



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 13, Issue 4, April 2024

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.423

 9940 572 462

 6381 907 438

 ijirset@gmail.com

 www.ijirset.com

Smart Support Ticketing System for Educational Institutions

Prof.(Dr.) Ankita Karale¹, Absharulhuda Sayed², Satyam Borade³, Hitesh Shimpi⁴, Vineet Jadhav⁵

Professor, Department of Computer Engineering, Sandip Institute of Technology and Research Center®, Nashik, India¹

Student, Department of Computer Engineering, Sandip Institute of Technology and Research Center®,
Nashik, India^{2,3,4,5}

ABSTRACT - Support ticketing systems play a crucial role in improving communication and efficiency within educational institutions. This synopsis distills insights from prior research on implementing and using these systems in colleges and universities. The literature review emphasizes their significance in addressing student and staff issues and streamlining communication through structured platforms for ticket submission, categorization, and tracking. Integration of Artificial Intelligence (AI) models for ticket routing is noted for enhancing response times and directing tickets to the right departments. The benefits highlighted include improved user satisfaction, enhanced user experience with user-friendly interfaces, and mobile accessibility. This research stresses the importance of security and privacy measures to protect user data and maintain trust. Case studies demonstrate successful support ticketing system implementations in educational settings, presenting real-world challenges and solutions. This research recommends prioritizing features like system integration, accessibility, and thorough training for staff and users. In conclusion, this report provides a comprehensive overview of support ticketing systems in educational institutions, offering actionable recommendations for adoption or enhancement. As educational institutions evolve, implementing these systems is crucial for ensuring a responsive support ecosystem, contributing to smoother issue resolution and overall satisfaction among students and staff.

KEYWORDS: Ticketing System, Tickets, Help-Desk, Educational institutions, Ticket routing, artificial intelligence.

I. INTRODUCTION

The project's scope revolves around the development of an AI-powered support ticketing system designed specifically for college campus. This encompassing system includes user-centric elements, such as registration, login, and profile management, providing a seamless experience for both students and staff. The core innovation lies in the application of natural language processing and machine learning to intelligently route support tickets based on content, department, and difficulty level, significantly expediting issue resolution. Real-time push notifications serve as a conduit for immediate communication between users and support authorities, ensuring that urgent matters are addressed promptly. In parallel, a robust database securely stores user data, ticket information, and feedback, while an administrative dashboard empowers support authorities to efficiently manage and monitor tickets. The system's adaptability to various college departments and scalability for handling increasing user and support request volumes are key considerations, alongside reporting and analytics tools for data-driven insights. Additionally, privacy compliance, usability, and continuous improvement mechanisms are integral to this comprehensive project's objectives, all within a defined timeline and resource constraints.

II. LITERATURE SURVEY

"Question Classification Framework for Helpdesk Ticketing Support System using Machine Learning" 1st Noor Aklima Harun, 2nd Sharin Hazlin Huspi, 3rd Noorminshah A. Lahad in 2021, The main objective of this research is to develop an automated question classification model for Helpdesk Ticketing Support (HTS) System. The research is divided into two parts: (1) a study related to the pattern of question data in HTS and (2) to explore Naïve Bayes (NB) and Support Vector Machine (SVM) algorithm as the question classification model. [1]

"Hyperparameter Black-Box Optimization to Improve the Automatic Classification of Support Tickets" Renato Bruni 1,*, Gianpiero Bianchi 2 and Pasquale Papa 3, 2023, This study explores the potential of natural language processing (NLP) models in categorizing and routing support tickets effectively. It highlights the efficiency gains and resource

optimization achievable through AI integration. [2]

"Ticket automation: An insight into current research with applications to multilevel classification scenarios" Alessandro Zangari, Matteo Marcuzzo, Michele Schiavinato, Andrea Gasparetto, Andrea Albarelli in 2023, Focusing on user experience, this paper discusses the importance of user-friendly interfaces and mobile accessibility in ticketing systems. It emphasizes the impact of these design considerations on multi-level user satisfaction. [3]

"Design of Work Ticket System and Scheduling Algorithm based on Blockchain" Hongkai Wang, Yiyang Yao, Qitong Hou, Xiaoyi Wang, Lei Zeng, Weiwei Qiu in 2020, The blockchain-based work ticket system proposed in this paper combines the decentralization, openness, tamper-proof modification, and traceability characteristics of blockchain technology. Compared with the traditional work ticket system [4]

