figures should be treated as indicative rather than conclusive across an entire university.

VI. LIMITATIONS

Several limitations qualify these findings. First, categorisation accuracy is lower for complaints spanning more than one department, which the current single-label classifier cannot represent without a manual override. Second, the priority predictor is trained primarily on hostel and IT categories, and its accuracy is less established for rarer categories with limited historical volume. Third, the ten-week pilot involved three hostels and cannot support strong claims about performance at full-university scale. Finally, the urgency floor for sensitive categories mitigates but does not eliminate the risk of a harassment or safety complaint being initially under-prioritised by the text model.

VII. FUTURE SCOPE

Future development will proceed along four directions: supporting multi-label categorisation for complaints spanning more than one department; integrating with the institution's identity system to streamline verified submissions while preserving anonymous reporting options; adding a mobile-first client for faster hostel-based reporting; and conducting a longer, full-university pilot to validate resolution-time and service-level improvements at larger scale.

VIII. CONCLUSION

This paper presented a Smart Campus Complaint & Resolution System that integrates automatic complaint categorisation, priority prediction, service-level-aware routing and escalation, and resolution tracking within a single platform. The categorisation engine achieved a classification accuracy of

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93.8%, and the priority predictor achieved 88.5% agreement with staff-assigned urgency labels.

A ten-week pilot across three campus hostels and departments reduced average resolution time from 6.2 to 1.8 days and raised service-level compliance from 54.0% to 89.0%, indicating that automated categorisation and escalation can meaningfully ease the administrative burden of campus complaint handling while improving outcomes for complainants. The limitations relating to multi-department complaints, category coverage, and pilot scale define a clear agenda for the extensions outlined above.

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