VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"Jnana Sangama", Belagavi-590018, Karnataka

A Project Report on

"AI BASED AYURVEDIC PLANT DIVINATION"

Submitted in partial fulfilment of the requirement for the award of degree of

Bachelor of Engineering

In

Computer Science and Engineering

Submitted by

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CERTIFICATE

This is to certify that the project work entitled **"AI BASED AYURVEDIC PLANT DIVINATION"** is carried out by ***NAVYASHREE S (4NN20CS030) PRATHEEK RAJ URS C P (4NN20CS036) VINAY PRAKASH (4NN20CS062) ASWIN VIJU MENON (4NN21CS401)*** in partial fulfilment for the Seventh semester of Bachelor of Engineering in Computer Science & Engineering of the Visvesvaraya Technological University, Belagavi during the academic year 2023-24. The project report has been approved as it satisfies the academic requirements with respect to project work prescribed for the Bachelor of Engineering degree.

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DECLARATION

We, **NAVYASHREE S of USN 4NN20CS030, PRATHEEK RAJ URS C P of USN 4NN20CS036, VINAY PRAKASH of USN 4NN20CS062, ASWIN VIJU MENON of USN 4NN21CS401**, hereby undertake that the project work entitled "**AI BASED AYURVEDIC PLANT DIVINTION**" is carried out by us independently under the guidance of **Dr. USHA M S** Associate Professor and Head, Department of Computer Science and Engineering, NIEIT, Mysuru-18, in partial fulfillment of the requirement for the award of Bachelor of Engineering in Computer Science and Engineering by the Visvesvaraya Technological University, Belagavi-590018. The project has been our original work and has not formed the basis for the award of any degree, associate ship, fellowship, or any other similar titles.

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Yours Sincerely,

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ABSTRACT

In the convoluted realm of medicinal plant utilization, the fusion of ancient wisdom and modern technology emerges as an imperative intervention. Celebrated for its efficiency in treating chronic illnesses. Ayurveda, a cornerstone of traditional Indian medicine, faces a critical challenge: the impending extinction of numerous Ayurvedic plants due to various threats. In response, this project introduces a groundbreaking application developed collaboratively under the guidance of Ayurvedic and technological experts. Powered by advanced computer vision, the TensorFlow Lite tool employs a convolutional neural network (CNN) algorithm to revolutionize Ayurvedic plant identification through sophisticated image processing techniques. The application's workflow commences with automated identification and seamlessly integrating TensorFlow Lite and CNN to enable rapid and precise scanning and detection of Ayurvedic plants. The algorithm scrutinizes plant characteristics, furnishing users with detailed insights into the medicinal benefits, traditional uses, and cultural significance of each identified plant. This innovative tool not only redefines plant recognition but also provides guidance on cultivation practices and conducts in-depth analyses of medicinal properties. Developed using Android Studio, this user-friendly application incorporates a scanner for image input, enhancing the accessibility of the identification process. Empowering users to actively contribute to the preservation of Ayurvedic medicinal flora and having an intuitive interface facilitate engagement in the identification process. Beyond its core functionalities, the application plays a pivotal role in the conservation of endangered Ayurvedic plants, safeguarding their rich heritage. Practitioners and enthusiasts alike gain profound understanding, unlocking the therapeutic potential of Ayurvedic plants. In essence, this project seamlessly merges ancient wisdom with cutting-edge technology, offering a transformative solution to the forthcoming threat faced by Ayurvedic medicinal flora. Through the synergistic integration of TensorFlow Lite, CNN algorithms, and Android Studio, this innovative tool ensures the preservation of Ayurvedic botanical treasures, inviting users to actively take part in the safeguarding of a cultural and medicinal legacy for generations to come.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

In the realm of healing traditions, Ayurveda, an ancient medicinal system originating from India, has long provided profound solutions for diverse ailments by harnessing the potent properties of medicinal plants. Rooted in a holistic approach that considers the interconnectedness of mind, body, and spirit, Ayurveda boasts a history spanning thousands of years. Despite their historical significance, awareness of Ayurvedic botanical remedies has waned in contemporary society, necessitating a concerted effort for preservation and reintroduction.

Our research aims to address this need through the development of an innovative system that merges ancient wisdom with state-of-the-art technology. We utilize a Convolutional Neural Network (CNN) algorithm implemented via TensorFlow, seamlessly integrated into a mobile application developed using Android Studio. This project offers a comprehensive guide to Ayurvedic plants, providing a modern tool to visually identify and understand their benefits and uses.

At the heart of our system is a sophisticated computer vision mechanism powered by advanced algorithms. This mechanism captures and processes detailed leaf images, extracting features such as eccentricity, color, and shape. The automated plant identification feature, akin to a digital herbalist, functions as a scanner, enabling users to effortlessly detect and learn about various Ayurvedic plants. This integration of artificial intelligence and Ayurvedic knowledge not only bridges awareness gaps but also fosters a deeper connection between individuals and the healing properties of nature.

Our project draws inspiration from recent advancements in automated plant identification. Techniques utilizing Gaussian distribution for precise classification, alongside innovative combinations of Speeded Up Robust Features (SURF) and Histogram of Oriented Gradients (HOG), have achieved near-perfect accuracy rates. These technological strides highlight the potential for a cultural resurgence by demonstrating how modern methodologies can enhance traditional practices.

This convergence represents not only a technological leap but also a harmonious integration where ancient wisdom synergizes with modern scientific methodologies. By seamlessly blending tradition with innovation, our transformative system revitalizes the understanding of Ayurvedic plants, ensuring the enduring legacy of their healing properties. This endeavor transcends technological innovation, signifying a cultural revival where the echoes of Ayurveda resonate through modernity, emphasizing the invaluable treasures nature provides for holistic well-being.

Ultimately, this research contributes to the ongoing discourse at the intersection of traditional medicinal knowledge and contemporary technological solutions, offering a promising avenue for the preservation and dissemination of Ayurvedic wisdom. Our project stands as a testament to the potential of combining ancient practices with modern technology to promote health and wellness in today's world.

1.1.1 INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Artificial Intelligence (AI) and Machine Learning (ML) are revolutionary technologies that are reshaping various facets of daily life, industry operations, and the broader scientific community. AI encompasses the development of systems capable of performing tasks that typically require human intelligence, such as understanding natural language, recognizing patterns, making decisions, and solving problems. ML, a subset of AI, focuses on creating algorithms and statistical models that enable computers to learn from data and make predictions.

AI's goal is to replicate or simulate human intelligence in machines. Its primary objectives include task automation, enhanced decision-making, natural language processing (NLP), and image and speech recognition. AI systems efficiently handle repetitive and mundane tasks, freeing humans to engage in more complex activities. Furthermore, AI can analyze vast amounts of data to provide insights and support decision-making in fields such as finance, healthcare, and logistics. NLP enables machines to understand and interact with human language, leading to advancements such as chatbots, virtual assistants, and automated customer service. Additionally, AI systems can interpret and comprehend visual and auditory data, enabling applications like facial recognition, voice-activated systems, and autonomous vehicles.

Machine Learning is centered on developing algorithms that allow computers to learn from data and enhance their performance over time without being explicitly programmed for each specific task. Key concepts in ML include supervised learning, unsupervised learning, and reinforcement learning. Supervised learning involves training a model on a labeled dataset, where each example is paired with an output label, allowing the model to make predictions based on this data. Common applications include spam detection, image classification, and medical diagnosis. Unsupervised learning involves training a model on data without labeled responses, aiming to find hidden patterns or intrinsic structures in the input data. Tasks like clustering and association are typical in this category and are useful in market research and customer segmentation. Reinforcement learning involves training agents to make sequences of decisions by rewarding correct actions and penalizing incorrect ones, and is widely used in robotics, game playing, and autonomous driving.

A critical tool in ML, especially for image and video processing, is the Convolutional Neural Network (CNN). CNNs are a type of deep neural network designed to handle grid-like data structures, such as images. They automatically and adaptively learn spatial hierarchies of features through backpropagation, making them particularly effective for tasks like image recognition, object detection, and facial recognition. Image recognition involves identifying objects within images and classifying them into categories. Object detection locates objects within an image and determines their positions, while facial recognition involves recognizing and verifying individuals based on their facial features.

AI and ML are catalysts for innovation across multiple domains. In healthcare, they enable predictive diagnostics and personalized medicine. In finance, they enhance fraud detection and algorithmic trading. In everyday life, AI powers virtual assistants like Siri and Alexa, and recommendation systems used by Netflix and Amazon. The potential of AI and ML is immense, but it also presents challenges such as ethical considerations, data privacy issues, and the need for substantial computational resources. As these technologies continue to evolve, their integration into various aspects of society promises to drive unprecedented advancements and efficiencies, fundamentally transforming how we live, work, and interact with the world around us.

1.1.2 INTRODUCTION TO CONVOLUTIONAL NEURAL NETWORKS AND TENSORFLOW

Convolutional Neural Networks (CNNs) and TensorFlow are key advancements in Artificial Intelligence (AI) and Machine Learning (ML), particularly in image and video processing. CNNs are a type of deep neural network designed to handle grid-like data structures, such as images, making them highly effective for tasks like image recognition and object detection. They achieve this through a series of layers that mimic the human brain's visual processing: convolutional layers detect local patterns, pooling layers reduce data complexity, and fully connected layers integrate features for classification. Activation functions, such as ReLU (Rectified Linear Unit), introduce non-linearity, allowing the network to learn complex patterns.

TensorFlow, an open-source framework developed by Google, supports the building and deployment of ML models. It is widely used due to its flexibility and scalability, enabling tasks from training deep neural networks to deploying models across various platforms, including desktops and mobile devices. TensorFlow's extensive library of pre-built models and tools streamlines the development process, allowing for quick prototyping and testing. Its robust community and comprehensive documentation further enhance its usability.

The combination of CNNs and TensorFlow provides a powerful toolkit for addressing complex AI challenges. This synergy drives innovation in fields such as healthcare, where CNNs assist in medical image analysis for disease diagnosis, and in finance, where they help in fraud detection and algorithmic trading. Additionally, autonomous systems, like self-driving cars, use these technologies for real-time object detection and decision-making. Together, CNNs and TensorFlow enable the development of advanced models that can learn from and interpret complex visual data, significantly advancing the capabilities of AI and ML.