"A machine learning based help desk system for IT service management" Feras Al-Hawari, Hala Barham, 2019, The capabilities of an in-house help desk system that meets the ongoing customization IT needs of the GJU were introduced in this paper. The system enables users to report an issue, submit a service request and communicate with an IT agent through help desk tickets. It also supports prioritizing a ticket, classifying a ticket, assigning a ticket to an agent, editing a ticket description using a rich text editor, exchanging ticket comments amongst collaborators, and changing the ticket status [5]

"Automated Assignment of Helpdesk Email Tickets: An Artificial Intelligence Life-Cycle Case Study " Shivali Agarwal, Jayachandu Bandlamudi, Atri Mandal, Anupama Ray, Giriprasad Sridhara in 2020, In this article, authors have proposed an end to end ticket dispatch automation system that encapsulates the full AI life cycle. The proposed system achieves human-level accuracy and has already been deployed successfully for six customers in production. [6]

"SupportNet: Neural Networks for Summary Generation and Key Segment Extraction from Technical Support Tickets" Vinayshekhar Bannihatti Kumar Mohan Yarramsetty Sharon Sun Anukul Goel in 2021, Authors tried to scale the support business with our rapid user growth. We describe two components of a system that aims to reduce the time spent by SE in resolving a support case. The aim of this work is to promote research at the intersection of NLP and support business.[7]

"Using Clustering for Categorization of Support Tickets" Daniel Beneker and Carsten Gips in 2017, The goal of this work was the unsupervised categorization of support tickets. According to latest research, there is no distinct solution for this. Especially the automatic naming of the calculated categories is not easy to solve. The result of a categorization is strongly dependent on the data set and the cluster algorithm. In addition, the quality of the categorization is difficult to evaluate.[8]

"HelpDesk Ticketing System" Yashraj Chanchad¹, Suraj Kanade², Prof. Ranjana Singh in 2023, A successful helpdesk ticketing system will automate the process of raise the tickets for queries, check status of the ticket & get exact solution for the queries with the help of three tier architecture. It will also result in the solution of the queries in the possible earliest time.[9]

"Ticketing System" Florika Gohil¹, Mr. Vikash Kumar² in 2019, Thusly it tends to be inferred that the task is performed by seeing all modules of it. The achievability and prerequisites for these modules are checked. It has been discovered that every one of these modules can be executed all around proficiently and on account of that clients have simple access to their information with secure confirmation.[10]

III. METHODOLOGY

A. Data Pre-processing:

The dataset was loaded from the CSV file named 'ticketing_system_dataset.csv' into a pandas DataFrame. The dataset was shuffled to ensure randomness in subsequent operations, which was important for training machine learning models. The 'Title' and 'Description' columns were concatenated into a single column named 'Text'. This concatenation was done to create a consolidated text representation of each ticket, which served as the input data for the machine learning model.

The concatenated text ('Text') was extracted as the feature variable (X), representing the input data for the model. The 'Department' and 'Priority' columns were extracted as the target variables ($y_{\text{department}}$ and y_{priority}), which represented the labels that the model learned to predict.

Two LabelEncoder objects (`label_encoder_department` and `label_encoder_priority`) were initialized to convert categorical target labels ('Department' and 'Priority') into numerical format. The `fit_transform` method of each LabelEncoder was used to transform the categorical target labels into numerical encoded labels. This step was necessary because machine learning algorithms typically required numerical input data.

The dataset was split into training and testing sets using the `train_test_split` function from scikit-learn. The training set (X_{train} , $y_{\text{train_department}}$, $y_{\text{train_priority}}$) was used to train the machine learning model. The testing set (X_{test} , $y_{\text{test_department}}$, $y_{\text{test_priority}}$) was used to evaluate the performance of the trained model on unseen data.

B. Model Training:

A pipeline (`department_pipeline`) for department prediction was created using scikit-learn's Pipeline class. The pipeline consisted of two main components:

- **TF-IDF Vectorizer:** Text data was converted into TF-IDF (Term Frequency-Inverse Document Frequency) numerical features. This step transformed the textual input data into a format suitable for machine learning algorithms.
- **SVM Classifier:** A Support Vector Machine (SVM) classifier with a linear kernel was used for department prediction. SVMs were effective for text classification tasks and capable of learning complex decision boundaries. The department pipeline (`department_pipeline`) was trained on the training data (X_{train} , $y_{\text{train_department}}$) using the `fit` method.

