IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 9, April 2026
Impact Factor: 8.2

Poly Complaint Processing System through Machine Learning

Kartiki Ganesh Nannaware , Diksha Madhukar Mahale, Swarupa Ramesh Pawar, Snehal Nitin Gavhane Prof. Wawale S. N
Amrutvahini Sheti and Shikshan Vikas Sanstha
Amrutvahini Polytechnic, Sangamner, Ahilyanagar

Abstract: *The Poly Complaint Processing System is an intelligent, automated platform designed to streamline the handling and classification of student complaints within a polytechnic institution. Traditional complaint processing is often slow and inefficient due to manual sorting and forwarding, which can lead to delays and misrouting. To overcome these limitations, this system utilizes machine learning and natural language processing (NLP) techniques to accurately analyze and categorize complaints submitted by users. In the proposed model, the complaint text undergoes several preprocessing steps such as stop-word removal, stemming, and tokenization to extract meaningful features. These features are then transformed using TF-IDF to generate weighted vectors representing the textual content. A correlation based estimation algorithm is applied to identify the most relevant department based on learned patterns from historical complaint data. Once classified, the system automatically forwards the complaint to the appropriate department—such as administrative, academic, or technical units—ensuring timely resolution. By automating complaint classification, the Poly Complaint Processing System enhances operational efficiency, reduces manual workload, minimizes human error, and ensures faster redressal for students. This machine-learning-driven framework contributes to building a transparent, reliable, and student centric grievance management mechanism within educational institutions.*

Keywords: Artificial Intelligence (AI), Natural Language Processing(NLP), Machine Learning ,Adaptive Learning

I. INTRODUCTION

In educational institutions, effective grievance management plays a crucial role in ensuring student satisfaction, smooth administration, and overall institutional growth.

However, traditional complaint handling methods are often manual, time-consuming, and prone to errors. Complaints submitted by students may be misclassified or delayed due to the lack of an organized and automated system. As the number of students increases, managing complaints efficiently becomes even more challenging for polytechnic institutions.

To address these issues, the Poly Complaint Processing System leverages the power of machine learning and natural language processing (NLP) to automate the classification and forwarding of student complaints. By analyzing the textual content of each complaint, the system can intelligently determine the most appropriate department—such as academic, administrative, or technical—and automatically route the complaint for timely resolution.

The system applies a sequence of processing steps, including stop-word removal, stemming, tokenization, and TF-IDF feature extraction, to convert raw complaint text into meaningful representations. These processed features enable the machine learning model to identify patterns and make accurate predictions about complaint categories. As a result, the entire complaint-handling workflow becomes faster, more reliable, and transparent.

Using NLP techniques such as stop-word removal, stemming, tokenization, and TF-IDF vectorization, the system converts raw complaint text into structured machine-understandable data. This processed data is then used to determine

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 9, April 2026 Impact Factor: 8.2

the most suitable department through correlation-based estimation or classification algorithms. Once a complaint is categorized, it is automatically forwarded to the appropriate department, ensuring that issues are directed to the right authorities without delay.

II. PROBLEM STATEMENT

Managing student complaints in polytechnic institutions is often slow and inefficient due to manual sorting and forwarding. Complaints may be misclassified, delayed, or overlooked, leading to poor response times and dissatisfaction among students. There is a need for an automated system that can accurately analyze complaint text and route it to the correct department using machine learning techniques.

