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CAMPUS ONBOARDING ASSIST

Pooja HS[1], Sanjana OS[2], Vandana[3], Varsha S Chavan[4], Dr. Rajashekar M B[5]

UG student Department of Computer Science and Engineering, GSSS Institute of Engineering and Technology for women, Mysuru, VTU, Belagavi, India[1-4]

Associate Professor, Department of Computer Science and Engineering, GSSS Institute of Engineering andTechnology for women, Mysuru, VTU, Belagavi, India[5]

Abstract: "Campus Onboarding Assist" is a comprehensive web application designed to streamline administrative and student processes within the campus environment. Built with Python Flask, it offers robust features for administrators and students alike. Administrators can easily manage circulars, faculties, and to-do lists, facilitating effective communication and organization. They can add, view, and delete circulars and tasks, enhancing administrative responsiveness. For students, the application provides access to essential campus resources through registration and login. They can stay updated on campus events with circulars and manage tasks efficiently with the to-do list feature. A notable aspect is its support for signboard classification and text translation. Using VGG16 for classification and Tesseract OCR for text extraction, students can access contextual information and multilingual communication. Additionally, the system offers route mapping, aiding in campus navigation and travel planning for students.

Keywords: Campus resource access, Improved navigation, Streamlined admin, Communication and Organization.

I. INTRODUCTION

"Campus Onboarding Assist" is a cutting-edge web application designed to meet the diverse needs of both administrative staff and students in educational institutions. It offers essential features for administrators, such as managing circulars, faculties, and to-do lists with ease. For students, the platform serves as a central hub for accessing campus-related information, including circulars, announcements, and updates.

Additionally, students can utilize productivity tools like the to-do list feature to manage their tasks efficiently. The application also employs innovative image processing techniques for signboard classification and text translation, enhancing accessibility and communication. Moreover, the integration of route mapping functionality enables students to plan their travel effectively on campus.

II. PROBLEM STATEMENT

The traditional methods of campus management and communication within educational institutions often face challenges such as inefficiency, lack of integration, and limited accessibility. These challenges can lead to administrative bottlenecks, communication gaps, and reduced student engagement.

The problem statement for "Campus Onboarding Assist" addresses these issues and aims to provide a solution that improves campus management processes and enhancesthe overall experience for both administrative staff and students.

III. PROPOSED SYSTEM CIRCULAR MANAGEMENT

- Administrators can add, view, and deletecirculars and announcements.
- Circulars are accessible to students for stayingupdated on campus activities and announcements.

Faculty Management:

- Administrative staff can manage faculty records, including adding, viewing, and deleting faculty profiles.
- Faculties can update their profiles and providerelevant information for students.

To-Do List:

- Students and faculty can create, view, andmanage their tasks and to-do lists.
- Task prioritization and categorization featuresenhance productivity and organization.

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Query Management:

- Students can submit queries or concernsthrough the system.
- Administrative staff can view and respond toqueries, ensuring timely resolution.

Signboard Classification:

- Students can upload images of campus signboards.
- The system utilizes machine learning (e.g.,VGG16) to classify sign types, providing contextual information.

Text Translation:

- Students can upload images of text boards.
- The system employs OCR (e.g., Tesseract) to extract text and provides language translation functionality.

Route Mapping:

- Students can input source and destinationlocations.
- The system generates route maps using latitude and longitude values, aiding in campus navigation.

Benefits:

- Enhanced communication and collaboration between administrative staff, faculty, andstudents.
- Improved organization and efficiency in managing campus-related tasks and activities.
- Empowerment of students through convenientaccess to campus resources and services.
- Integration of advanced technologies for automated processes and enhanced user experiences.
- Facilitation of multilingual communication and accessibility.

Overall, Campus Onboarding Assist represents a modern and innovative solution for campus management, leveraging technology to optimize administrative processes and foster a conducive learning environment within educational institutions.

IV. LITERATURE SURVEY

Indoor Campus Navigation using Web Application System for Seamless University Mobility, IEEE – 2023:
A cutting-edge navigation system tailored for indoor campus mobility is explored in an IEEE paper from 2023. This system allows users to access location- based information within the university premises, facilitating navigation to specific destinations on campus. Leveraging interior navigation technology, the system utilizes data from the campus' active database to pinpoint requested locations. Users can manually input paths into the web application, which displays routes from their current location to their desired destination. The ultimate goal of the project is to develop a functional smartphone or laptop application to assist students in exploring the campus, highlighting nearby attractions from their current location.

