



Online Certificate Management System adopting Machine Learning

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Abstract: The ML-Based Certificate Request and Management System is a web application that simplifies the certificate request process for students and administrators by allowing students to submit requests online with their details, certificate type, uploaded documents, and messages. It uses Machine Learning and Natural Language Processing techniques to analyse the sentiment and priority of each request, helping administrators quickly identify urgent cases. The system also provides an admin dashboard to view, manage, and update requests, as well as send email responses efficiently. Developed using Flask, Python, SQLite, HTML, CSS, and ML libraries, it includes features like secure login, file upload, request tracking, and notifications. Overall, the system reduces manual effort, improves communication, and ensures faster and more organized certificate management in educational institutions.

Index Terms – Certificate Request System, Machine Learning, Natural Language Processing (NLP), Flask Web Application, SQLite Database, Sentiment Analysis, Admin Dashboard, Email Notification System, Request Management, Web Development, Student Management System.

I. INTRODUCTION

In today's digital world, educational institutions are adopting smart systems to reduce manual work and improve efficiency. The manual process of requesting certificates is time-consuming and difficult to manage for both students and administrators. To solve this problem, the ML-Based Certificate Request and Management System is developed as a web-based application. The system allows students to submit certificate requests online by entering details, selecting certificate types, and uploading documents. Machine Learning and Natural Language Processing techniques are used to analyse request messages and predict request priority and sentiment. The system helps administrators identify urgent requests and respond quickly. Students can also track the status of their requests through the application. The project includes secure login, database management, email notifications, and file upload functionality. Administrators can manage requests, update status, and send replies easily. The application is developed using Python, Flask, SQLite, HTML, CSS, JavaScript, and Machine Learning libraries. The main aim of the project is to reduce paperwork, save time, improve accuracy, and provide an efficient digital solution for certificate management.

II. LITERATURE SURVEY

This project is based on research focused on improving certificate management systems using web technologies, Artificial Intelligence, and Machine Learning techniques.^{[5][14]} Researchers and developers have shown that online request management systems help reduce paperwork, save time, and improve communication between students and administrators.^[5] Recent studies on Machine Learning and Natural Language Processing highlight the importance of automatic request analysis, sentiment detection, and priority identification for handling urgent requests efficiently.^{[1][13]} Modern web-based applications developed using Flask, databases, and email notification systems provide secure and organized management of student records and certificate requests.^{[2][7]} Features like online request tracking, file uploads, automated email responses, and admin dashboards improve the overall efficiency of educational institutions.^{[5][10]} These existing technologies and research works form the foundation for developing this ML-Based Certificate Request and

Management System. These existing technologies and research works form the foundation for developing this ML-Based Certificate Request and Management System. They provide valuable insights into automation, secure data handling, document verification, and intelligent request processing. By analyzing previous studies and modern web-based management systems, the proposed solution aims to overcome the limitations of manual certificate issuance processes such as delays, data redundancy, and lack of transparency.

III . CHALLENGES

Implementing an ML-Based Certificate Request and Management System involves several technical and practical challenges related to data handling, automation, and system management.^{[5][14]} One major challenge is collecting and managing accurate student request data, as incomplete or incorrectly entered information can affect the performance of Machine Learning and NLP models.^{[1][11]} The system must also correctly analyse request messages and identify priority levels without producing inaccurate results.^[3] Maintaining data security and protecting sensitive student information is another important challenge, especially when handling file uploads, login details, and email communication.^[7] Additionally, integrating Machine Learning models with a web application requires proper backend management and continuous model improvement for better accuracy.

Another challenge is ensuring smooth communication between students and administrators through real-time notifications and request tracking.^[5] Managing large numbers of requests simultaneously may increase server load and affect system performance. The project also requires reliable database management and proper storage handling for uploaded documents. In educational institutions, adapting traditional manual processes into digital systems can sometimes face resistance due to lack of technical knowledge or training.^[14] Furthermore, maintaining the system, updating AI models, and handling technical issues over time require skilled personnel and additional operational costs.

IV. PROPOSED METHODOLOGY

The proposed methodology for this project uses an ML -based web application approach to simplify and automate the certificate request process in educational institutions.^[5] The process begins with data collection, where students submit certificate requests by entering personal details, selecting certificate types, uploading required documents, and providing request messages through the web interface.^[5] During data preprocessing, the submitted text data is cleaned and prepared for analysis using Natural Language Processing techniques. Machine Learning and Sentiment Analysis methods are then applied to identify the priority and sentiment of each request automatically. The processed data is stored securely in the SQLite database for efficient management and tracking. The Flask-based backend handles request processing, user authentication, file management, and communication between students and administrators.^[7] The admin dashboard allows administrators to view requests, update request status, manage records, and send email notifications to students. This methodology helps reduce manual work, improves request handling efficiency, and provides a secure and organized certificate management system.