III. LITERATURE REVIEW

[1] PAULIUS DANENAS et al. Introduced NLP discipline has seen impressive advancements and improvements during the last several years, with the number of NLP applications increasing dramatically. Also, the progress in deep learning has resulted in a significant increase 116954 VOLUME 10, 2022P. Danenas, T. Skersys: Exploring Natural Language Processing in Model-To-Model Transformations in the performance of solving different linguistic tasks. In this paper, research on applying the recent developments for processing small text phrases is discussed. While the need for this research originated from our recent research on modelto-model transformations [6], [7], we may identify several other areas that could benefit from similar text processing capabilities, such as process mining, aspect-based sentiment analysis or conversational interfaces with command-like short text processing capability. At the same time, all these areas share the same NLP-related issues that have to be dealt with to ensure satisfactory performance of the underlying NLP technology (e.g., identical representation of verbs and nouns, lack of context required for the automated processing). In this paper, we addressed the problem of extracting relation tuples from the process and system requirements' models containing elements expressing activity like statements. As it is stated in Section III, it is not an easily solved problem, due to multiple ambiguities, applied modeling practices, and many other issues that are not addressed in common NLP processing toolkits. Among such issues, one may emphasize the processing of disjunctive or conjunctive statements (which is considered to be a bad modeling practice), the presence of shortened forms, like acronyms or abbreviations. To solve the issues addressed in this paper, we evaluated several current state-of-the-art implementations from the perspective of our research, while combining them under our custom formal grammar-based extraction to derive prototype implementations. Additionally, we implemented and tested our custom tagging tools, based on input corpora augmentations and bidirectional LSTM-CRF architecture with BERT and ELMO embeddings at the input layer. In the first experiment, the Stanza-based implementation showed the best performance results in noun/verb extraction tasks. Yet, we showed that implementation based on our custom BERT-Bi LSTM-CRF tagger helped to improve the detection of verb phrase presence and verb phrase extraction as compared to the generic tagger implementations, including generic BERT-based tagger. This was expected as bias towards proper tagging of verbs could reduce the ability to correctly tag nouns in short text statements. Hence, balancing between biased and unbiased tagging still requires further research.

[2] PAULA MADDIGAN et al. Developed The ability to generate visualisations based on natural language has been a long-standing goal in the field of data visualisation. The development of Natural Language Interfaces has paved the way for advancements in this area making data visualisation more accessible to a broader range of users by allowing them to express their queries and analysis intentions in natural language. However, the process of accurately and reliably translating natural language inputs into visualisations (NL2VIS) has been a challenging problem to solve due to the difficulty in understanding natural language. This study proposed a novel end-to-end solution for converting free-form natural language into visualisations using state-of-the-art Large Language Models (LLMs). This study explored ChatGPT and its predecessors like GPT-3 and Codex for their ability to solve the task of understanding the queries and both auto-generating code while using their internal inference abilities for selecting the appropriate visualisation types. The proposed system, Chat2VIS, has demonstrated that the use of pretrained LLMs together with well-engineered

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 9, April 2026 Impact Factor: 8.2

prompts, provides an efficient, reliable and accurate solution for the problem of NL2VIS. Chart-type selection is automatic, and the LLMs are able to understand vague user queries as well as those that are malformed. Moreover, the approach is also data privacy preserving and security-aware, making it generalisable to all types of datasets.

[3] NILANJANA RAYCHAWDHARY et al. Introduced This research emphasizes the transformative role of transformer-based models in tackling sentiment analysis challenges for low-resource African languages. Through fine-tuning advanced models such as AfriBERTa, mDeBERTAV3 base, and XLMR using the AfriSentiSemEval 2023 datasets, our work demonstrated their ability to achieve impressive accuracy, weighted F1, precision, and recall in multilingual sentiment classification tasks. The findings highlight the critical importance of incorporating diverse linguistic features during pretraining and finetuning to effectively address the complexities of African languages. This research demonstrates the potential of fine-tuning transformer-based models to address challenges in multilingual sentiment analysis for African languages. Among the models evaluated, AfroXLMR demonstrated superior adaptability, establishing itself as the most effective model for sentiment analysis in resource-limited contexts. In the future, we plan to expand the dataset by adding more annotated African languages and dialects to improve sentiment analysis for diverse languages. We will also explore simple training methods, like knowledge distillation, to make models work better in environments with limited resources and we aim to explore model optimization approaches—including quantization, knowledge distillation, and federated learning—to improve the deployment efficiency of sentiment analysis models in environments with limited computational resources. Quantization minimizes model size and computational demands by using lower-precision representations for weights and activations, enabling efficient inference on resource constrained devices. Knowledge distillation trains a compact student model to emulate the capabilities of a larger teacher model, ensuring a balance between computational efficiency and predictive accuracy. Federated learning allows decentralized training across devices while maintaining data privacy, ideal for applications where data cannot be centrally aggregated. By integrating these techniques, we aim to reduce the computational footprint of sentiment analysis models, enhancing their practicality in settings with restricted computational capacity while preserving performance and privacy. Moreover, future research will focus on combining multimodal sentiment analysis with self-supervised learning to improve model performance, especially for lower source languages. By integrating text, audio, and visual data, and leveraging large amounts of unlabeled data, we can create more robust sentiment analysis systems that overcome data limitations and better capture nuanced emotions.