Wi-Fi Based Indoor Positioning and Navigation System (IPS/INS), IEEE – 2020:
Another IEEE paper from 2020 delves into the Wi-Fi Based Indoor Positioning and Navigation System (IPS/INS) developed at Kettering University. This system was created to address the growing demand for accurate indoor localization solutions across various sectors. Key objectives included developing a mobile app with an intuitive interface, enabling map representation with zooming and scrolling features, displaying user positions with acceptable accuracy, providing path planning and routing capabilities, ensuring scalability, and maintaining affordability. Through experimentation, the system's performance was evaluated, demonstrating satisfactory achievement of the project's goals. Overall, the Wi-Fi based indoor positioning system proved to be a cost-effective solution with acceptable accuracy for various indoor navigational applications, including navigating university campuses.

Transfer learning using VGG-16 with Deep Convolutional Neural Network for Classifying Images, International Journal of Scientific and Research Publications – 2019:
A research paper published in the International Journal of Scientific and Research Publications in 2019 introduces a novel indoor navigation method utilizing QR codes, developed by researchers from Plekhanov Russian University of Economics. This method addresses the challenges of navigating complex indoor environments, particularly multi-story buildings with intricate layouts. The integration of QR codes and augmented reality (AR) technology offers precise positioning and routing guidance for users. QR codes placed strategically within buildings provide visual cues and directions, enhancing coordination and navigation efficiency. The paper emphasizes the potential of this approach to improve indoor navigation experiences in complex indoor environments, ultimately enhancing public safety and user satisfaction.

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A multi-functional method of QR code used during the process of indoor navigation, IEEE – 2019

The study addresses the challenges faced in indoor navigation, especially in complex environments like multi-story buildings with intricate layouts. It emphasizes the importance of accurate positioning, routing, and timely updates of navigation charts, particularly in emergency situations. The integration of QR codes and augmented reality (AR) technology is proposed to address these challenges. QR codes are placed at key locations within buildings to facilitate accurate positioning and routing. The advantages of using QR codes for indoor navigation, including cost-effectiveness and ease of deployment, are highlighted. The combination of QR codes and AR technology enhances the user experience by providing visual cues and directions, ultimately improving coordination and navigation efficiency. The study concludes by highlighting the potential of this method to deliver an excellent indoor navigation experience for users in complex indoor environments.

Campus assistant application on an Android platform, IEEE – 2013

"Campus Assistant Application on an Android Platform" explores the development of a campus assistant application specifically designed for the Florida Atlantic University - Boca Raton campus. The paper addresses the challenges faced by individuals, including visitors, new students, and staff, in navigating large and evolving university campuses. The architecture of the campus assistant application, available on the Android platform, is outlined. Features such as selecting source and destination locations, displaying the shortest path on a map, and providing driving directions within the campus are highlighted. The implementation details, including the use of Java and the Android SDK, are discussed. Future enhancements, such as speech directions and voice- activated navigation control, are also mentioned. In summary, the paper provides a comprehensive overview of the development, architecture, and potential enhancements of a campus assistant application tailored for the Florida Atlantic University

- Boca Raton campus.

Smart Assistance for Students and People Living in a Campus, IEEE – 2019

The paper on "Smart Assistance for Students and People Living in a Campus" explores various works on virtual assistants and their characteristics. It details the architecture and logical components of a virtual assistant, emphasizing its ability to interact effectively with users and provide support on diverse topics. A case study conducted at the University of Palermo showcases the results achieved by the virtual assistant, evaluating its performance and impact on user interactions within the campus environment. Overall, the paper provides insights into the design and implementation of virtual assistants tailored for campus environments.

V. SYSTEM REQUIREMENTS

Hardware Requirements

- Server: A dedicated server or cloud infrastructure capable of hosting the web application and supporting its functionalities.
- Storage: Sufficient storage space to store user data, circulars, faculty profiles, task lists, query records, and other system-related information.
- Processing Power: Adequate processing power to handle concurrent user requests, perform image processing tasks (e.g., OCR, signboard classification), and execute database queries efficiently.

