Visual Question and Answering with Satellite Image

[1]Dr. P. V. S. Sarma,[2]Manchala Prasanna Lakshmi,[3]Mekala Sharon Priya Dharshini,[4] Nakka Kiran Babu

[1]Associate Professor, Dept of Computer Science and Engineering, St. Ann's College of Engineering and Technology, Chirala-523187, India.

[2,3,4]U. G Student, Dept of Computer Science and Engineering, St. Ann's College of Engineering and Technology, Chirala-523187, India.

ABSTRACT- ***This project presents an Visual question and answering with satellite image is an intelligent system developed to analyze satellite imagery and generate meaningful answers to user queries. The proposed system integrates image classification and a rule based keyword matching algorithm to improve the accuracy of question answering. It is implemented using python, flask, HTML, CSS, JavaScript, TensorFlow, SQLite, and matplotlib to provide a responsive web application. The uploaded satellite image is processed to identify its category, while the input question is analyzed to extract important keywords for answer predication. The system also provides graphical analysis and generates downloadable PDF reports for better interpretation of result. This approach offers a simple, efficient, and user-friendly solution for satellite image understanding and supports application in remote sensing, environmental monitoring, and geospatial analysis.***

KEYWORDS: Visual Question Answering (VQA), Satellite Image Analysis, Remote Sensing, Rule-Base Keyword Matching Algorithm, Image Classification, TensorFlow, Flask Framework, natural Language Processing (NLP), Geospatial Intelligence, PDF Report Generation.

LITERATURE SURVEY

Visual Question Answering (VQA) has become an emerging research area due to rapid advancements in Artificial Intelligence (AI), Machine Learning (ML), Deep Learning (DL), Computer Vision, Natural Language Processing (NLP), and remote sensing technologies. Traditional satellite image analysis mainly depends on manual interpretation by domain experts, which is time-consuming, labor-intensive, and difficult when processing large volumes of satellite imagery. AL-powered visual Question Answering systems overcome these limitations by automatically analyzing satellite images and generating meaningful answers based on user questions. Researchers have developed intelligent VQA solutions that utilize deep learning models, convolutional Neural Networks (CNNs), TensorFlow,

Natural Language Processing, and image classification techniques to understand satellite images and answer queries related to land cover, vegetation, water bodies, buildings, roads, and other geographical features. Modern VQA applications also integrate graphical visualization, confidence analysis, and report generation to improve result interpretation and decision-making. However, many existing Visual Question Answering system primarily focus on complex deep learning architectures and large annotated datasets, while lacking efficient rule-based reasoning, lightweight processing, user-friendly web interfaces, interactive visualization, and automated report generation for domain-specific satellite image analysis.

RELATED WORK

Several researchers have contributed to the development of Visual Question Answering(VQA) systems with the objective of improving satellite image understanding, remote sensing analysis, and intelligent geospatial information retrieval. Early satellite image analysis system mainly depended on manual learning methods to identify objects and land-cover patterns. Although these systems provided useful analytical capabilities, they required expert knowledge, consumed considerable time, and were unable to answer user queries directly from satellite images. With the advancement of Artificial Intelligence (AI), Machine Learning (ML), Deep Learning (DL), Natural Language Processing (NLP), and Convolutional Neural Networks (CNNs), modern Visual Question Answering system have become more intelligent user questions, and generate relevant answer with improved accuracy. They also support applications such as environmental monitoring, urban planning, agriculture, disaster management, and geospatial analysis through interactive and user-friendly platforms.

EXISTING SYSTEM

Existing Visual Question Answering (VQA) system mainly rely on deep learning models, image classification techniques, and large-scale annotated satellite image datasets to answer user queries. User can upload satellite images and receive answers based on trained AI models, but these systems primarily depend on computationally intensive architectures and extensive training data. Most existing time, and provide limited support for simple domain-specific question answering, interactive visualization and automated report generation.

PROPOSED SYSTEM

The proposed system implements a Visual

Question Answering with Satellite Images application that provides intelligence answers to user queries based on satellite imagery using Artificial Intelligence (AI) and Computer Vision techniques. It analyzes uploaded satellite images, processes user questions using a Rule-Based Keyword Matching Algorithm, and generates accurate responses based on the identified image category. The system is developed using Python, Flask, HTML, CSS, JavaScript, TensorFlow, SQLite, Matplotlib, and image processing libraries to provide a responsive and user-friendly web application. Secure user authentication enables authorized access to the system and predication services. The application also supports graphical analysis and PDF report generation, allowing users to visualize prediction result and maintain records for future reference.