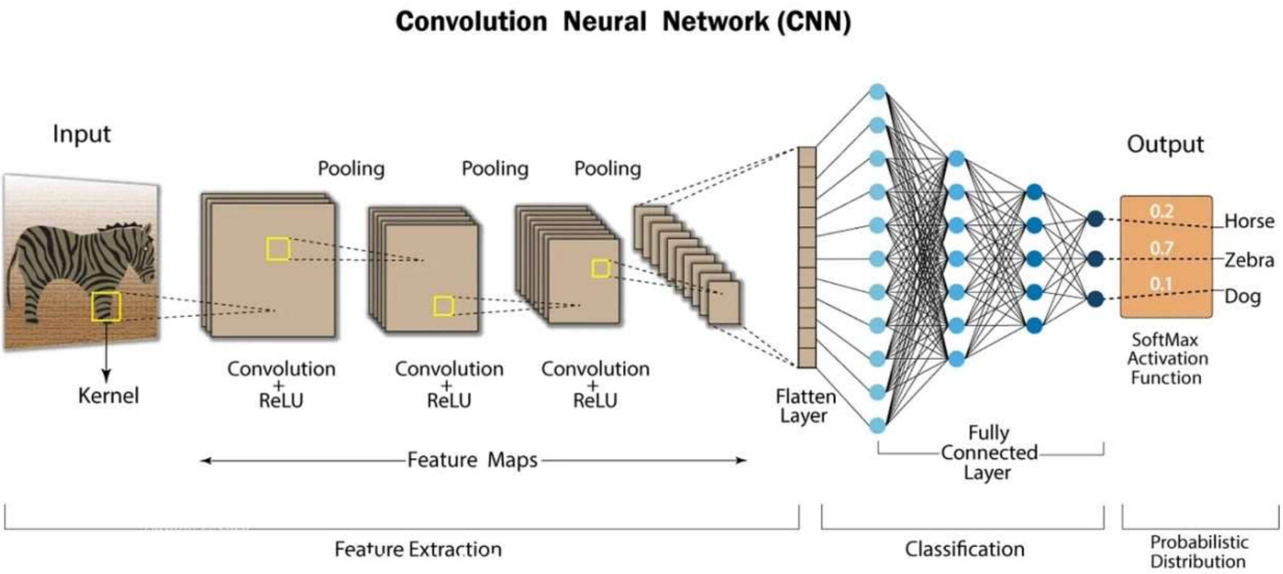

FIGURE 1.1: CNN Model

1.2 INTRODUCTION TO THE PROJECT

Our project aims to create a harmonious blend of ancient Ayurvedic traditions and modern technological advancements, bridging the gap between traditional knowledge and contemporary needs. Ayurveda, with its profound insights into holistic health and medicinal plants, offers a rich heritage that has withstood the test of time. However, in today's fast-paced world, this ancient wisdom is at risk of being forgotten. Therefore, our mission is to revitalize Ayurvedic practices by harnessing the power of AI and machine learning.

We are developing a mobile application powered by Convolutional Neural Networks (CNNs) implemented through TensorFlow to empower individuals with knowledge about Ayurvedic plants. Our user-friendly interface facilitates plant identification and provides comprehensive information on their benefits, uses, and incorporation into daily life. By reigniting interest and appreciation for Ayurvedic remedies, this initiative serves as both a technological innovation and a cultural revival, ensuring that the timeless wisdom of Ayurveda continues to enrich modern lives.

The objectives of this project include:

- Developing a robust deep learning model capable of accurately identifying Ayurvedic plants from a wide range of species based on input images.
- Utilizing CNN algorithms to extract detailed information from textual sources about the recognized Ayurvedic plants, including their medicinal properties, uses, and cultural significance.
- Designing an intuitive and user-friendly interface that allows users to easily interact with the application, supporting image capture, upload, and result presentation, along with additional options like health, beauty, and cooking tips with benefits information.
- Creating an educational tool that provides valuable insights into Ayurvedic plants, promoting awareness and understanding of their medicinal properties.

1.2.1 FEATURES

- Deep Learning Model for Plant Identification
- Information Extraction
- User-Friendly Interface
- Supplementary Benefits and Tips
- Educational Tool

1.3 MOTIVATION BEHIND THE WORK

As students of Computer Science and Engineering, we are driven to contribute to the ever-evolving field of technology. Our responsibilities go beyond coding; they include understanding and collaborating with various engineering disciplines to interact with complex systems. Our project aims to bridge the gap between traditional Ayurvedic wisdom and modern technological advancements. With the rapid development of new technologies and medical innovations, preserving and reintroducing the knowledge of Ayurvedic botanical remedies has become crucial. To address this need, our project focuses on developing an innovative solution that leverages AI to facilitate the identification and understanding of Ayurvedic plants. By employing advanced technologies, we aspire to create a comprehensive platform that empowers individuals to explore the medicinal properties, uses, and cultural significance of Ayurvedic plants. This initiative aims to foster holistic well-being and promote environmental stewardship, ensuring that the timeless wisdom of Ayurveda continues to benefit contemporary society.

1.4 SCOPE OF THE PROJECT

- Create a resilient AI system adept at precisely identifying Ayurvedic plants.
- Deploy sophisticated algorithms to retrieve comprehensive data regarding recognized plants, encompassing medicinal attributes and cultural importance.
- Craft an intuitive interface ensuring effortless interaction and exploration of Ayurvedic plants.

- Integrate functionalities offering supplementary tips and suggestions concerning the health, beauty, and culinary applications of Ayurvedic plants.
- Champion the cause of promoting awareness and comprehension of Ayurvedic wisdom, nurturing a profound connection with nature and holistic wellness.

1.5 ORGANIZATION OF THE PROJECT

The organization of pages and their hierarchical arrangement plays a crucial role in structuring the project report effectively, facilitating the integration of essential elements in a coherent format. This project report comprises ten chapters outlined as follows:

- Introduction
- Literature survey
- System requirements
- System analysis
- System design
- System implementation
- System Testing
- Snapshots
- Conclusion & Future Scope
- References

1. **Introduction**: Offers background information about the project and outlines its primary objectives.

2. **Literature Survey**: Conducts an in-depth study of existing systems, highlighting their limitations and shortcomings.

3. **System Requirements**: Provides a detailed breakdown of the hardware and software prerequisites for the project.

4. **System Analysis**: Offers a comprehensive overview of the analysis process, including the examination of the current system, proposed improvements, and system components.

5. **System Design:** Describes the planned architecture and design of the system, outlining the development process.

6. **System Implementation**: Details the implementation phase, focusing on the critical coding aspects of the project.

7. **System Testing**: Discusses the testing procedures conducted to evaluate the system's performance in real-world scenarios.

8. **Snapshots**: Includes visual representations of software and hardware modules to illustrate their functionality.

9. **Conclusion & Future Scope**: Summarizes the project outcomes and explores potential extensions and future developments.

10. **References**: Lists the sources, including papers, books, and websites, referenced throughout the project for further reading and verification.

CHAPTER 2

LITERATURE SURVEY

The convergence of machine learning, deep learning, and image processing has received significant attention within the field of medicinal plant classification, particularly emphasizing the utilization of convolutional neural networks (CNNs). Previous research endeavors have predominantly leaned on CNNs to distinguish plant species based on leaf characteristics, showcasing commendable accuracy across various studies. However, these efforts have encountered inherent limitations, particularly in addressing complex backgrounds and smaller leaves, as evidenced by studies such as those by R. Upendar Rao et al. These challenges underscored the need for advancements in this domain.

Our proposed application represents a notable progression beyond these limitations through the integration of cutting-edge technologies such as TensorFlow and advanced CNN architectures. A thorough examination of prior literature projects, as exemplified by those proposed by Nilesh Bhelkar et al., revealed deficiencies and inaccuracies in the employed algorithms, hindering overall efficiency. In contrast, our application harnesses CNN technology, achieving an exceptional accuracy rate of 94%, thereby surpassing the constraints observed in previous projects by Dinesh Shitole et al. and Rakibul Sk et al., and significantly enhancing efficiency in Ayurvedic plant recognition.

The distinctive aspect of our application lies in its user-centric features, crafted to facilitate active engagement in plant identification and learning. Particularly notable is the inclusion of a comprehensive database, setting our application apart by offering users extensive information beyond mere plant identification. This integration of advanced technological precision and user-centered design collectively positions our application as an innovative and unique solution in the domain of Ayurvedic plant recognition.

In summary, while earlier projects laid the groundwork, our proposed application represents a significant advancement, overcoming the inefficiencies of past algorithms and providing a more accurate and efficient platform for Ayurvedic plant classification. This research contribution establishes a new paradigm, promoting a seamless amalgamation of technological sophistication and user engagement in the exploration and dissemination of herbal medicine knowledge.

2.1 TABLE OF COMPARISON

Comparison Of Existing Models Vs Proposed Model

Research Paper Name	**Drawback of Existing System**	**Proposed System**
System To Detect Ayurvedic Plants and it is Medicinal Values	The proper result was not generated when the leaf images were rotated.	Designed to provide most accurate result irrespective of dimension
Identification Of Plants Using Deep Learning	Size of the dataset is limited. Samples of different classes of the plants leaf to be added	Most of the dataset has been tried to collect which are available in surrounding irrespective of classes
Worldwide Research Trends on Medicinal Plants	Discussed only about the development of medicinal plants over English medicine	Includes many other features compare to this model like identification of plant, image, information with use and benefits
Literature searches on Ayurveda	It only concentrates on Ayurveda literature search and strategy to retrieve maximum publications	It is devoid of any of the practical use that our model is proposing it is specifically designed only to search
The Significance of Ayurvedic Medicinal Plants	It discusses only on the importance, availability and caution before using the plants	Considering this information briefly our app consists a scanner to identify the plant using CNN technique and retrieve the data.