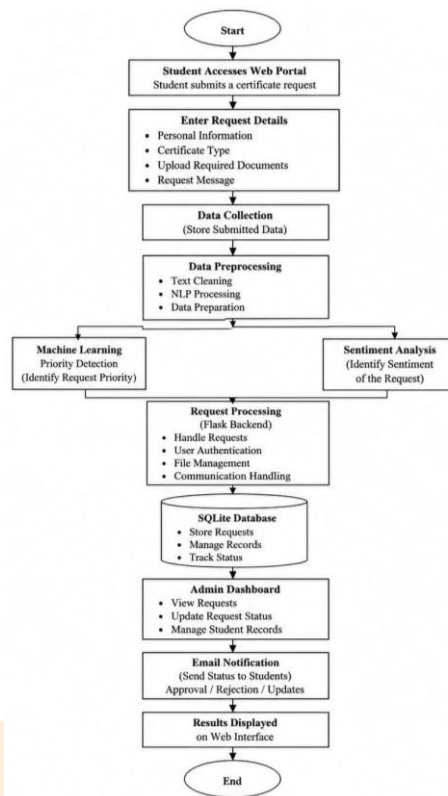


Figure 1: Flow chart of the proposed methodology

V. ALGORITHMS AND TECHNIQUES

The project utilizes a combination of Machine Learning, Natural Language Processing, and web technologies to simplify and automate certificate request management.^[3]

• Machine Learning (ML):

Used to automatically identify the priority level of certificate requests based on the student's request message. This helps administrators quickly recognize urgent requests and improve response time.^[4]

• Natural Language Processing (NLP):

Applied to analyse the text entered by students and determine the sentiment of the request, such as positive, negative, or urgent messages.^[13]

• Flask Web Framework:

Used as the backend framework to handle routing, request processing, user sessions, and communication between the frontend, database, and Machine Learning models.^[7]

• SQLite Database:

Used for secure storage and management of student details, certificate requests, uploaded files, request status, and admin records.^[8]

• Data Preprocessing Techniques:

o **Text Cleaning:** Used to remove unnecessary symbols, spaces, and unwanted words from request messages before analysis.^[13]

o **Tokenization:** Splits text into smaller words or tokens for easier NLP processing.^[11]

• Email Notification System:

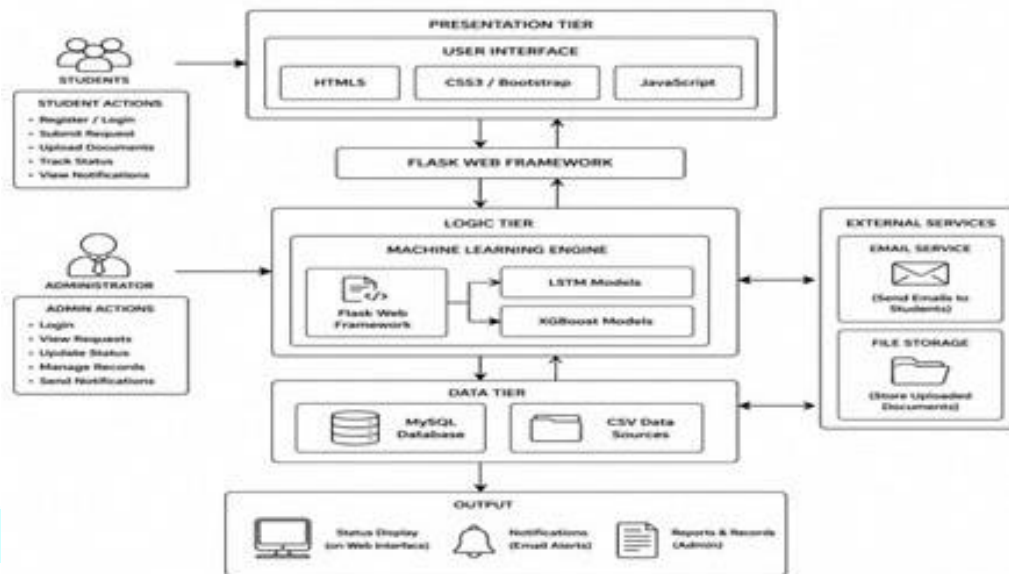
Used to send request updates, status notifications, and replies from administrators directly to students through email.^[5]