SYSTEM ARCHITECTURE

The architecture of the Visual Question Answering with Satellite Images system consists of a web-based user interface, Flask backend, SQLite database, image classification module, Rule-Based Keyword Matching module, prediction module, and report generation module. Users upload a satellite image and enter a question through the web interface, which is processed by the Flask application. The backend performs image preprocessing and classification to identify the image category, while the keyword matching module analyzes the user's query and retrieves the most relevant answer. The prediction module display the generated response along with graphical analysis, and the report generation module creates a downloadable PDF containing the prediction details and analysis results.

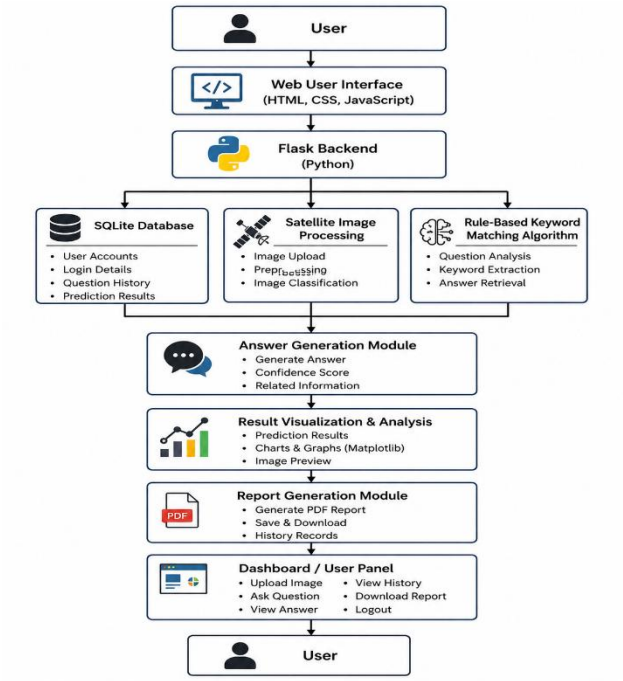

Fig 1: System Architecture

METHODLOGY DESCRIPTION

The methodology of the Visual Question Answering with Satellite Images system is designed to provide accurate and efficient answer by integrating image classification with a Rule-Based Keyword Matching Algorithm. The process begins with user registration and login, allowing authenticated users to access the web

application developed using HTML,CSS, and JavaScript. After uploading a satellite image and entering a question, the request is forwarded to the Flask backend, where the image is processed and classified. The user's question is analyzed to extract relevant keywords, which are match with predefined rules to generate the appropriate answer. Finally, the system presents the prediction result, graphical analysis, and a downloadable PDF report through an interactive interface.

RESULTS AND DISCUSSION

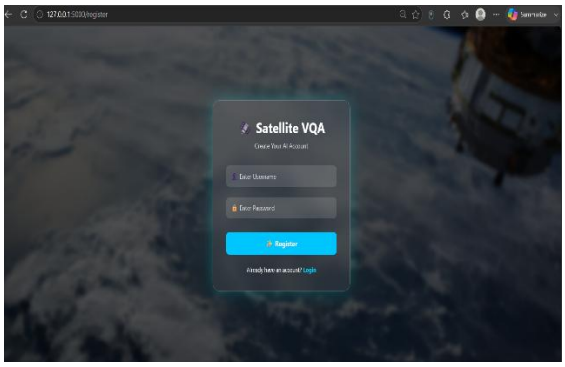

Fig 1: Home Page

The Home Page serves as the main entry point of the Visual Question Answering with Satellite Images system. It introduces the application and allows users to access features such as Login, Sign Up, and Get Started to begin satellite image analysis and question answering.

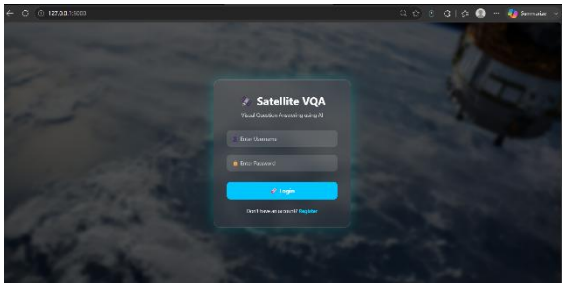

Fig 2: Login Page

The Login Page allows registered users to securely access the Visual Question and Answering with Satellite Images system.

Users enter their user ID and password to authenicate their account and access personalized services.