Software Requirements

- Operating System: The server should berunning a stable and secure operating system, such as Linux (e.g., Ubuntu, CentOS) or Windows Server.
- Web Server: Installation of a web server software (e.g., Apache, Nginx) to host the web application and serve HTTP requests.
- Database Management System: Setup of a relational database management system (e.g., MySQL, PostgreSQL) to store and managethe application's data.
- Programming Languages: The application may be developed using programming languages such as Python (for backend logic), HTML/CSS/JavaScript (for frontend development), and SQL (for database queries).
- Libraries and Frameworks: Utilization of relevant libraries and frameworks for web development, machine learning (e.g., TensorFlow, PyTorch), image processing (e.g., OpenCV), and natural language processing (e.g., NLTK, spaCy).
- Third-Party APIs: Integration with third-party APIs for functionalities such as text translation (e.g., Google Translate API) andgeospatial mapping (e.g., Google Maps API).

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Network Requirements

- Internet Connectivity: A stable and high- speed internet connection to ensure seamless access to the web application from variousdevices and locations.
- Firewall and Security Measures: Implementation of firewall rules, network security protocols, and encryption mechanisms to protect the system from unauthorized access, data breaches, and cyber threats.
- Domain and DNS Configuration: Configuration of domain name settings and DNS records to make the web application accessible via a user-friendly domain name.

Deployment and Maintenance

- Deployment Environment: Selection of an appropriate deployment environment, such as on-premises servers, cloud platforms (e.g., AWS, Azure, Google Cloud), or containerization platforms (e.g., Docker,Kubernetes).
- Continuous Monitoring: Implementation of monitoring tools and practices to track system performance, resource utilization, and user activity, enabling proactive management and troubleshooting.
- Regular Updates and Maintenance: Scheduled maintenance activities, including software updates, security patches, database backups, and performance optimizations, to ensure the system's reliability, security, and scalability over time.

Requirement Analysis

1. User Management:

Identify the types of users accessing the system (e.g., admin, faculty, students).

- Determine the user roles and permissions, specifying what actions each type of user can perform (e.g., admin can add, delete circulars; students can view circulars).
- Define user authentication and registration processes, including password policies, email verification, and account recovery mechanisms.

2. Circular Management:

- Gather requirements for creating,updating, and deleting circulars.
- Determine the information to beincluded in each circular (e.g., title, content, date).
- Specify any categorization or taggingfeatures for organizing circulars (e.g., by department, event type).
- Identify requirements for viewing circulars, such as search filters, pagination, and sorting options.

3. Faculty Management:

- Collect requirements for adding, updating, and deleting facultyprofiles.
- Define the fields and information to be captured in each faculty profile (e.g., name, contact details, department, and qualifications).
- Specify any additional functionality related to faculty management, such as assigning courses, scheduling office hours, or managing researchprojects.

4. To-Do List:

- Identify requirements for creating, updating, and deleting tasks in the to-do list.
- Determine features such as task prioritization, categorization, duedates, and reminders.
- Define any collaborative features, such as sharing tasks with other usersor teams.

5. Query Management

- Gather requirements for submitting, viewing, and responding to queries.
- Specify the types of queries that can be submitted (e.g., academic, administrative, technical).
- Determine the workflow for handling queries, including assignment to relevant personnel, status tracking, and resolution notifications.

6. Signboard Classification:

- Define requirements for uploading signboard images and classifyingsign types.
- Specify the supported sign types and the accuracy threshold forclassification.
- Determine any additional functionalities, such as reporting misclassifications or retraining the classification model.

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7. Text Translation:

- Gather requirements for uploading text board images, extracting text using OCR, and translating text toselected languages.
- Specify the supported languages for translation and any language detection features.
- Define the user interface for selecting source and target languagesand viewing translated text.

8. Route Mapping:

- Identify requirements for generating route maps based on user input (source and destination locations).
- Specify the map visualizationfeatures, such as displaying routes,landmarks, and directions.
- Determine any additional functionality, such as real-time traffic updates, alternate route suggestions, or accessibility information.

By conducting thorough requirement analysis, you can ensure that the developed system meets the needs and expectations of its users while adhering to project constraints and objectives.