• HTML, CSS, and Bootstrap:

Used to design a simple, responsive, and user-friendly interface for both students and administrators.^[10]

VI. ARCHITECTURE

The architecture of the ML-Based Certificate Request and Management System is designed as a web-based multi-tier application.^[5] The frontend uses HTML, CSS, Bootstrap, and JavaScript to provide a simple and user-friendly interface for students and administrators.^[10] The backend is developed using the Flask framework, which handles request processing, login authentication, file uploads, and communication with Machine Learning and NLP models.^[7]



SQLite database is used to store student details, certificate requests, uploaded files, and request status securely.^[8] The system also uses sentiment analysis and priority detection techniques to analyse request messages and help administrators manage requests efficiently.

VII. OUTPUTS

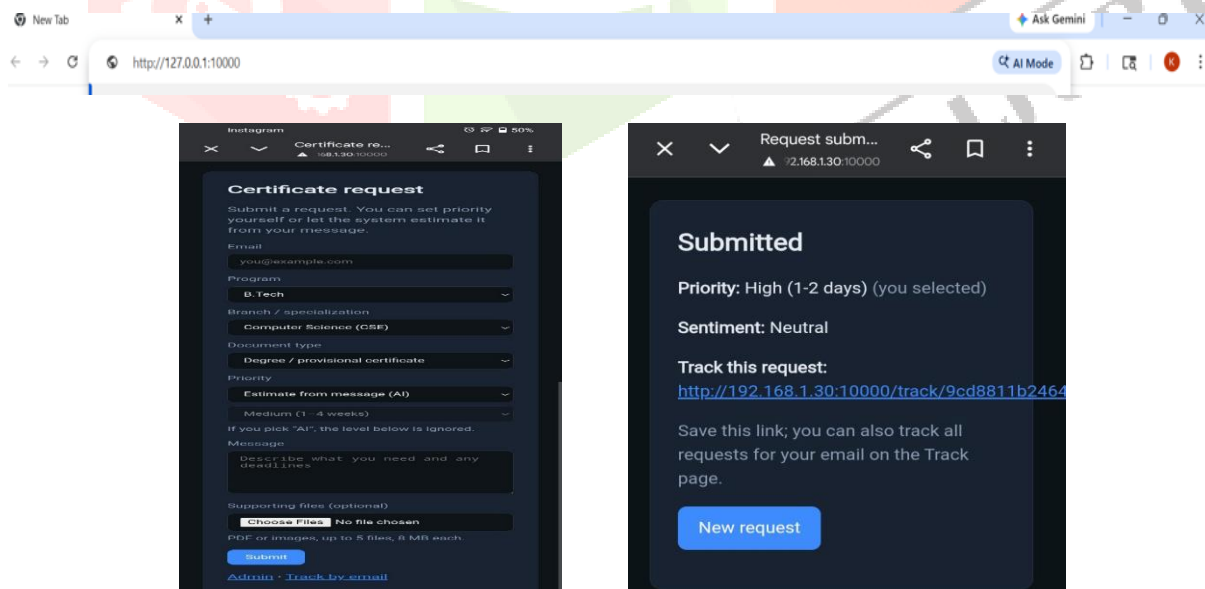


Fig 1. Home page

The above screen shows the Home Page of the ML-Based Certificate Request and Management System. The project is developed using Flask Framework, Python, HTML, CSS, Bootstrap, SQLite Database, and Machine Learning with Natural Language Processing techniques. The home page provides a simple, responsive, and user-friendly interface for both students and administrators to access the system easily from desktop or mobile devices.

Through this page, students can submit certificate requests, upload supporting documents, track request status, and communicate with administrators efficiently. The system uses AI and NLP techniques to analyse request messages and identify the priority and sentiment automatically. The application also includes secure login authentication, email notification support, request tracking, and database management features. Overall, the home page acts as the central platform that connects all modules of the system and helps provide a faster, secure, and organized certificate request management process.