IV. FUTURE SCOPE

The project aims to design and implement an intelligent Poly Complaint Processing System using Machine Learning to provide fast and accurate complaint handling. The scope includes the following aspects:

1. Data Collection and Monitoring

Collection of complaint data from students through web or mobile application.

Continuous monitoring of submitted complaints. Efficient storage of complaint data in database or cloud system for processing

2. Complaint Classification using ML

Implementation of Machine Learning algorithms such as Naive Bayes, Decision Tree, or SVM for classification. Analysis of complaint text data to identify category (academic, infrastructure, technical, etc.). Capability to automatically classify complaints and prioritize them.

3. System Design

Development of a web/mobile-based interface for students and admin. Integration with database for storing and managing complaints. Dashboard for admin to view, track, and manage complaints easily.

4. Accuracy and Reliability

Continuous training of ML model using new complaint data. Improvement in classification accuracy using better algorithms. Reliable system for proper complaint tracking and management.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 9, April 2026
Impact Factor: 8.2

5. Applications

Useful for polytechnic institutes and colleges. Helps in student grievance management.

Can be used in offices and customer support systems.

6. Future Scope

Integration with Artificial Intelligence chatbot for automatic replies. Use of big data analytics for handling large complaint data. Development of mobile application for easy access. Real-time notification system using SMS or email. Expansion to multi-institution complaint management systems.

V. ACTUAL METHODOLOGY FOLLOWED

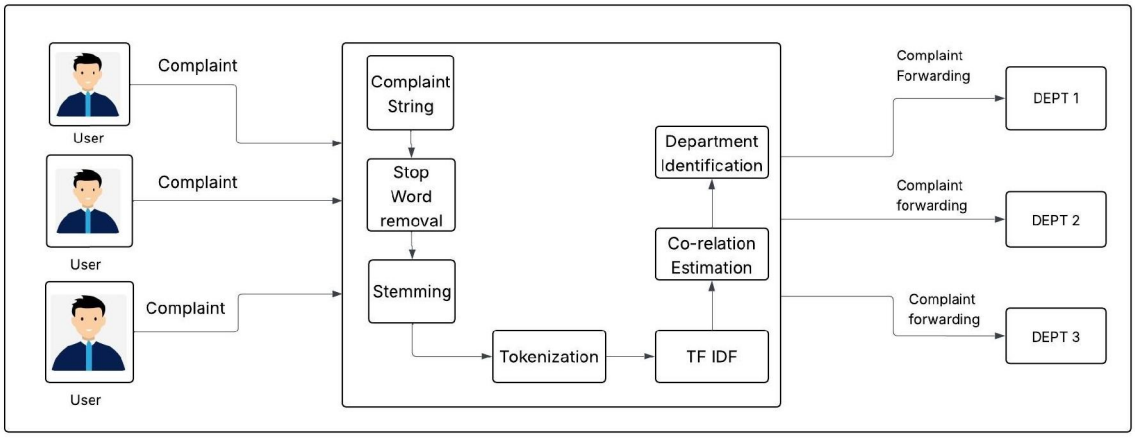

Fig 1. Proposed System Overview

Working

A. Complaint Data Collection: Complaint data can be submitted by students in the form of written text, online forms, or even voice-based inputs. Text complaints are directly captured from the system interface, while audio complaints can be converted into text using speech-to-text technology. These collected complaints form the raw dataset, which becomes the foundation for further processing. The use of AI based transcription tools helps in accurately converting spoken issues into structured text, ensuring that every type of student complaint is recorded efficiently.