VI. DESIGN

Architecture

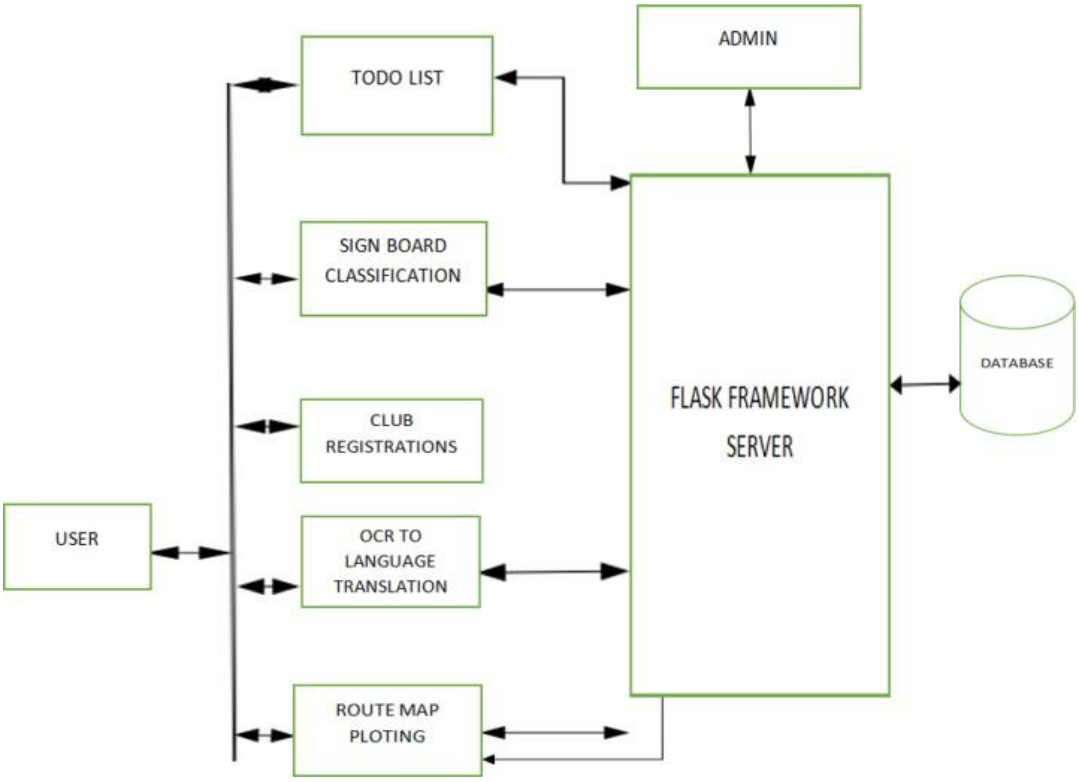

FIG. 1 Architecture DiagramBreakdown of the components

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- **User**: Initiates requests to the Flash Framework server.
- **Admi**n: Manages the system by performing actions like adding or modifying data.
- **Flash Framework Server**: Acts as the central processing unit, storing and retrieving data based on user and admin requests.
- **Database**: Stores the system's data.
- **Sign Board & Classification**: Likely handles visual data processing tasks such as image classification or content moderation.
- **OCR to Language Translation**: Possibly translates text extracted from images using Optical Character Recognition (OCR) technology.
- **Route Map & Plotting**: Potentially deals with geospatial data visualization or route planning.
- **Club Registrations**: Presumably manages club membership data.

Overall, the architecture suggests a system that can handle various data processing tasks, including user requests, data storage and retrieval, and potentially image recognition, translation, location services, and club management.

Use Case Diagram

Use case diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The main purpose of a use case diagram is to show what system functions are performed for which actor. Roles of the actors in the system can be depicted. Interaction among actors is not shown on the use case diagram. If this interaction is essential to a coherent description of the desired behavior, perhaps the system or use case boundaries should be re-examined. Alternatively, interaction among actors can be part of the assumptions used inthe use case.

Student:

- Register on the website.
- Login to the website.
- View a to-do list, likely related to clubactivities or assignments.
- Register for a club.

Admin:

- Upload a signboard, possibly for the club, and get it classified (perhaps to ensure it adheres to certain guidelines).
- Upload a text board, potentially containing club information or announcements, and get the text translated.
- Access a route map, likely for navigating to club events or locations.