Medicinal plant classification using a convolution neural network	Identify only one plant leaf at a time and also automata plant recognition is most difficult in complex backgrounds	It is designed to identify an ayurvedic plant irrespective of complex backgrounds and also provide complete information about the plant
A mobile app for recognition of medicinal plants from Republic of Mauritius using deep learning in real time	This app is only designed for plants from Republic of Mauritius and it is done in MATLAB platform where they perform poorly under normal environment	It is done using CNN which has highest of 94% accuracy and the best model for plant detection and also our app contain many features with lot of benefits

Table 2.1 Literature Paper Comparison

CHAPTER 3

SYSTEM REQUIREMENTS

A System Requirements Specification (SRS) serves as a detailed description of the behavior expected from a software system under development. It encompasses both functional aspects, which outline how users will interact with the software through various use cases, and non-functional requirements, which entail constraints on design or implementation, such as performance benchmarks, quality standards, or design restrictions.

The purpose of a Software Requirements Specification is to establish a mutual understanding between customers and contractors or suppliers (which may be represented by marketing and development divisions in market-driven projects) regarding the functionality expected from the software product, as well as what functionalities are not within its scope. By delineating these specifications, the SRS facilitates a thorough evaluation of requirements prior to design implementation, thereby minimizing the need for subsequent redesign. Furthermore, it offers a realistic foundation for estimating product costs, identifying potential risks, and establishing project timelines.

3.1 PLATFORM AND LANGUAGE USED

In this section, we will get to know about the platform and programming language we use to build this project .table 3.1 summarizes it.

Android Studio	Version 2022.1.1 above
TensorFlow	Version 2.12
Computer OS	Windows 11
Language	Python 3.11.3

Table 3.1 Platform and Language used

1 Platform Utilized:

- **Android Studio**: The primary Integrated Development Environment (IDE) for Android app development, Android Studio offers a comprehensive suite of tools. Developed by Google, it includes features like a visual layout editor, advanced code editor, and a robust emulator for testing apps on various virtual devices. With integrated support for version control systems and a flexible Gradle-based build system, Android Studio simplifies project management.
- **Kotlin**: Developed by JetBrains, Kotlin has emerged as the preferred language for Android development. Fully interoperable with Java, Kotlin enhances productivity with its concise syntax and modern language features. Android Studio provides seamless support for Kotlin, facilitating intelligent code completion and debugging, enabling developers to create high-quality Android apps efficiently.
- **TensorFlow**: TensorFlow, an open-source machine learning library from Google, simplifies building and deploying machine learning models. It enables tasks such as classification, regression, image recognition, and natural language processing. TensorFlow's core features include tensor manipulation and a set of tools for model building and training. Related projects like TensorFlow Extended (TFX) and TensorFlow Lite extend its capabilities for building end-to-end machine learning pipelines and deploying models on mobile and embedded devices.
- **Windows 11**: Developed by Microsoft, Windows 11 is a personal computer operating system within the Windows NT family, offering a range of features and functionalities for users.

2 Programming Language:

- **Python**: Python, a high-level interpreted programming language, is renowned for its simplicity, readability, and versatility. Created by Guido van Rossum, Python is widely used for web development, scientific computing, data analysis, and machine learning. With a vast ecosystem of libraries and frameworks, Python enables developers to accomplish various tasks efficiently. It is an open-source language with cross-platform compatibility, making it suitable for diverse operating systems like Windows, Mac, and Linux.

3.2 SOFTWARE REQUIREMENTS

- Operating System: WINDOWS
- TensorFlow Lite-python
- Android Studio-kotlin

3.3 HARDWARE REQUIREMENTS

- RAM :16 GB-32 GB
- Computer-16gb
- Android mobile with 32mp camera
- Camera access
- Storage access
- Data access

CHAPTER 4

SYSTEM ANALYSIS

System analysis involves a detailed examination of activities or professions, aiming to define their goals and discover efficient operations and procedures for achieving them. It is a structured inquiry conducted to assist decision-makers, often in business contexts, in identifying optimal courses of action. Systems analysis encompasses the study of interacting entities, including computer systems analysis, and is closely related to requirements analysis and operations research.

During the systems-analysis phase, the primary objective is to specify what the system must do to meet end-user requirements. This phase transitions into systems design, where specifications are translated into a hierarchy of charts defining the necessary data and processes for computer program instructions. The process of system analysis entails several steps:

1. **Gathering Information about Current Systems:** This involves collecting information through research, observation, and user reviews to understand the behavior of existing systems in various scenarios.

2. **Identifying Inputs, Outputs, and Processes:** The systems analyst identifies the data inputs and outputs of the current system, as well as its processes. Understanding how the current system operates is crucial for designing a new system that handles similar inputs, outputs, and processes.

3. **Identifying Issues in Current Systems:** The systems analyst identifies problems within the current system to improve its efficiency and effectiveness. Recognizing and addressing these issues can lead to smoother operation and increased profitability, particularly in business contexts.

4. **Specifying New System Requirements:** Once problems with the current system are understood, the systems analyst plans how the new system will address these issues. This involves specifying a list of requirements, known as the Requirements Specification, for the new system.

5. **Determining Hardware and Software Requirements**: Finally, the systems analyst determines the hardware and software needed for the new system. This includes decisions about the number of computers, network type, servers, and software solutions, such as off-the-shelf or custom-written software.

4.1 EXISTING SYSTEM

The current approaches to identifying medicinal plants primarily involve manual methods that rely on observing various structural features such as leaf characteristics, flower morphology, and branching patterns. These methods also consider factors like leaf color and texture to aid in species recognition. Traditional techniques include visual assessment by human raters and microscopic examination, while some modern methods incorporate image processing and pattern recognition. However, these approaches often rely on human interpretation and are supplemented by reference materials, leading to limitations in accuracy and comprehensiveness.

Moreover, traditional identification methods are hindered by language barriers and are tailored to specific geographic regions, limiting their broader applicability. The accuracy of these methods is heavily dependent on the expertise of the user, resulting in inconsistencies and potential errors. Additionally, the information provided by these methods may be outdated and lacks integration, failing to offer a comprehensive understanding of plant characteristics and medicinal properties. Given these limitations, there is a pressing need for more advanced, precise, and user-friendly solutions that leverage modern technology to improve accuracy, accessibility, and the overall user experience.

4.2 ANALYSIS OF THE PROPOSED SYSTEM

The proposed system seeks to transform the process of identifying Ayurvedic plants by harnessing cutting-edge technologies to provide precise and thorough plant recognition. By leveraging convolutional neural networks (CNNs) and TensorFlow, the system ensures accurate identification of Ayurvedic plants, even amidst complex environmental conditions. It boasts an extensive database of Ayurvedic plants, facilitating real-time information extraction to furnish users with comprehensive insights into each plant's medicinal properties, uses, and cultural significance. This database undergoes continuous updates to maintain its currency and relevance. The system's user-friendly interface is meticulously crafted to streamline plant identification and information retrieval, catering to users of varying expertise levels.

Beyond its primary function of accurate plant identification, the system serves as a platform for knowledge dissemination and holistic health promotion. By integrating educational content on Ayurvedic practices, supplemented by regular updates and maintenance, it ensures users have access to the most reliable and up-to-date information. Integration with existing Ayurvedic databases enriches the system's data repository, fostering a comprehensive plant library. Noteworthy advantages include the system's speed and convenience, facilitating swift identification and information retrieval, thereby enhancing user engagement. In essence, this proposed system not only enhances the accuracy and efficiency of plant identification but also promotes broader accessibility and deeper understanding of Ayurvedic medicine, thereby contributing to holistic health and well-being.

CHAPTER 5

SYSTEM DESIGN

System design encompasses the delineation of a system's architecture, components, modules, interfaces, and data to meet predefined requirements effectively. It can be viewed as the application of systems theory to the development of products. This process often intersects with disciplines such as systems analysis, systems architecture, and systems engineering.

5.1 DESIGN AND METHODOLOGY OF THE PROPOSED WORK

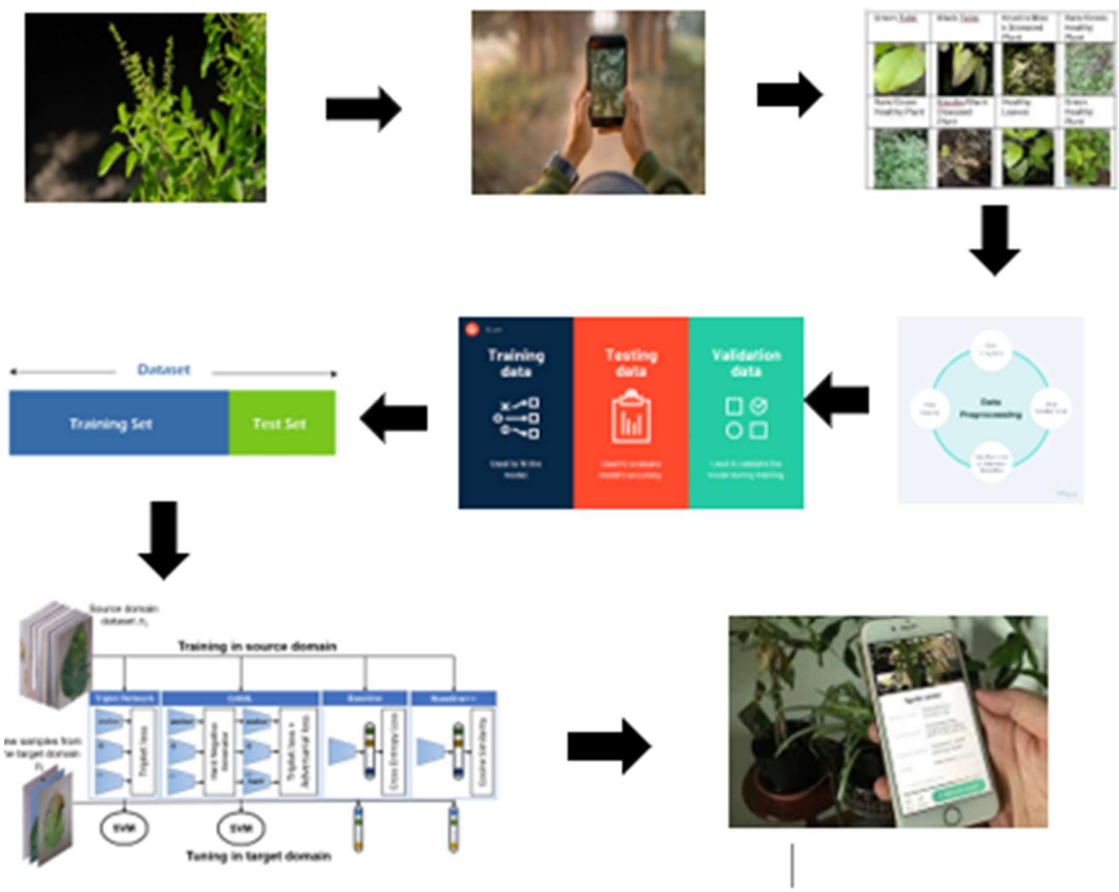

FIGURE 5.1: Design of the proposed project

- **Image Capture**: Users scan Ayurvedic plants using the mobile application.
- **Database Comparison**: Captured images are compared with the extensive Ayurvedic plant database.
- **CNN Detection**: Convolutional Neural Networks (CNNs) analyze the images to identify plant species.
- **Information Extraction**: Detailed information about the identified plants is extracted from the database.
- **Output Presentation**: Relevant information, including medicinal properties and uses, is presented to the user.