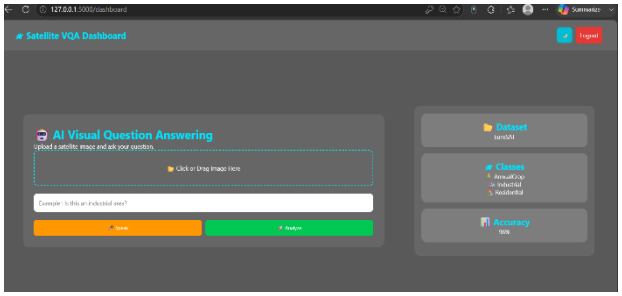

Fig 3: Dashboard

The Dashboard provides a centralized interface for accessing the main features of the Visual Question And Answering with Satellite Images system. It allows users to upload satellite images, submit questions, view prediction results, graphical analysis.

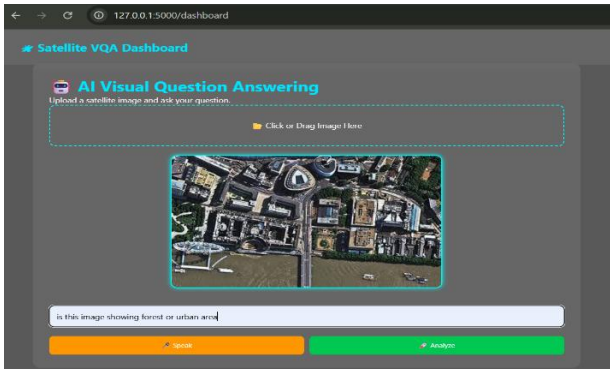

Fig 4: Upload and Analyze

The Upload and Analyze page enables users to upload a satellite images and submit questions for analysis. The system processes the uploaded image and generates accurate answers based on the content and user query.

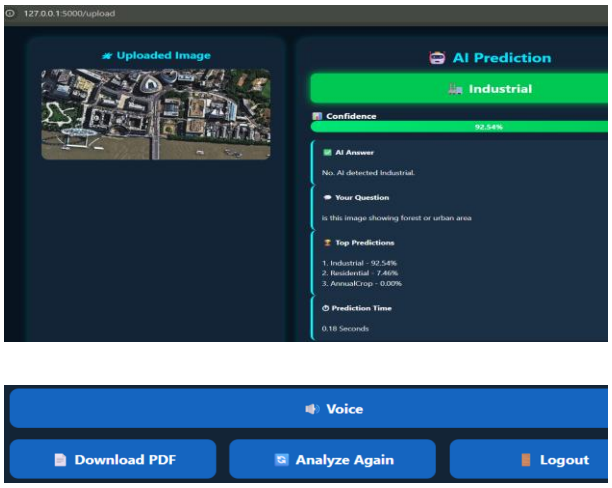

Fig 5: Prediction Result

The prediction result page displays the analyzed satellite images, the predicted image category, and the answer generated for the users question. It provides accurate and easy to understand results based on the uploaded image and query.

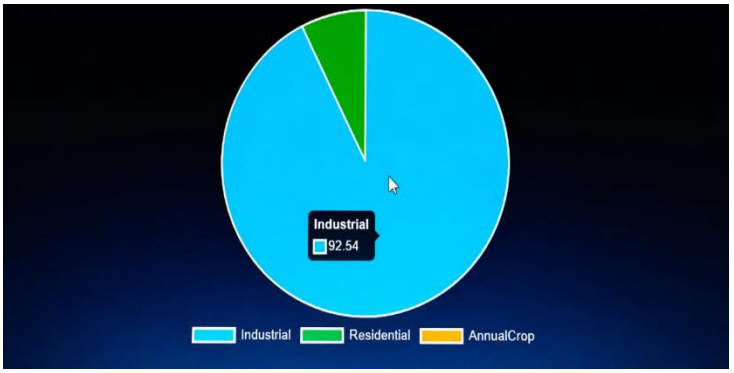

Fig 6: Graphical Analysis

The Graphical Analysis page represents the prediction results in graphical form, making the analysis easy to understand and interpret. It helps users visualize the classified satellite image results effectively.

CONCLUSION

The Visual Question Answering with Satellite Image system successfully provides intelligent answers by combining satellite image analysis and question processing techniques. It enables users to upload satellite images, submit queries, and obtain meaningful responses through an interactive web based platform. The system also supports graphical visualization and PDF report generation, allowing users to interpret prediction results effectively and maintain records for the future references.

FUTURE SCOPE

The Visual Question And Answering with Satellite Image system can be further enhanced by integrating advanced AI and Deep Learning (DL) models to improve

image understanding and question-answering accuracy. The application can also support multilingual and voice based query interaction, enabling users from different regions to access the system more conveniently. Additionally, cloud-based storage and advanced geospatial analytics can be incorporated.

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