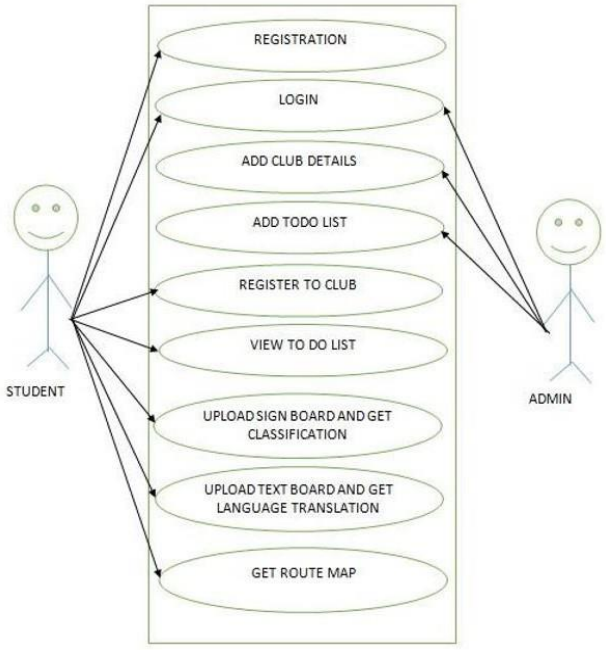

FIG. 2 Use Case Diagram

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VII. IMPLEMENTATION

Technologies Used

VGG16 Deep learning Model

FIG. 3 VGG16 Visual Geometry Group

VGG-16 stands as a convolutional neural network renowned for its depth, comprising 16 layers. Pre- trained iterations of the network, trained on a substantial subset of the ImageNet database, boasting over a million images, are readily available.

Proposed by the Visual Geometry Group (VGG) at the University of Oxford, VGG-16 serves as a go-to architecture for image classification endeavors, showcasing exceptional performance across various benchmark datasets.

Key Characteristics of VGG-16:

Architecture: VGG-16 encompasses 16 layers, including 13 convolutional layers followed by three fully connected layers. Each convolutional layer is paired with a ReLU activation function and a subsequent max-pooling layer, facilitating feature extraction.

Max Pooling: Post each convolutional layer set, VGG- 16 integrates max-pooling layers with a 2x2 window and a stride of 2, aiding in dimensionality reduction while preserving crucial information.

Fully Connected Layers: The final three layers handle high-level reasoning and classification, leveraging features extracted by earlier convolutional layers.

Activation Function: VGG-16 employs the Rectified Linear Unit (ReLU) activation function throughout the network, instilling non-linearity and facilitatingintricate mapping learning.

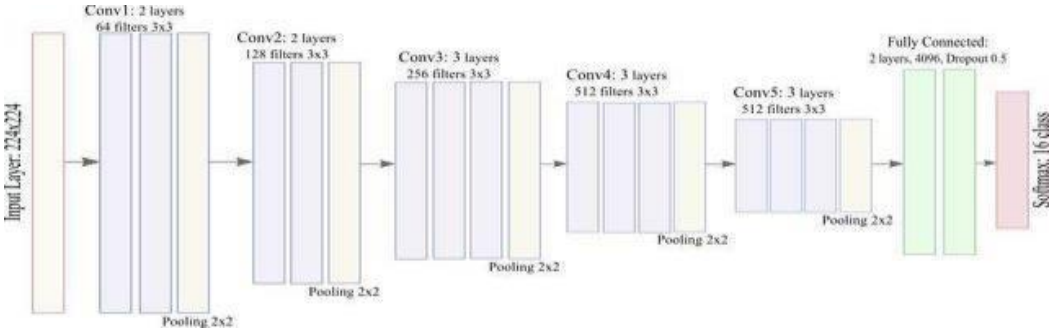
Pretrained Models: Pretrained variants of VGG-16, trained on extensive image classification tasks such as ImageNet, are at disposal. These models are amenable to fine-tuning on specific datasets or serve as feature extractors for transfer learning endeavors.

Transfer Learning: Renowned for its efficacy and accessibility of pretrained models, VGG-16 finds extensive utility in transfer learning scenarios.