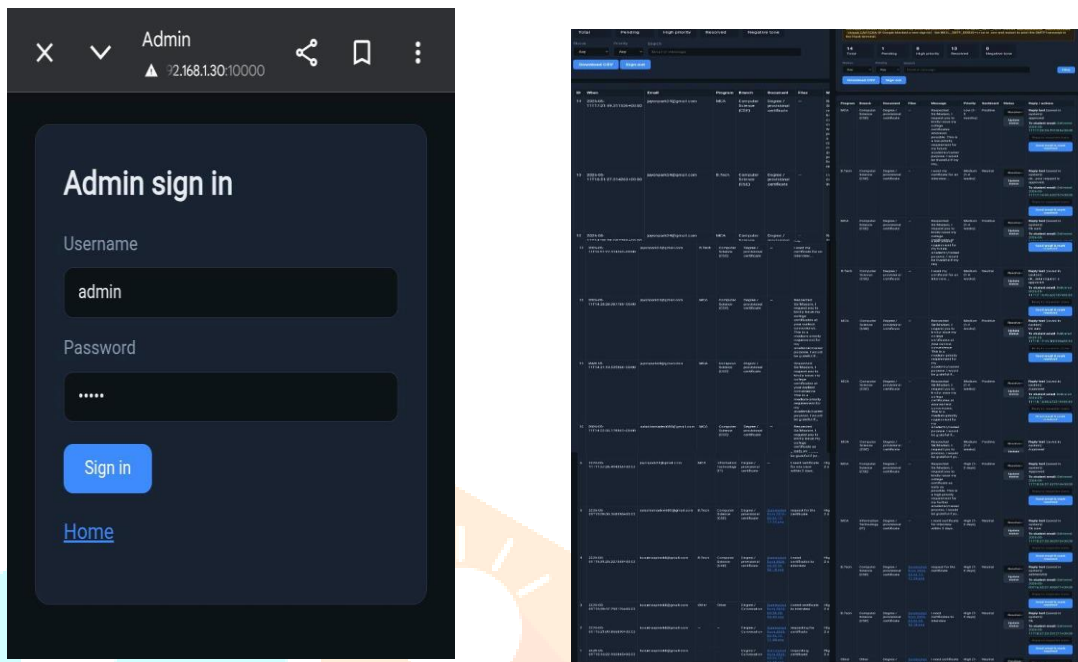


Fig2. Admin login

The above screen shows the Admin Login Page of the ML-Based Certificate Request and Management System. This module is developed using Flask, Python, HTML, CSS, Bootstrap, and SQLite Database to provide secure access for administrators.

The admin login system helps protect student records and request details by allowing only authorized administrators to access the dashboard.

After successful login, administrators can view all certificate requests, analyse request priority and sentiment, update request status, manage student records, and send replies through email notifications. The module also helps in organizing request data efficiently and reducing manual work in certificate management. The simple and user-friendly design makes it easy for administrators to handle requests quickly and securely.