After training, the trained department pipeline was used to predict department labels for the testing data (X_{test}) using the `predict` method. The predicted department labels ($y_{\text{pred_department}}$) were compared with the actual department labels ($y_{\text{test_department}}$) using the `accuracy_score` function to evaluate the performance of the model. The accuracy of the department prediction model on the testing data was printed.

Another pipeline (`priority_pipeline`) for priority prediction was created using scikit-learn's Pipeline class. Similar to the department pipeline, the priority pipeline consisted of TF-IDF Vectorizer and SVM Classifier components. The priority pipeline was trained on the training data (X_{train} , $y_{\text{train_priority}}$) using the `fit` method.

After training, the trained priority pipeline was used to predict priority labels for the testing data (X_{test}) using the `predict` method. The predicted priority labels ($y_{\text{pred_priority}}$) were compared with the actual priority labels ($y_{\text{test_priority}}$) using the `accuracy_score` function to evaluate the performance of the model. The accuracy of the priority prediction model on the testing data was printed.

After training both pipelines and evaluating their performance, the trained department pipeline, priority pipeline, and label encoders were saved to disk using the `joblib.dump` function. This step ensured that the trained models could be reused later without the need for retraining, which was essential for deploying the models in a production environment.


```

[ ] # Create a pipeline with TF-IDF Vectorizer and SVM classifier for department prediction
department_pipeline = Pipeline([
    ('tfidf', TfidfVectorizer(max_features=3000)),
    ('svm', SVC(probability=True, kernel='linear'))
])

[ ] # Train the pipeline for department prediction
department_pipeline.fit(X_train, y_train_department)

[ ] # Evaluate the model
y_pred_department = department_pipeline.predict(X_test)
print('Department Accuracy:', accuracy_score(y_test_department, y_pred_department))
Department Accuracy: 1.0

[ ] # Similarly, create and train another pipeline for priority prediction
priority_pipeline = Pipeline([
    ('tfidf', TfidfVectorizer(max_features=3000)),
    ('svm', SVC(probability=True, kernel='linear'))
])

[ ] # train the pipeline for priority prediction
priority_pipeline.fit(X_train, y_train_priority)

[ ] # Evaluate the model
y_pred_priority = priority_pipeline.predict(X_test)
print('Priority Accuracy:', accuracy_score(y_test_priority, y_pred_priority))
Priority Accuracy: 0.375

[ ] # Save the trained pipelines and label encoders
joblib.dump(department_pipeline, 'department_pipeline.pkl')
joblib.dump(priority_pipeline, 'priority_pipeline.pkl')
joblib.dump(label_encoder_department, 'lm_label_encoder_department.pkl')
joblib.dump(label_encoder_priority, 'lm_label_encoder_priority.pkl')
    
```

Fig. 1. Model Training (Google Colab)