Researchers and practitioners harness the learned

representations from VGG-16 and adapt them for bespoke tasks, even with limited task-specific data.

In summary, VGG-16 emerges as a potent convolutional neural network architecture, lauded for its simplicity, efficacy, and robust performance in diverse image classification endeavors.



VIII. METHODOLOGY

Deep Learning Implementation Methodology

Data Collection:

- Assemble a diverse dataset of sign imagesencompassing various types and conditions.
- Assign appropriate labels to each imagecorresponding to its sign category.

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Data Pre-processing:

- Clean and preprocess the dataset by resizing images, normalizing pixel values, and augmenting data to enhance diversity.
- Divide the dataset into training, validation, and testing subsets.

Model Selection:

- Opt for a deep learning architecture suited for image classification, such as Convolutional Neural Networks (CNNs). Consider pre- trained models like VGG16 or ResNet.
- Fine-tune the chosen model for the specific task or train it from scratch.

Model Training:

- Train the deep learning model using the training dataset.
- Monitor training metrics like accuracy, loss, and validation performance.
- Implement techniques like dropout or batch normalization to mitigate overfitting.

Hyper-parameter Tuning:

- Refine hyper parameters including learning rate, batch size, and model architecture to optimize performance.
- Validation:
- Assess the model's performance using the validation dataset to ensure robust generalization to unseen data.
- Adjust the model or training process based on validation results if necessary.

Testing:

- Evaluate the model's effectiveness on the test dataset to obtain a final assessment of its performance.

Application Methodology:

Define Requirements:

- Clearly outline the desired features and functionalities of the campus onboarding assist application.
- Specify the languages to support for translation purposes.

Set Up the Flask Web Application:

- Initialize a new Flask project and establish therequisite project structure.
- Define routes for different functionalities such as language translation, text extraction, board signs detection, and route maps.

Integrate OCR for Text Extraction:

- Select an Optical Character Recognition (OCR) library or API, such as Tesseract OCR with Python bindings.
- Implement a route within the Flask app to handle image uploads, extract text using OCR, and return the extracted text.

Implement Language Translation:

- Choose a suitable language translation API or library, such as Google Cloud Translation API or Microsoft Translator API.
- Develop a route to manage translation requests, taking the extracted text and target language as input and returning the translated text.

Board Signs Detection:

- Utilize deep learning techniques and computer vision libraries like OpenCV for board signs detection.
- Create a route to process image inputs, detect board signs, and furnish relevant information or highlight the identified signs.

Route Maps:

- Integrate a mapping service or API like Google Maps API for generating route maps.
- Develop a route to receive starting and ending locations as input and deliver the corresponding route information.

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User Interface (UI):

- Craft a user-friendly UI to facilitate interaction with the web application.
- Utilize HTML, CSS, and potentially a front- end framework to enhance the UI aesthetics and functionality.

Testing:

- Conduct comprehensive testing for each functionality to ensure accuracy andreliability.
- Encompass unit testing, integration testing, and user acceptance testing to validate the application's efficacy and usability.

IX. CONCLUSION

The "Campus Onboarding Assist" project has effectively tackled the challenges encountered by both administrators and students in managing and accessing campus-related information. Through the implementation of a comprehensive array of features and functionalities, the system has streamlined various processes, improved communication, and heightened overall efficiency within the campus community.

Throughout the project's development, several notable accomplishments have been realized:

- The administration module empowers administrators to proficiently manage circulars, faculties, to-do lists, and queries, furnishing them with centralized control over campus-related information.
- The student module provides students with a user-friendly platform to register, login, access circulars, view to-do lists, and submit queries, facilitating smooth interaction withcampus resources.
- The image classification and translation features introduce innovative solutions for interpreting signboards and text boards, offering students convenient access to multilingual information.
- The route mapping functionality enhances campus navigation by enabling students to visualize and plan their routes between different locations on campus.
- These achievements not only address the initial project objectives but also establish a foundation for future enhancements and expansions.

In conclusion, the "Campus Onboarding Assist" project has made significant advancements in simplifying campus operations, fostering communication, and enriching the overall onboarding experience for students and administrators alike. As the project continues to progress and expand, it remains steadfast in its commitment to providing a seamless and user-centric onboarding solution for campus communities.

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