5.2 PROPOSED DATASET

The proposed dataset for our project comprises a diverse array of Ayurvedic plant images sourced from credible botanical databases and repositories. Each image is meticulously annotated with the corresponding plant species name and relevant metadata to ensure accuracy and comprehensiveness. To bolster the model's robustness and ability to generalize, advanced data augmentation techniques are employed to introduce variations in lighting, orientation, and background across the dataset. Subsequently, the dataset is divided into distinct training and testing sets to facilitate rigorous model evaluation and validation. Before commencing model training, the images undergo preprocessing procedures such as resizing, normalization, and feature extraction to optimize compatibility with our convolutional neural network (CNN) architecture. Access to the dataset and images can be found [link to dataset].

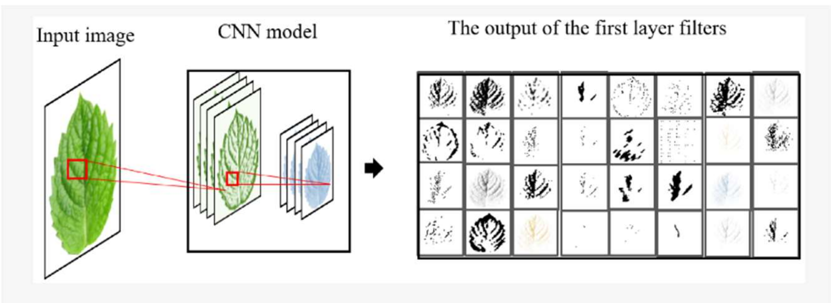

FIGURE 5.2: The first activation layer of each channel related to the test images.

- **Activation Layer Extraction**: Retrieve the activation layers from the initial convolutional layer of the CNN model.
- **Channel-wise Examination**: Scrutinize the activation layers individually on a per-channel basis to discern the features detected by each channel.
- **Feature Illustration**: Depict the features detected by each channel in the activation layer pertaining to the test images.
- **Insight Generation**: Derive insights into the distinct patterns and attributes recognized by the CNN model in the test images by scrutinizing the activation layers.

5.3 SYSTEM ARCHITECTURE

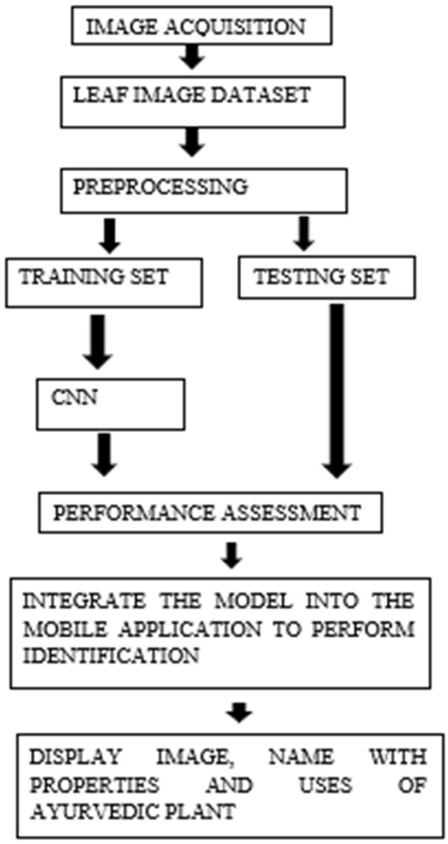

FIGURE 5.3: Proposed integrated model to identify the Ayurvedic plants

Work Flow:

- **Image Capture**: High-resolution images of Ayurvedic plants are captured.
- **Pre-processing**: Images undergo enhancement and noise removal.
- **Feature Extraction**: Key plant features like patterns and textures are extracted.
- **CNN Implementation**: Convolutional
- **Data Presentation**: User-friendly interface categorizes and presents plant information.
- **User Interaction**: Users can explore, save, and share plant profile.

5.4 FUNCTIONAL REQUIREMENTS

A functional requirement outlines the specific functions that a system or its components must perform. Each function is defined by its inputs, behavior, and outputs. These requirements can include calculations, technical specifications, data manipulation, and processing tasks.

The system methods are delineated as follows:

- **Data Preprocessing**: This method involves the addition of the dataset to the preprocessing stage.

1 Input: The crop dataset.

2 Process: Preprocessing identifies missing values and performs feature removal.

3 Output: The preprocessed dataset.

4 Error Handling: If the input file is invalid.

- **Feature Selection**: This method selects relevant data from the dataset.

1. Input: The preprocessed dataset.
2. Process: Only important data required for analysis is selected.
3. Output: The selected data is displayed.

- **Data Splitting**: This method divides the dataset into training and test sets.

1. Input: The feature-selected data.
2. Process: The data is split into the train and test sets.
3. Output: The dataset is presented as the train set and test set, and specific algorithms are tested, followed by performance analysis.

5.4.1 Product function

- **Product Recognition**: The system effectively recognizes diverse products through images submitted by users.
- **Database Matching**: Images captured by users are cross-referenced with a comprehensive database to identify corresponding items.
- **Algorithm Implementation**: Cutting-edge algorithms, such as convolutional neural networks (CNNs), evaluate the images to discern distinctive product attributes.
- **Result Display:** Pertinent product details, including pricing, reviews, and availability, are showcased to users.
- **User Interaction**: Interactive functionalities encourage user participation, enabling feedback mechanisms to enhance the accuracy and relevance of product suggestions..

5.4.2 General Constraints

During the development phase of our project, various constraints must be taken into account. These encompass the availability of high-caliber data necessary for training the machine learning model, the potential expenses, and accessibility of computational resources required for both training and inference operations, and the necessity of ensuring the interpretability of intricate models. Moreover, scalability issues need to be tackled to manage the expansion of data and user interactions while upholding performance standards. Privacy and security concerns, design intricacies of the user interface, the complexity of integration, adherence to regulatory guidelines, and the ongoing necessity for maintenance and support also contribute to the constraints associated with the project.

CHAPTER 6

SYSTEM IMPLEMENTATION

Implementation refers to the actualization of an application or the execution of a plan, idea, model, design, specification, standard, algorithm, or policy. The successful implementation of a system typically relies on extensive user involvement and strong support from management. When users actively participate in the design and operation of information systems, it yields several favorable outcomes.