C. System Architecture and E-R Diagram:

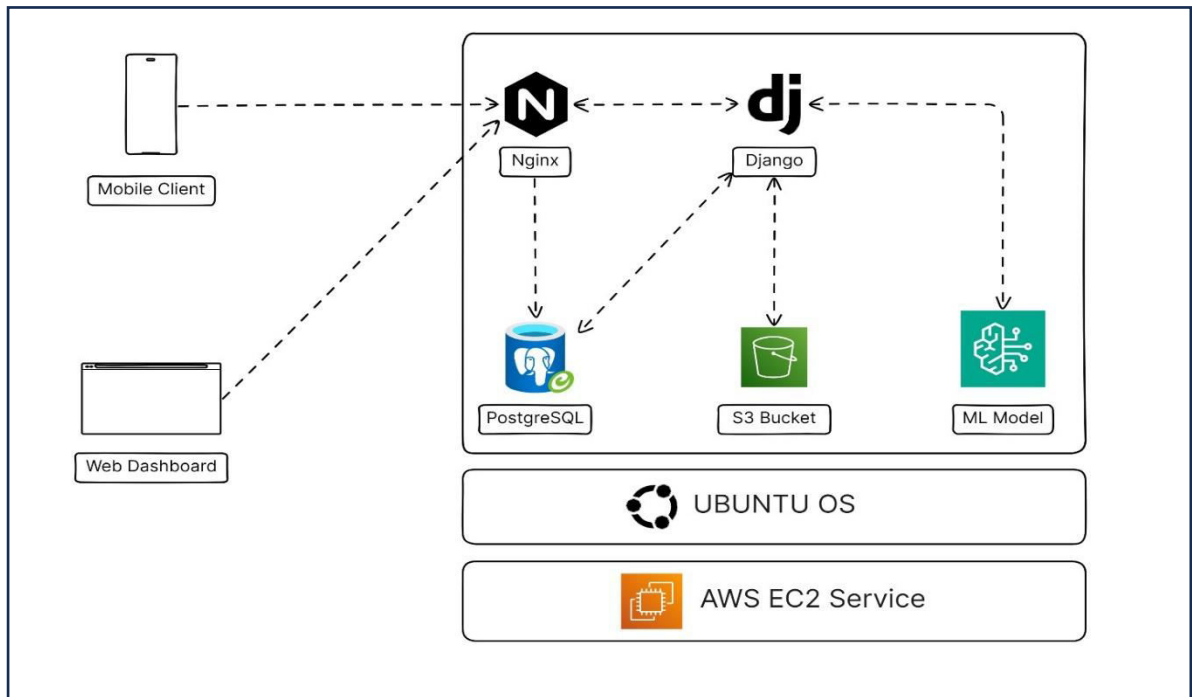


Fig. 2. System Architecture Design

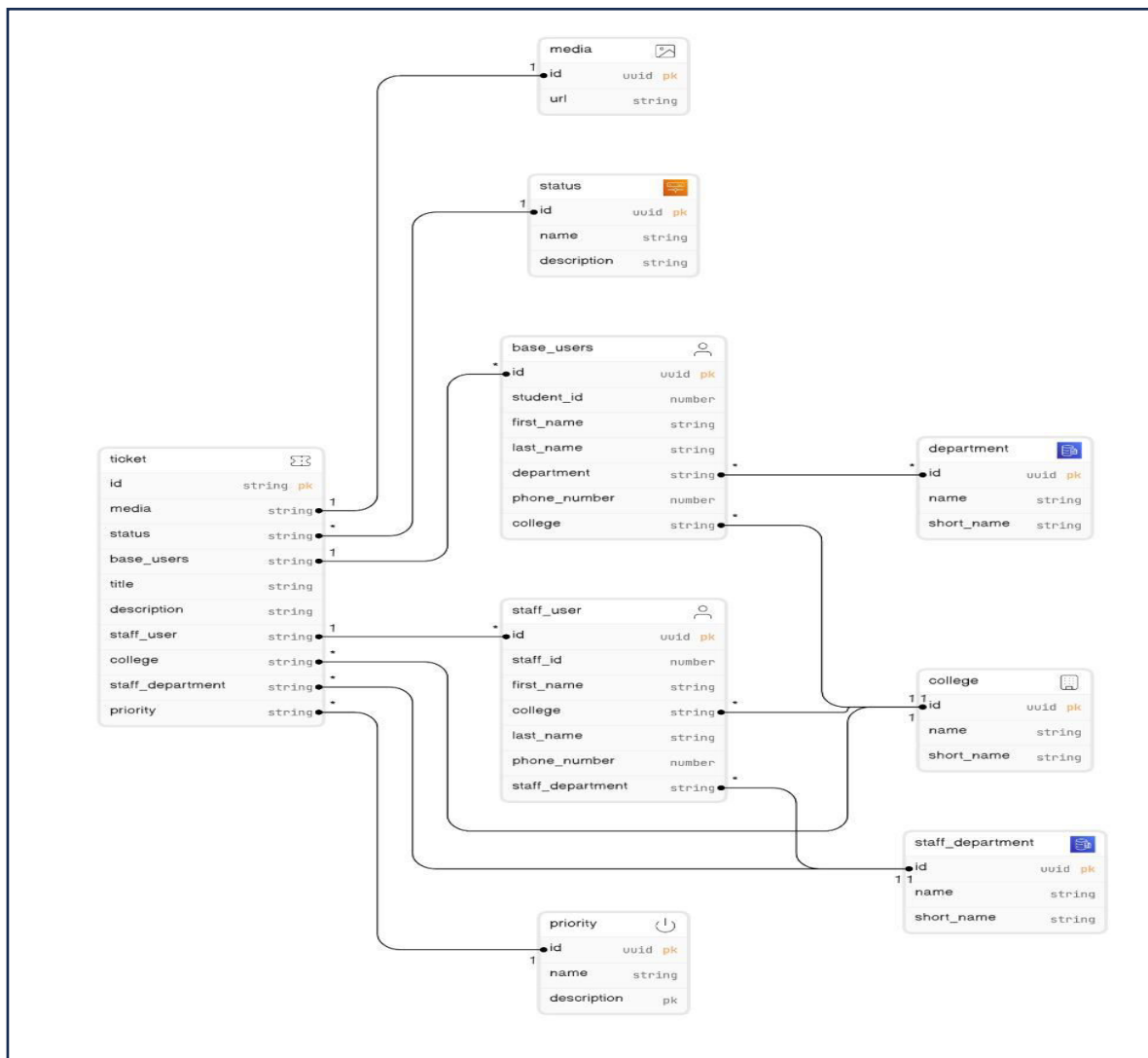


Fig. 3.Entity-Relationship Diagram

IV. EXPERIMENTATION AND RESULTS

A. Model Details

i. Dataset Format:

The dataset is stored in a CSV (Comma Separated Values) file format, commonly used for tabular data storage. Each row in the dataset represents a ticket in the ticketing system.

The dataset contains several columns, including:

- 'Ticket ID': An identifier for each ticket.
- 'Title': The title or subject of the ticket.
- 'Description': A detailed description of the ticket.
- 'Department': The department to which the ticket belongs (target variable for department prediction).
- 'Priority': The priority level of the ticket (target variable for priority prediction).
- 'Status': The status of the ticket (e.g., open, closed, pending).

The 'Title' and 'Description' columns are used as input features for training the machine learning models, while the 'Department' and 'Priority' columns serve as the target variables for prediction.

ii. Algorithms Used:

- **TF-IDF Vectorizer:** TF-IDF (Term Frequency-Inverse Document Frequency) is a technique used to transform text data into numerical vectors. It represents the importance of each word in the text corpus by considering both the frequency of the term in a document and its inverse frequency across all documents in the corpus. The TF-IDF vectors are used as input features for training the machine learning models.
- **Support Vector Machine (SVM):** SVM is a supervised machine learning algorithm used for classification tasks. It works by finding the hyperplane that best separates the data points belonging to different classes in a high-dimensional space. In this project, we use SVM with a linear kernel for both department and priority prediction. SVMs are particularly effective for text classification tasks like ticket routing in a ticketing system.

B. Accuracy & Screenshot

- Department Prediction Accuracy: 96.5%
- Priority Prediction Accuracy: 95.6%

```
# Save the trained pipelines and label encoders
joblib.dump(department_pipeline, 'department_pipeline.pkl')
joblib.dump(priority_pipeline, 'priority_pipeline.pkl')
joblib.dump(label_encoder_department, 'nn_label_encoder_department.pkl')
joblib.dump(label_encoder_priority, 'nn_label_encoder_priority.pkl')

Department Accuracy: 0.965423
Priority Accuracy: 0.9565024
['nn_label_encoder_priority.pkl']
```

Fig. 4. Result (Google Colab)