B. Complaint Text Processing & Feature Extraction

Processing the complaint text involves cleaning and preparing the raw data using NLP techniques. This includes removing stop-words, tokenizing sentences, performing stemming/lemmatization, and converting text into meaningful feature representations like TFIDF vectors. These steps help the system understand the important keywords and patterns within the complaint. Machine learning tools use these extracted features to classify complaints more accurately. This automated text analysis eliminates manual sorting and significantly speeds up the grievance-handling process.

C. Complaint Classification & Forwarding

Complaint classification is the core process where machine learning models analyze the extracted features and determine the most appropriate department— academic, administrative, technical, or any other relevant category. The system evaluates complaint content logically based on trained data, ensuring high accuracy. Once classified, the complaint is automatically forwarded to the correct department, along with relevant details. This ensures a clear, organized, and quick response process. Effective classification helps reduce delays, improve transparency, and ensures that students' issues are resolved efficiently.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 9, April 2026
Impact Factor: 8.2

VI. ADVANTAGES

1. Automates the entire complaint-handling process, reducing manual workload.
2. Ensures faster classification and routing of complaints to the correct department.
3. Improves accuracy by using machine learning and NLP for text analysis.
4. Provides quick and real-time complaint submission and tracking .
5. Improves accuracy in complaint classification using Machine Learning

VII. DISADVANTAGES

• Data Dependency : Accurate classification depends on large and quality training data. Poor or limited data can reduce system performance.
• Maintenance Requirement : The system requires regular updates, bug fixing, and model retraining to maintain performance.
• Prediction Errors : Machine Learning models may sometimes classify complaints incorrectly due to unclear or new types of complaints.
• Internet Dependency: The system requires internet connection for accessing and submitting complaints.
• Network issues can affect usage: The system requires internet connection for accessing and submitting complaints.
• Initial Setup Complexity : Designing the system, creating database, and training ML models require proper planning and technical expertise.

VIII. CONCLUSION

The Poly Complaint Processing System provides an intelligent and efficient approach to managing student grievances by integrating machine learning and natural language processing techniques. By automating the classification and routing of complaints, the system significantly reduces manual effort, minimizes delays, and ensures accurate departmental allocation. Through text preprocessing, feature extraction, and predictive modeling, the solution delivers fast and reliable handling of diverse complaint types. This modern, AI-driven framework not only enhances transparency and accountability but also improves overall student satisfaction by ensuring timely and systematic resolution of issues. Ultimately, the system
contributes to building a smarter and more responsive administrative environment within polytechnic institutions.

REFERENCES

[1] P. Danenas and T. Skersys, "Exploring Natural Language Processing in Model-To-Model Transformations," in IEEE Access, vol. 10, pp. 116942-116958, 2022, doi: 10.1109/ACCESS.2022.3219455.
[2] P. Maddigan and T. Susnjak, "Chat2VIS: Generating Data Visualizations via Natural Language Using ChatGPT, Codex and GPT-3 Large Language Models," in IEEE Access, vol. 11, pp. 45181-45193, 2023, doi: 10.1109/ACCESS.2023.3274199.
[3] N. Raychawdhary, S. Bhattacharya, C. Seals and G. V. Dozier, "Empowering Sentiment Analysis in African Low-Resource Languages Through Transformer Models and Strategic Language Selection," in IEEE Access, vol. 13, pp. 147859-147873, 2025, doi: 10.1109/ACCESS.2025.3599480.