6.1 CLASS DIAGRAM

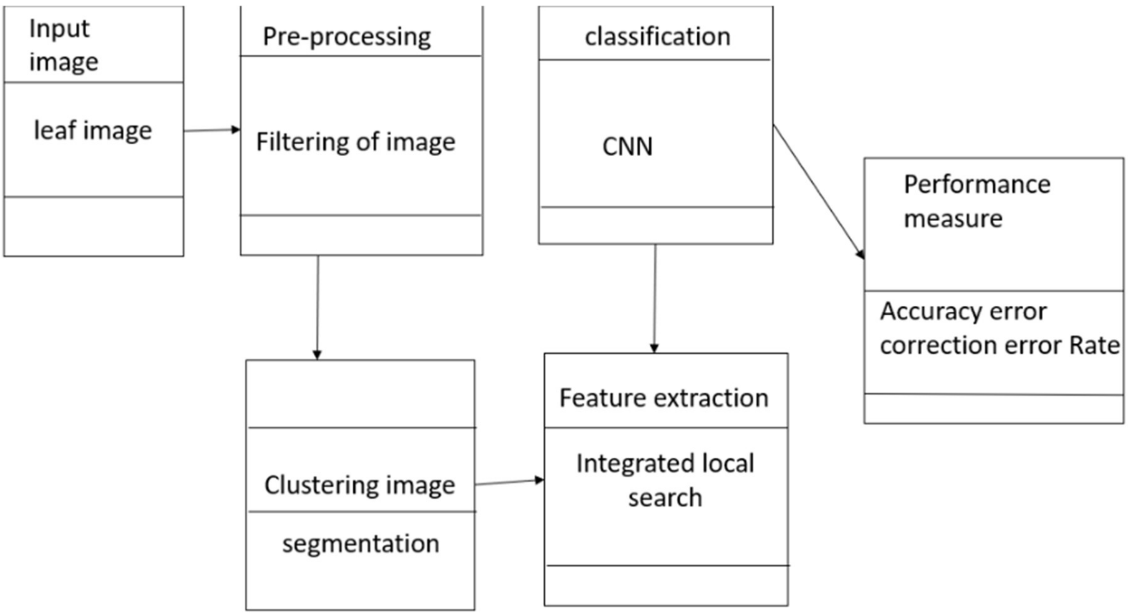

FIGURE 6.1: Class diagram

6.2 ACTIVITY DIAGRAM

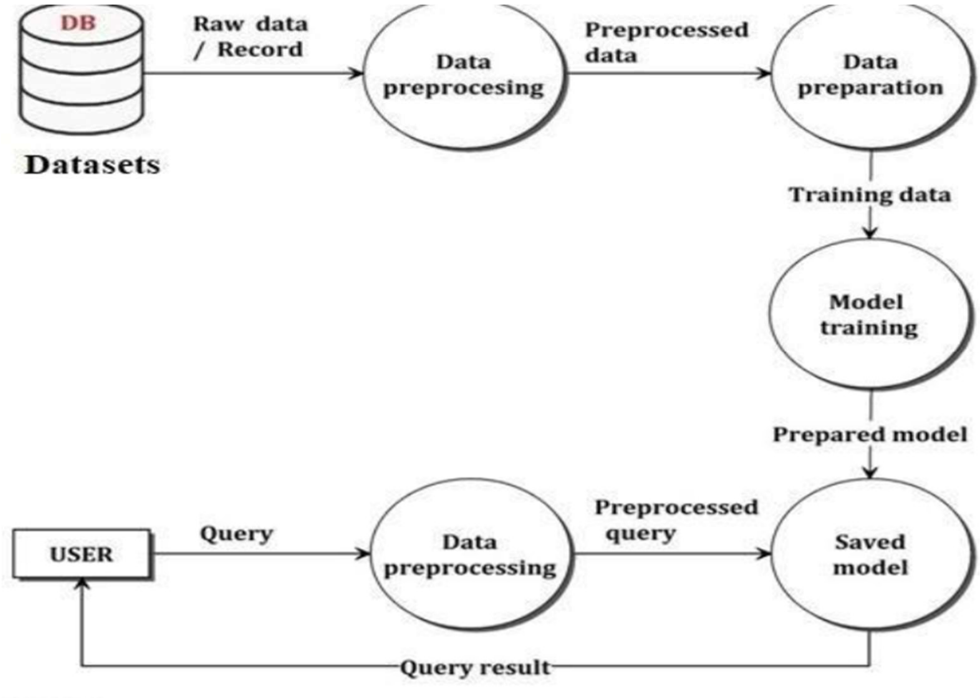

FIGURE 6.2: Activity diagram

6.3 USE CASE DIAGRAM

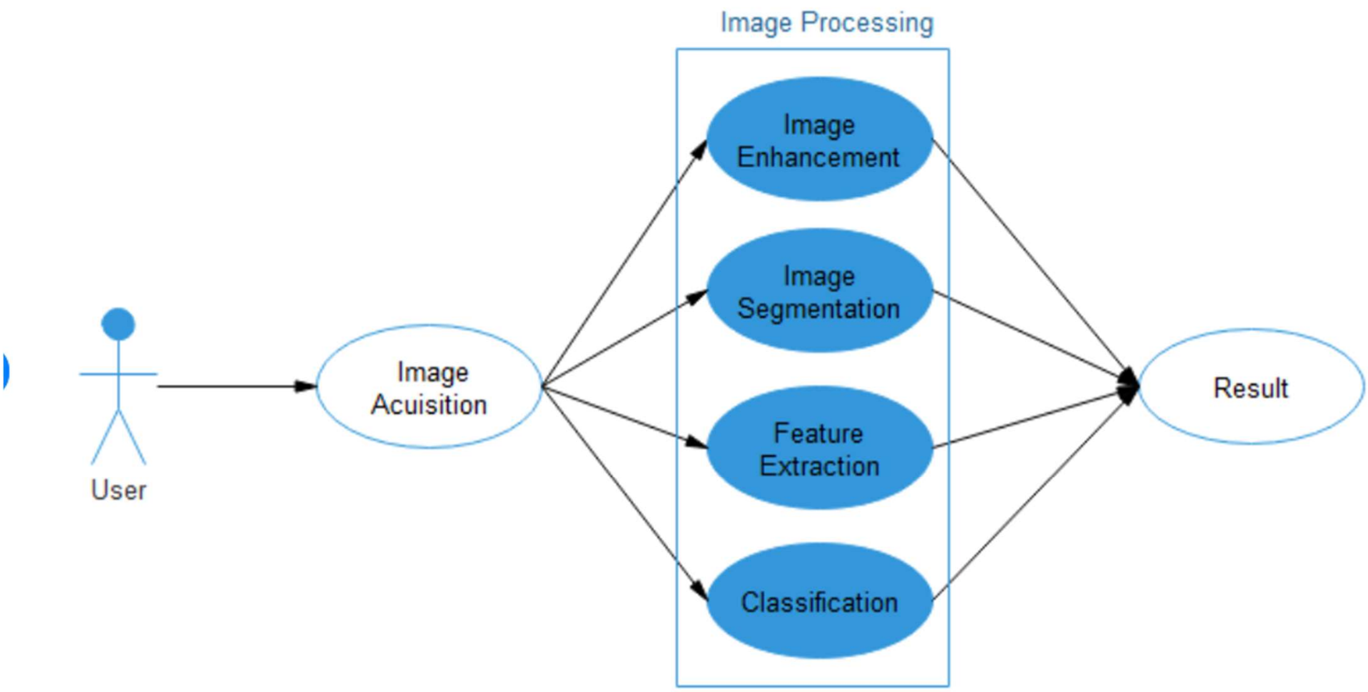

FIGURE 6.3: Use case diagram

6.4 METHODOLOGY

This innovative application employs cutting-edge technologies, particularly focusing on computer vision and deep learning algorithms, to enable the scanning, identification, and comprehensive analysis of Ayurvedic plants. The process initiates with capturing high-resolution images of plants, which undergo preprocessing techniques to enhance clarity and quality. By leveraging Convolutional Neural Networks (CNN), a robust deep learning algorithm, the application conducts intricate plant recognition by discerning unique features like leaf patterns, shapes, and textures.

Implemented in Python using TensorFlow, the CNN algorithm plays a pivotal role in accurately identifying Ayurvedic plants. TensorFlow provides a sturdy framework for developing and training deep neural networks, thereby enhancing the efficiency and accuracy of the identification process. The integration of Android Studio, employing Kotlin, further facilitates seamless application development for Android devices.

Following successful identification, specialized algorithms are employed for image detection and processing, employing complex pattern recognition methodologies to extract essential characteristics from the plant images. The CNN architecture, tailored for image classification tasks, ensures precise feature extraction, thereby contributing to accurate plant classification.

Post-identification, the application retrieves comprehensive information about the recognized plant from an extensive database. This database encompasses the plant's local name, uses, properties, and botanical information, aiming to empower users to easily identify and comprehend Ayurvedic plants. The information is presented in distinct sections within the application, each dedicated to specific aspects such as plant recognition and detailed analysis of medicinal properties.

Operating by performing all algorithms in the backend, the app displays the output upon completion, presenting the matching plant's information, including its uses. In cases where the scanned plant is not identified as an Ayurvedic plant, the application connects to Google and provides relevant results, indicating it is not an Ayurvedic plant.

The significance of utilizing CNN, TensorFlow, and Android Studio lies in their combined efficiency. While CNN excels in image recognition tasks, TensorFlow offers a robust deep learning framework, and Android Studio facilitates user-friendly application development. Python serves as a versatile language for seamless implementation. The meticulous design of the application ensures not only the accurate scanning and identification of Ayurvedic plants but also the dissemination of valuable information, fostering a deeper understanding of these natural resources in the context of holistic healthcare.

6.5 CNN

The Convolutional Neural Network (CNN) represents an advanced iteration of artificial neural networks (ANN), primarily utilized for extracting features from grid-like matrix datasets.

6.5.1 CNN ARCHITECTURE

A convolutional Neural Network consists of multiple layers like the input layer, Convolutional layer, Pooling layer, and fully connected layers.

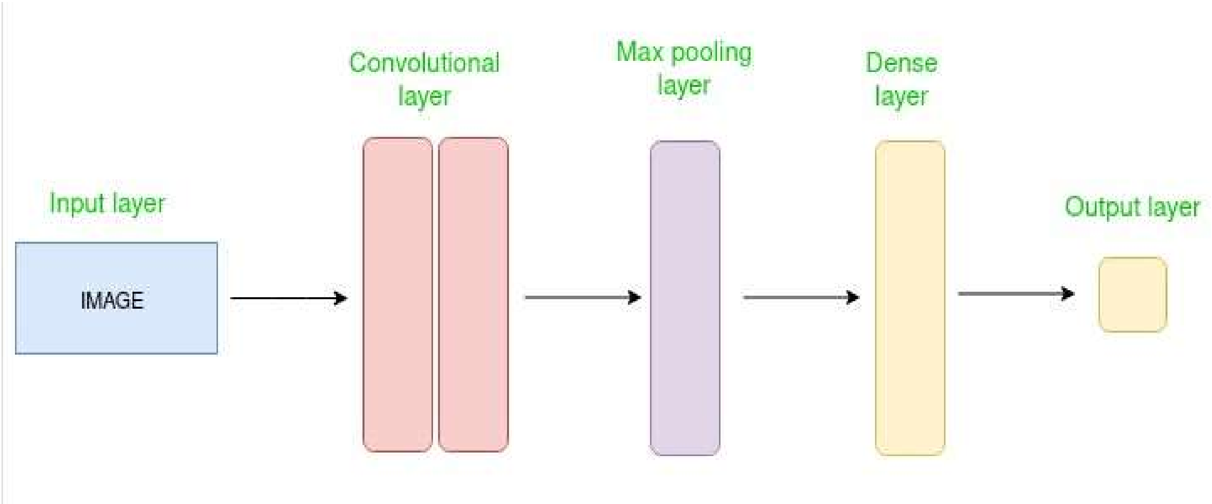

FIGURE 6.5: Simple CNN architecture

In the Convolutional layer, filters are applied to the input image to extract features, while the Pooling layer downsamples the image to decrease computation. Finally, the fully connected layer generates the ultimate prediction. Through backpropagation and gradient descent, the network learns the optimal filters.

6.5.2 CNN ALGORITHM

1**. Input Layer**: At the outset, the input layer of the CNN accepts input data, typically in the form of an image. Through a sequence of convolutional filters, which are matrices of weights, applied to the input image, the layer extracts features by performing element-wise multiplication and summation.