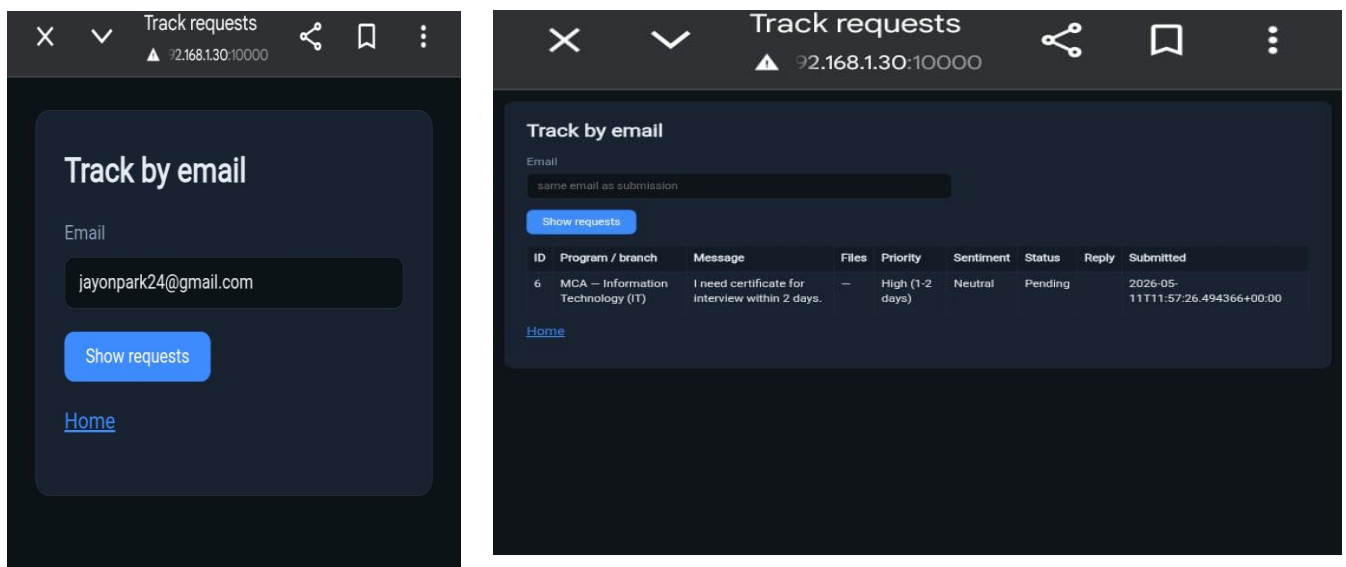


Fig 3. Track requests

The above screen shows the Request Tracking module of the system. Students can enter their email ID to view all submitted certificate requests and check their current status easily. The system displays important details such as request priority, sentiment, submission date, and admin reply. This feature improves transparency, reduces confusion, and helps students track their requests without visiting the office directly. The system successfully provides an online platform for managing certificate requests in a simple and efficient way. Students can submit requests, upload documents, and track their request status easily through the web application. The AI and NLP techniques automatically analyse the request message and identify the priority and sentiment of the request. Administrators can view requests, update status, and send replies through the admin dashboard. The project reduces manual work, improves communication, saves time, and provides a secure and organized certificate management process for educational institutions.

VIII.CONCLUSION

The ML-Based Certificate Request and Management System provide a simple, secure, and efficient solution for handling certificate requests in educational institutions. The system reduces manual work by allowing students to submit requests online and helps administrators manage requests easily through the admin dashboard. By using Machine Learning and Natural Language Processing techniques, the system can identify request priority and analyse student messages automatically. Features like request tracking, file upload, email notifications, and secure data storage improve communication and overall efficiency. Overall, the project saves time, improves organization, and provides a better user experience for both students and administrators.

REFERENCES

- [1] S. Bird, E. Klein, and E. Loper, *Natural Language Processing with Python*, O'Reilly Media, 2009.
- [2] M. Grinberg, *Flask Web Development: Developing Web Applications with Python*, O'Reilly Media, 2018.
- [3] J. Brownlee, *Machine Learning Mastery with Python*, Machine Learning Mastery, 2017.
- [4] F. Pedregosa et al., "Scikit-learn: Machine Learning in Python," *Journal of Machine Learning Research*, vol. 12, pp. 2825–2830, 2011.
- [5] A. Rajput and S. Mahajan, "Online Certificate Management System Using Web Technologies," *International Journal of Computer Applications*, vol. 180, no. 32, pp. 15–19, 2018.
- [6] Python Software Foundation, "Python Documentation," [Online]. Available: <https://docs.python.org/>
- [7] Flask Documentation, "Flask Web Framework," [Online]. Available: <https://flask.palletsprojects.com/>
- [8] SQLite Documentation, "SQLite Database Engine," [Online]. Available: <https://www.sqlite.org/docs.html>
- [9] Scikit-learn Documentation, "Machine Learning Library for Python," [Online]. Available: <https://scikit-learn.org/>
- [10] Bootstrap Documentation, "Bootstrap Frontend Framework," [Online]. Available: <https://getbootstrap.com/docs/>
- [11] C. D. Manning and H. Schütze, *Foundations of Statistical Natural Language Processing*, MIT Press, 1999.
- [12] T. Mikolov, K. Chen, G. Corrado, and J. Dean, "Efficient Estimation of Word Representations in Vector Space," *Proceedings of Workshop at ICLR*, 2013.
- [13] D. Jurafsky and J. H. Martin, *Speech and Language Processing*, Pearson Education, 2019.
- [14] Research papers and online journals related to Artificial Intelligence, Machine Learning, NLP, and Educational Management Systems.

BIBLIOGRAPHY

K. Tulasi Krishna Kumar is a Ratified Associate Professor affiliated with Andhra University and currently serves as the Placement Officer at SVPEC. With over 17 years of distinguished experience, he has played a pivotal role in training and placing students across IT, ITES, and core industry sectors, having mentored more than 16,000 students and 750 faculty members. An accomplished academician, authored eight books and successfully guided over 85 undergraduate and postgraduate project teams. He has also contributed extensively to research, with guidance leading to more than 70 publications in reputed international journals. A Certified Campus Recruitment Trainer (JNTUA), he holds an M. Tech in Computer Science and is presently pursuing his Ph.D. in CSE.



A. Kusuma is currently pursuing her final semester of Master of Computer Applications (MCA) at Sanketika Vidya Parishad Engineering College, which is accredited with an 'A' grade by NAAC, affiliated to Andhra University, and approved by AICTE. With a keen interest in Machine Learning and AI, she has undertaken her postgraduate project titled "ML-Based Certificate Request and Management System". The project has been successfully carried out under the guidance of K. Tulasi Krishna Kumar, Assistant Professor, SVPEC.