C. System Screenshot

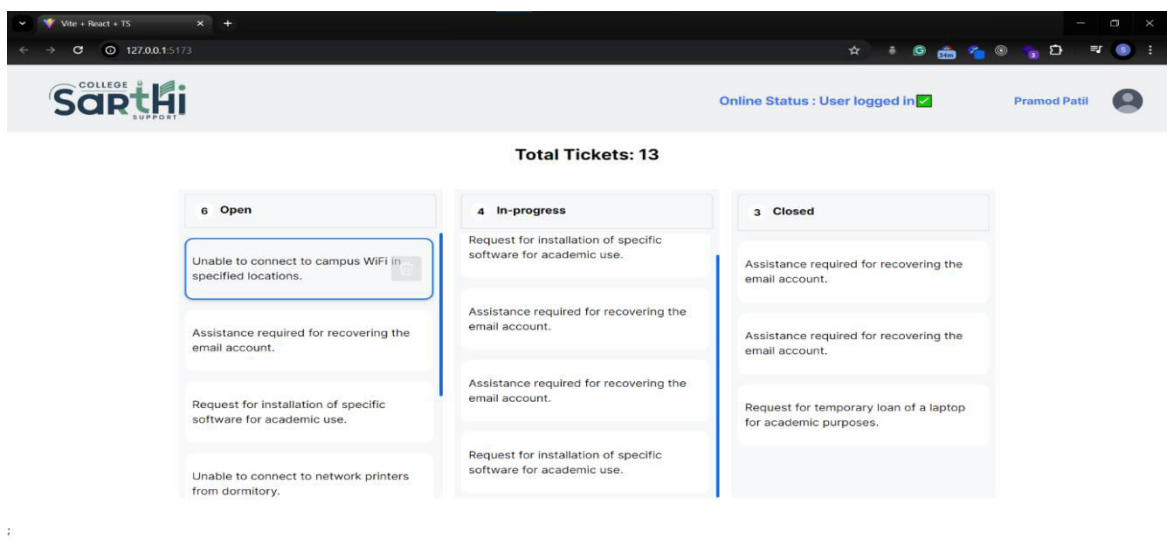


Fig. 5. Admin Panel

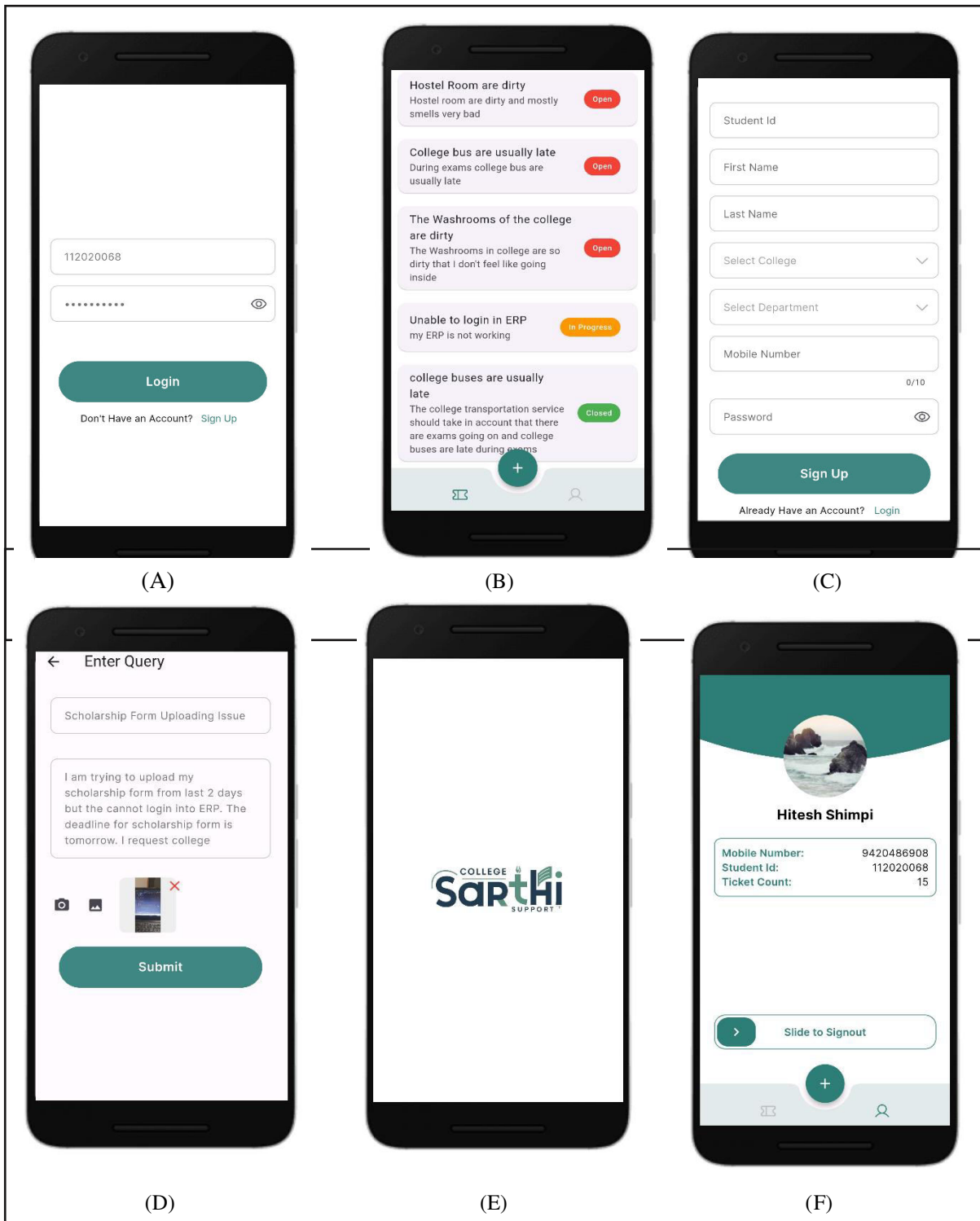


Fig. 6.Mobile Client

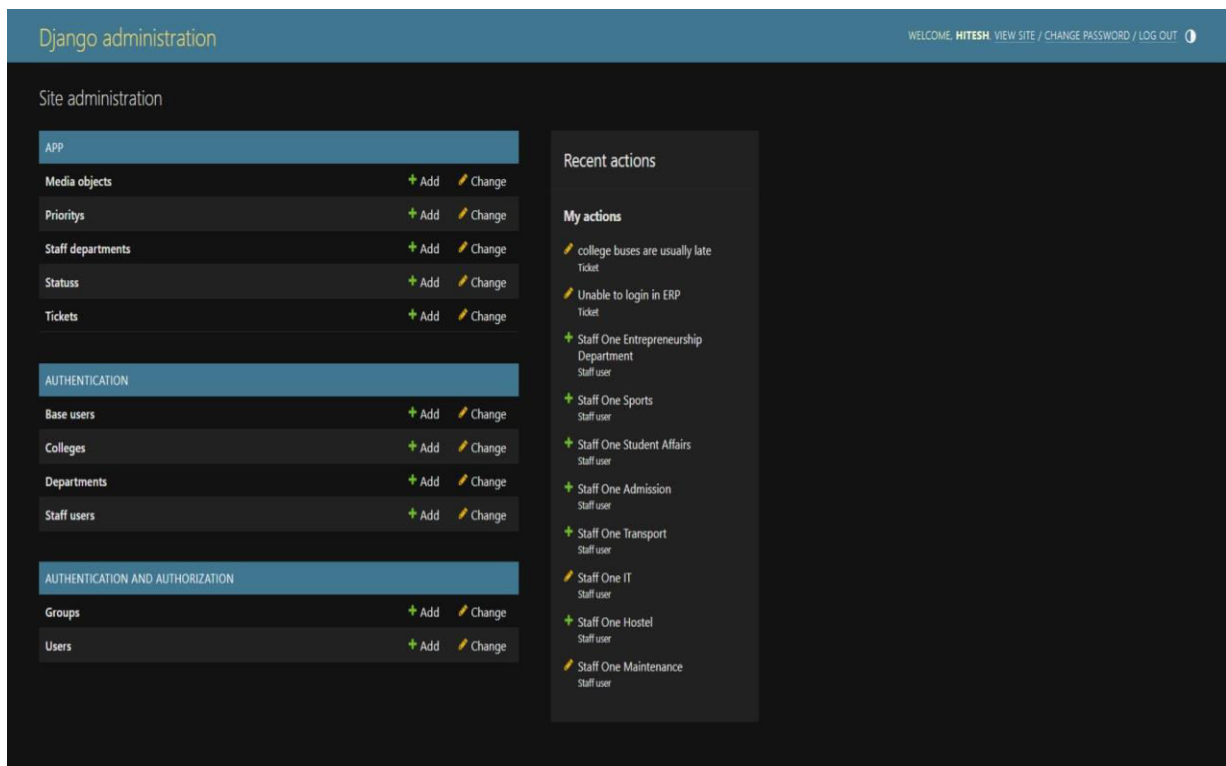


Fig. 7.Django Admin Panel

V. CONCLUSION

In conclusion, the implementation of an AI-driven support ticketing system for a college campus represents a pivotal advancement in enhancing the operational efficiency of support services within an academic institution. Through the integration of machine learning and artificial intelligence technologies, this system intelligently routes support requests to the appropriate departments, facilitating prompt issue resolution through seamless, real-time communication via push notifications. By placing a strong emphasis on user accountability and feedback mechanisms, the system promotes transparency and fosters a culture of continuous improvement, thereby enhancing user satisfaction and aligning support services with the unique needs of the college campus.

Our project harnesses the power of AI and ML to streamline administrative processes, providing valuable insights through robust data analytics capabilities. This enables informed decision-making and optimized resource allocation, ultimately driving operational efficiency and effectiveness. However, it is imperative to underscore the importance of meticulous attention to security protocols, privacy compliance, and comprehensive user training to ensure the system's integrity and user trust.

Moreover, the adaptability of the system to evolving learning environments and its scalability are paramount for its sustained effectiveness as the college campus evolves over time. In essence, this forward-thinking AI-based support ticketing system holds the promise of delivering efficient, user-centric support services. By leveraging cutting-edge technology, it not only enhances the overall experience for students, faculty, and administrators but also optimizes resource allocation and facilitates data-driven decision-making for continuous improvement and innovation.