2. **Convolutional Layer**: Subsequently, the output from the input layer traverses one or more convolutional layers, each comprising multiple filters. These filters generate distinct feature maps by executing the convolution operation on the feature map from the preceding layer.

3. **Activation Function**: Following the convolutional layer, an activation function is applied to introduce non-linearity into the network's output. Commonly used activation functions include ReLU, sigmoid, and tanh.

4. **Pooling Layer:** Post activation, the output undergoes downsampling via a pooling operation, which reduces the spatial dimensions of the feature maps. This downsampling enhances computational efficiency. Max pooling and average pooling are among the common pooling operations employed.

5. **Fully Connected Layer**: After pooling, the final feature maps are flattened into a one-dimensional vector and transmitted through one or more fully connected layers. Analogous to traditional neural network layers, these fully connected layers aid in classification or regression tasks.

6. **Output Layer:** The ultimate layer of the CNN furnishes the network's output, which can manifest as a singular value or a vector of probabilities.

7. **Training**: The CNN undergoes training using a dataset containing labeled examples. Through an optimization algorithm such as stochastic gradient descent, the network's weights are iteratively adjusted to minimize the disparity between the predicted output and the actual output.

8. **Evaluation**: Once trained, the CNN is evaluated on a distinct dataset to gauge its performance. This evaluation discerns if the network has overfitted or underfit the training data and guides subsequent adjustments to the network's architecture and hyperparameters.

CHAPTER 7

SYSTEM TESTING

System testing involves evaluating a program or system to ensure it meets the desired outcomes and functions as intended. Despite being crucial for software quality, testing remains somewhat of an art due to the complex nature of software. The challenge lies in the fact that, with moderately complex programs, it's impossible to test every aspect comprehensively.

Testing goes beyond mere debugging; it's an investigative process aimed at providing stakeholders with insights into the quality of the product or service being tested. Various techniques, including executing the program to uncover bugs, are employed to achieve this. The ultimate goal of testing is to assure quality, verify and validate functionality, and estimate reliability.

Software testing is about validating and verifying that a program:

- Aligns with its design and development requirements.
- Performs as anticipated.
- Retains its intended characteristics upon implementation.
- Meets the needs of stakeholders.

Testing can be conducted at any stage of the software development process, depending on the chosen methodology. Traditionally, most testing occurs after defining requirements and completing coding. However, in agile approaches, testing is ongoing throughout the development cycle. Therefore, the testing methodology adapts to the specific needs and timelines of the project.

7.1 TESTING METHODOLOGIES

Software Testing encompasses various types, each serving different purposes and targeting different components of the system:

- **Unit Testing**: This involves testing individual software components or modules. Typically performed by programmers, it requires a deep understanding of the internal program design and code. Test driver modules or test harnesses may be developed to facilitate this process.

- **Integration Testing:** Here, integrated modules are tested to ensure combined functionality post-integration. Modules tested can include code modules, individual applications, or client and server applications in a network. This type of testing is particularly relevant for client/server and distributed systems.
- **System Testing**: The entire system is tested against requirements specifications. It's a form of functional testing that covers all interconnected parts of the system based on overall requirements.
- **End-to-end Testing**: Similar to system testing, this involves testing the complete application environment in a scenario simulating real-world use. This may include interactions with databases, network communications, or other hardware, applications, or systems as necessary.
- **Acceptance Testing**: Typically conducted to validate if the system meets customer-specified requirements. In engineering, acceptance testing is performed to determine if a specification's requirements are met, which may involve chemical, physical, or performance tests.

7.2 CASE STUDIES

Case studies serve as a means to validate whether a system functions as expected during regular operation. Typically presented in a textual format, they depict scenarios encountered during system use. These studies can be conducted using formal research methodologies to ensure accuracy and reliability.

In case study research, the subject being studied could be an individual, organization, or abstract concept, such as a claim or argument. Various research methods, both qualitative and quantitative, can be employed in conducting case studies.

Throughout this project, numerous case studies were undertaken, both preceding the design phase and following implementation, to assess operational effectiveness. During the analysis phase, case studies were utilized to comprehend the contexts in which the system would be beneficial. Post-implementation case studies focused on verification, validation, and the system's performance over time.

Test cases are documented in Table 7.1, detailing the test case, the condition under evaluation, the expected outcome, and the actual outcome obtained.

7.3 TEST CASES

TEST NO	INPUT	EXCEPTED RESULTS	ACTUAL RESULTS	PASS/ FAIL	REASON FOR FAIL
1	TULSI	TULSI	TULSI	PASS	-
2	PUNARNAVA	PUNARNAVA	PUNARNAVA	PASS	-
3	SHATAVARI	SHATAVARI	SHATAVARI	PASS	-
4	CACTUS	CACTUS	NOT FOUND	FAIL	IT IS NOT AN AYURVEDIC PLANT
5	CORIANDER	CORIANDER	NOT FOUND	FAIL	IT IS NOT AN AYURVEDIC PLANT
6	PIPPALLI	PIPPALLI	PIPPALLI	PASS	-

Table 7.1 Test Cases

CHAPTER 8

SNAPSHOTS

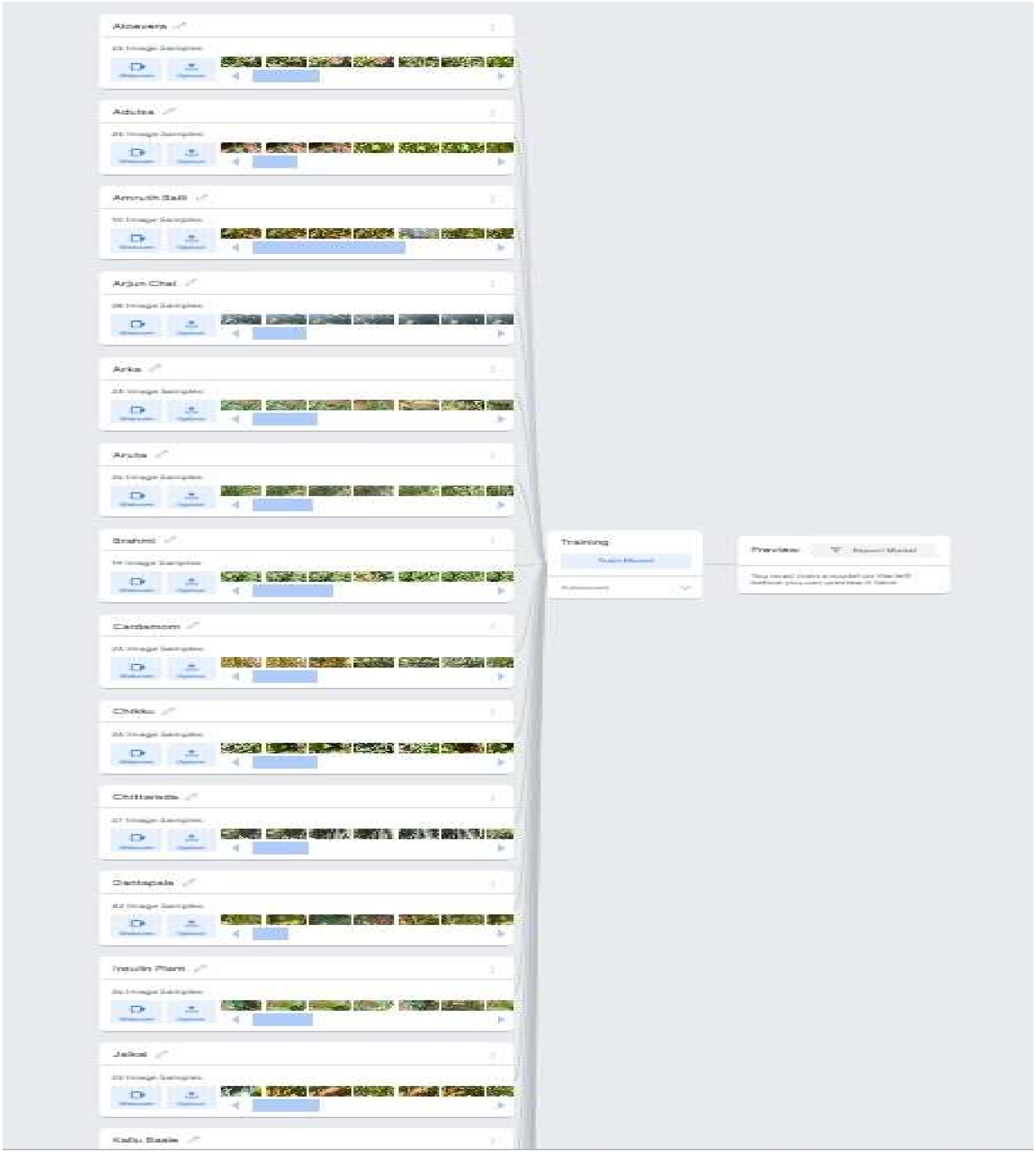

FIGURE 8.1: Training the Dataset using Teachable Machine

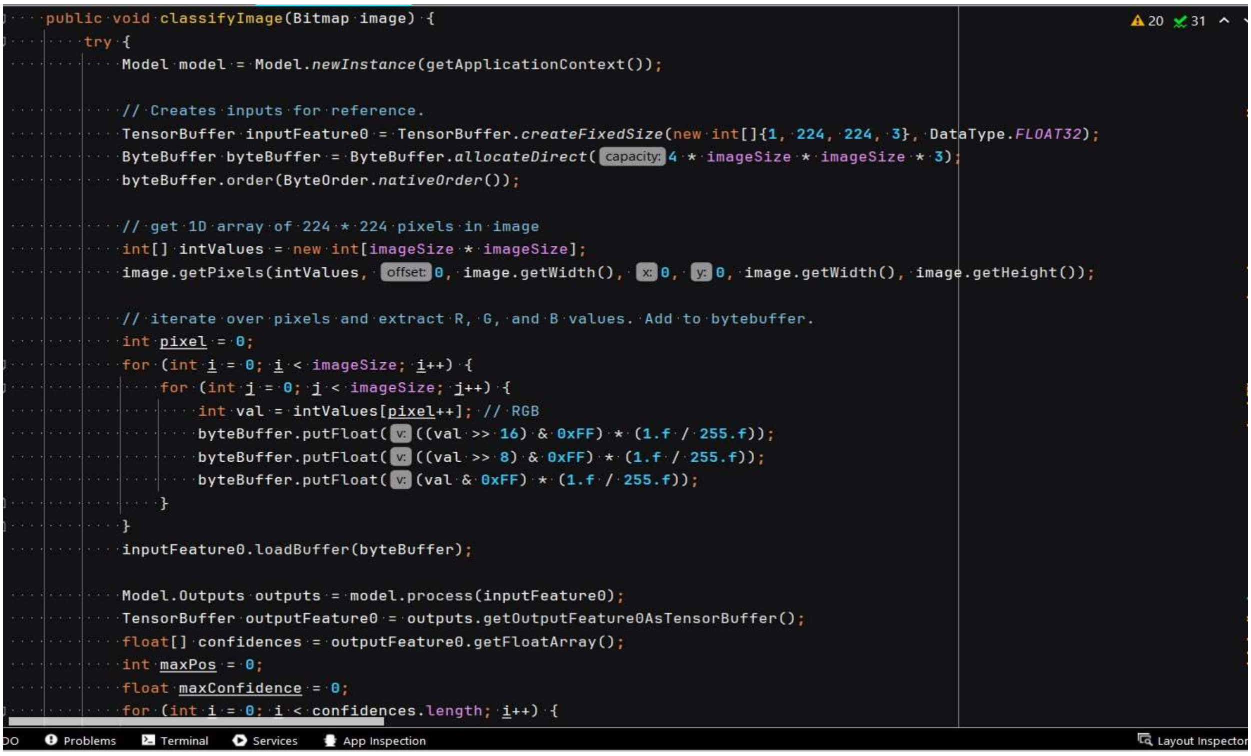

FIGURE 8.2: Deploy dataset in Android Studio

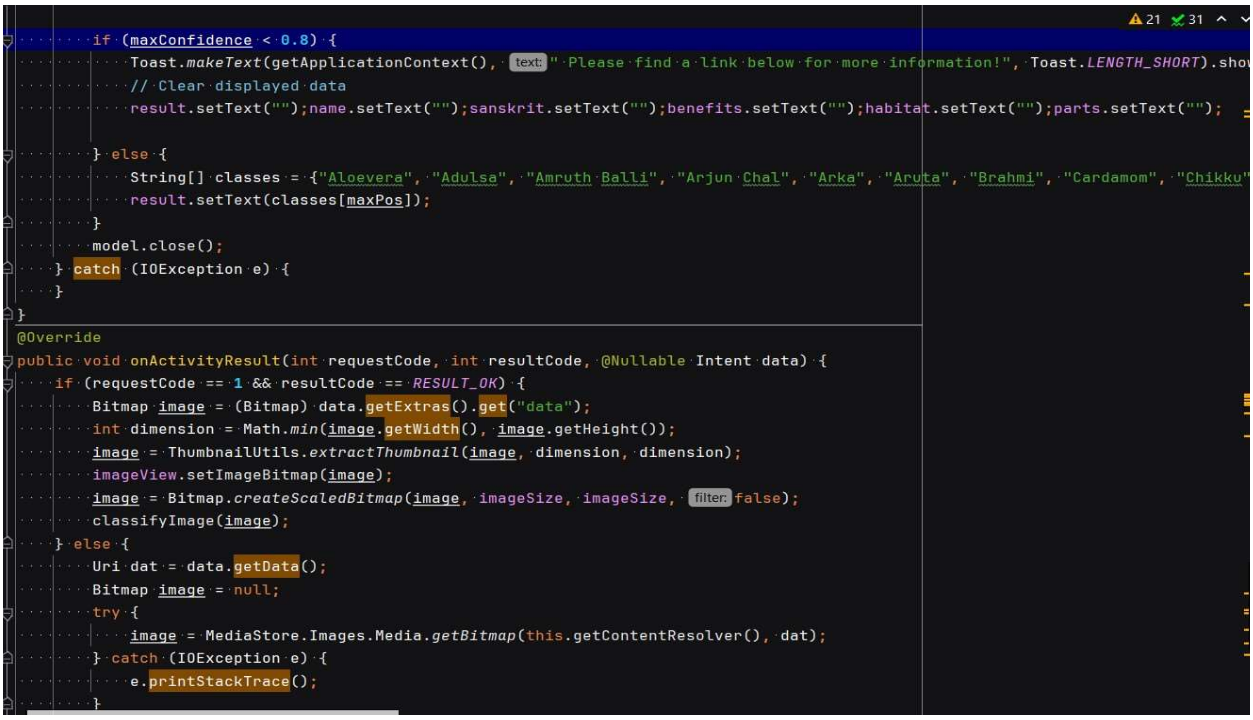

FIGURE 8.3: Confidences to predict output

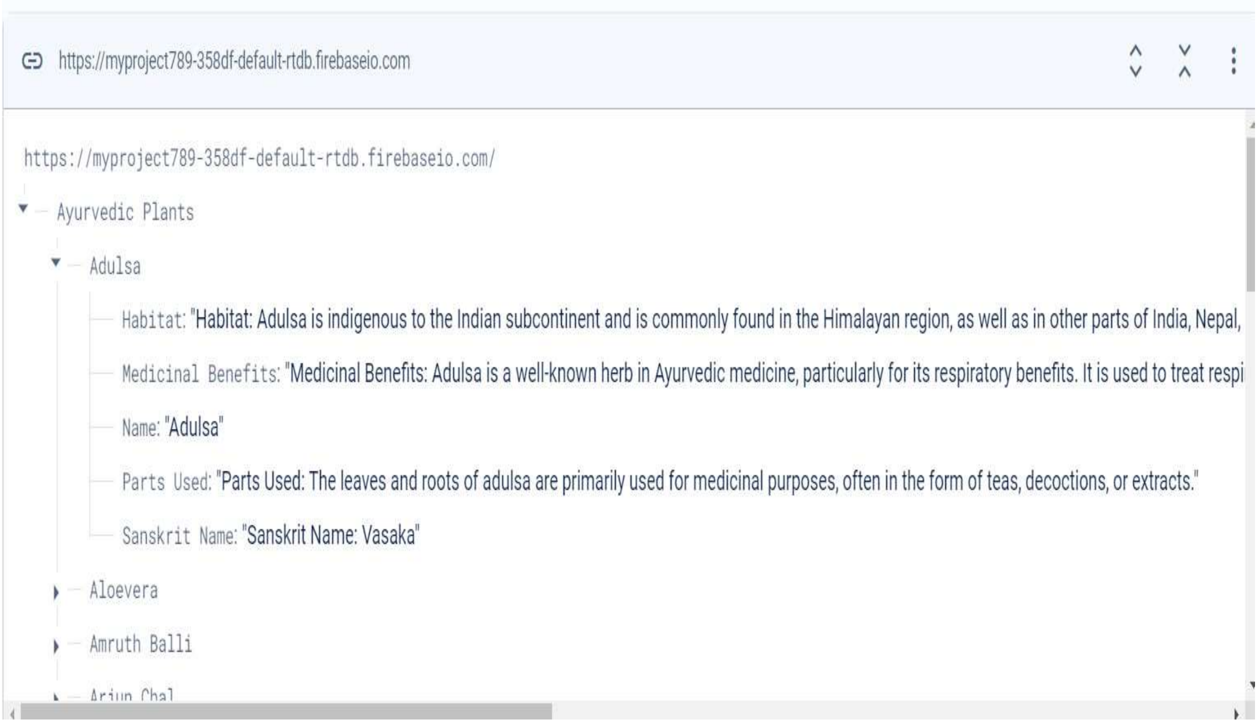

FIGURE 8.4: Features of Plants Stored in Firebase

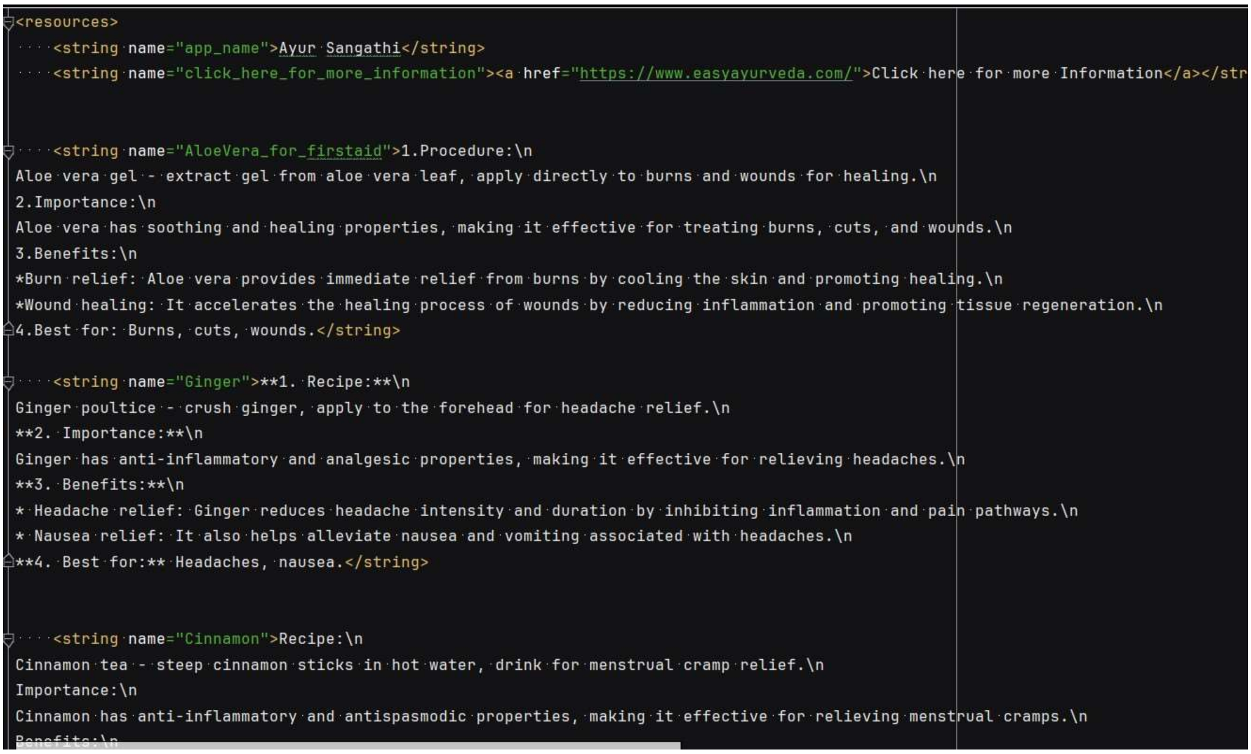

FIGURE 8.5: Features of various Ayurvedic Plants stored in String.xml

```java
private void retrieveData() {
    String Name = result.getText().toString().trim();

    if (!Name.isEmpty()) {
        DatabaseReference userRef = databaseReference.child( pathString: "Ayurvedic Plants").child(Name);

        userRef.get().addOnCompleteListener(task -> {
            if (task.isSuccessful()) {
                DataSnapshot dataSnapshot = task.getResult();
                if (dataSnapshot.exists()) {
                    String Sanskrit = dataSnapshot.child( path: "Sanskrit Name").getValue(String.class);
                    String Parts = dataSnapshot.child( path: "Parts Used").getValue(String.class);
                    String Habitat = dataSnapshot.child( path: "Habitat").getValue(String.class);
                    String Benefits = dataSnapshot.child( path: "Medicinal Benefits").getValue(String.class);

                    name.setText(Name);
                    habitat.setText(Habitat);
                    benefits.setText(Benefits);
                    sanskrit.setText(Sanskrit);
                    parts.setText(Parts);
                } else {
                    name.setText("Not Found");
                    sanskrit.setText("Not Found");
                    habitat.setText("Not Found");
                    benefits.setText("Not Found");
                    parts.setText("Not Found");
                }
            } else {
                name.setText("Error retrieving data");
                sanskrit.setText("");
                habitat.setText("");
```

FIGURE 8.6: Retrieve data from firebase

```kotlin
        detailImageList = arrayOf(
            R.drawable.aloevera, R.drawable.turmeric, R.drawable.sandalwood, R.drawable.neem, R.drawable.rose, R.drawable.hib
            R.drawable.gotukola, R.drawable.fenugreek, R.drawable.coconut, R.drawable.avocado, R.drawable.oatmeal, R.drawable
            R.drawable.almond, R.drawable.papaya, R.drawable.greentea, R.drawable.carrot, R.drawable.rosemary, R.drawable.min
            R.drawable.amla, R.drawable.manjistha, R.drawable.chandan, R.drawable.lodhra )

        recyclerView = findViewById(R.id.recyclerView)
        searchView = findViewById(R.id.search)
        recyclerView.layoutManager = LinearLayoutManager( context: this)
        recyclerView.setHasFixedSize(true)
        dataList = arrayListOf<dataclass1>()
        searchList = arrayListOf<dataclass1>()
        getData()
        searchView.clearFocus()
        searchView.setOnQueryTextListener(object : SearchView.OnQueryTextListener{
            override fun onQueryTextSubmit(query: String?): Boolean {
                searchView.clearFocus()
                return true
            }
            override fun onQueryTextChange(newText: String?): Boolean {
                searchList.clear()
                val searchText = newText!!.toLowerCase(Locale.getDefault())
                if (searchText.isNotEmpty()){
                    dataList.forEach{ it: dataclass1
                        if (it.dataTitle.toLowerCase(Locale.getDefault()).contains(searchText)) {
                            searchList.add(it)
                        }
                    }
                    recyclerView.adapter!!.notifyDataSetChanged()
```

FIGURE 8.7: Retrieve Data from Strings.xml

FIGURE 8.8: APP LOGO

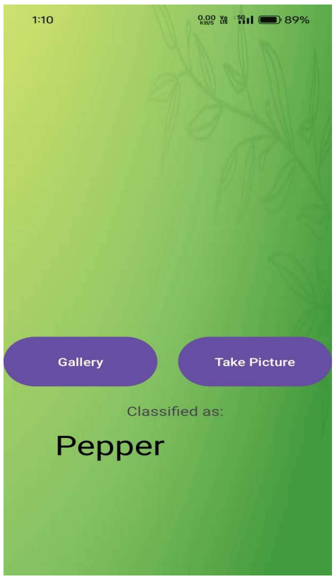

FIGURE 8.9: SCAN PAGE

FIGURE 8.10: HOME PAGE

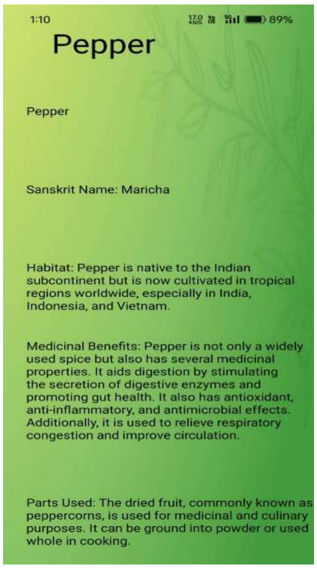

FIGURE 8.11: INFORMATION DISPLAY

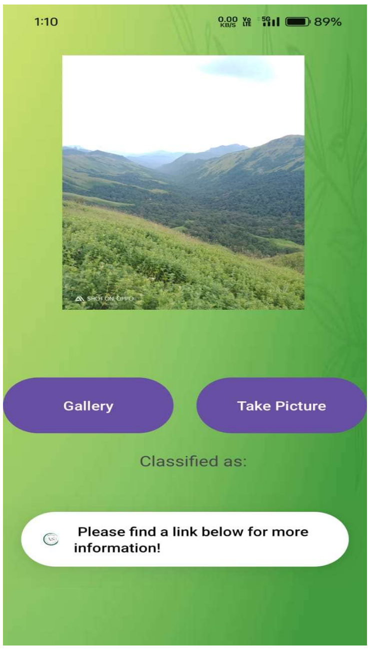

FIGURE 8.12: NOT FOUND PAGE

FIGURE 8.13: DATABASE PAGE

FIGURE 8.14: SEARCH PAGE

FIGURE 8.15: DATABASE PAGE

CHAPTER 9

CONCLUSION AND FUTURESCOPE

In summary, this project endeavors to transform the classification of Ayurvedic plants by tackling current limitations through an innovative application. Extensive research has pinpointed the challenges in achieving accurate plant recognition, particularly in complex environments. These insights serve as the cornerstone for our proposed solution, which leverages cutting-edge technologies like TensorFlow Lite and advanced CNN architectures.