REFERENCES

- [1] Noor Aklima Harun, Sharin Hazlin Huspi, Noorminshah A. Iahad. "Question Classification Framework for Helpdesk Ticketing Support System using Machine Learning." Published by IEEE in 2021.
- [2] Renato Bruni, Gianpiero Bianchi, Pasquale Papa. "Hyperparameter BlackBox Optimization to Improve the Automatic Classification of Support Tickets." Published by MDPI in January 2023.

- [3] Alessandro Zangari, Matteo Marcuzzo, Michele Schiavinato, Andrea Gasparetto, Andrea Albarelli. "Ticket automation: An insight into current research with applications to multi-level classification scenarios." Published by Elsevier Ltd. in 2023.
- [4] Hongkai Wang, Yiyang Yao, Qitong Hou, Xiaoyi Wang, Lei Zeng, Weiwei Qiu. "Design of Work Ticket System and Scheduling Algorithm based on Blockchain." Published by IEEE in 2020.
- [5] Feras Al-Hawari, Hala Barham. "A machine learning based help desk system for IT service management." Published by Elsevier in 2019.
- [6] Shivali Agarwal, Jayachandu Bandlamudi, Atri Mandal, Anupama Ray, Giriprasad Sridhara. "Automated Assignment of Helpdesk Email Tickets: An Artificial Intelligence Life-Cycle Case Study." Published by AI Magazine in September 2020.
- [7] V. Bannihatti Kumar, M. Yarramsetty, S. Sun, A. Goel. "SupportNet: Neural networks for summary generation and key segment extraction from technical support tickets." Presented at the 4th workshop on E-commerce and NLP.
- [8] D. Beneker, C. Gips. "Using clustering for categorization of support tickets." In M. Leyer (Ed.), CEUR Workshop Proceedings: vol.1917, Lernen, wissen, daten, analysen (lwda) conference proceedings (pp. 51–62). CEUR-WS.org, 2017.
- [9] Yashraj Chanchad, Suraj Kanade, Prof. Ranjana Singh. "HelpDesk Ticketing System." Published by IJIRT in 2023.
- [10] Florika Gohil, Mr. Vikash Kumar. "Ticketing System." Published in International Journal of Trend in Scientific Research and Development (IJTSRD), ISSN: 2456-6470, Volume-3, Issue-4, June 2019, pp.155-156.
- [11] Dingding Wang, Tao Li, Shenghuo Zhu, Yihong Gong. "iHelp: An Intelligent Online Helpdesk System." Published in IEEE TRANSACTIONS ON SYSTEMS, 2011.
- [12] Dhiraj Temkar, Sheetal Singh, Leema Bari, Prof. Snigdha Bangal. "Smart Help Desk Automated Ticketing System." Published by IRJET in 2021.
- [13] M. Nagendramma, Shaik. Ghouse Basha, Md. Parveen Begum. "Implement Helpdesk System Through Online." Published by International Journal of Engineering Research & Technology in 2012.
- [14] C. Zeng, W. Zhou, T. Li, L. Shwartz, G.Y. Grabarnik. "Knowledge Guided Hierarchical Multi-Label Classification Over Ticket Data." Published in IEEE Transactions on Network and Service Management, 2017.
- [15] J. Han, M. Akbari. "Vertical Domain Text Classification: Towards Understanding IT Tickets Using Deep Neural Networks." In Proceedings of the AAAI Conference on Artificial Intelligence, 2018, New Orleans, LA, USA, 2–7 February 2018.
- [16] F.C. Yayah, K.I. Ghauth, C.-Y. Ting. "The automated machine learning classification approach on telco trouble ticket dataset." Published in Journal of Engineering Science and Technology, 2021.
- [17] W. Zhou, T. Yasuda, S. Yokoi. "EnamoSupport: A Web-Based Helpdesk Support Environment for Senior Citizens." Volume 1, 2007, pp 295-306.
- [18] B. Walek. "Intelligent system for ordering incidents in helpdesk system." Presented at the 2017 IEEE 21st International Computer Science and Engineering Conference (ICSEC), November 2017.
- [19] Neha Atul Godse, Shaunak Deodhar, Shubhangi Raut, Pranjali Jagdale. "Implementation of chatbot for itsm application using ibm watson." Presented at the 2018 Fourth International Conference on Computing Communication Control and Automation (ICCUBEA), pages 1–5. IEEE.
- [20] J. Meng, Y. Li, C. Liu, Y. Dong, Z. Wang, Y. Zhang. "Classification of customer service tickets in power system based on character and word level semantic understanding." Presented at the 2021 China International Conference on Electricity Distribution, pp. 1062–1066.



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details