The upcoming application marks a substantial leap forward, aiming to overcome algorithmic shortcomings and deliver improved accuracy and efficiency in Ayurvedic plant identification. By incorporating user-centric features and a comprehensive database, our application promises to offer users detailed information beyond mere plant identification.

Moreover, we recognize the constraints associated with relying solely on Google Images for CNN training, which may lead to diminished accuracy. To mitigate this issue, future developments could concentrate on diversifying the dataset with additional sources and implementing language-specific models to enhance accuracy across various languages.

In essence, our work aspires to set a new standard by seamlessly blending traditional wisdom with modern technology. By providing a transformative platform for Ayurvedic plant classification, our project contributes to the preservation and dissemination of herbal medicine knowledge. Looking ahead, potential enhancements include expanding the database, addressing CNN limitations, and integrating language-specific models to ensure effectiveness and accessibility across diverse user demographics. Through these endeavors, we aim to significantly advance the preservation of Ayurvedic botanical heritage for future generations.

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JOURNAL PAPER PUBLICATION

Our project, titled "AI-Based Ayurvedic Plant Divination," has been published in the Indian Journal of Natural Sciences, a reputable Web of Science indexed journal. This international bimonthly publication is dedicated to advancing knowledge across natural sciences.The full paper can be accessed through the following link: https://tnsroindia.org.in/journals.html

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RESEARCH ARTICLE

AI Based Ayurvedic Plant Divination

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ABSTRACT

In the convoluted realm of medicinal plant utilization, the fusion of ancient wisdom and modern technology emerges as an imperative intervention. Celebrated for its efficiency in treating chronic illnesses. Using Tensor Flow Lite and a Convolutional Neural Network (CNN) algorithm, the application revolutionizes Ayurvedic plant identification through advanced image processing. The user-friendly app, developed in Android Studio, facilitates rapid, precise scanning and detection, providing detailed insights into medicinal benefits, traditional uses, and cultural significance. Beyond recognition, the application encourages active user engagement in cultivation practices and conservation efforts. This innovative tool is essential to safeguard endangered Ayurveda plants, ensuring the preservation of their rich heritage. The project offers a synergistic solution, merging ancient wisdom with cutting-edge technology to conserve Ayurvedic botanical treasures for future generations. This contributes to the intersection of traditional knowledge and technological solutions in a concise and impactful manner, addressing the critical need for the preservation of Ayurvedic plant species.

Keywords: Medicinal plants, Ayurveda, Computer vision, Traditional medicine, Medicinal properties

INTRODUCTION

In the realm of healing traditions, Ayurveda, an ancient medicinal system originating in India, has provided profound solutions for diverse ailments by harnessing the potent properties inherent in medicinal plants. Rooted in a holistic approach that considers the interconnectedness of mind, body, and spirit, Ayurveda boasts a history spanning thousands of years. Despite their historical significance, awareness of Ayurvedic botanical remedies has waned in contemporary society, necessitating a concerted effort for preservation and reintroduction. This research endeavors to address this imperative through the development of an innovative system at the confluence of ancient wisdom and state-of-the-art technology. Leveraging a Convolutional Neural Network (CNN) algorithm implemented via TensorFlow and seamlessly integrated into a Mobile Application developed using Android Studio. The project offers a comprehensive guide to Ayurvedic plants. This application not only visually identifies the plants but also provides extensive information regarding their benefits and methods of incorporation into daily life. Central to this system is a sophisticated computer vision mechanism empowered by advanced algorithms. This mechanism captures and processes intricate leaf images, extracting features such as eccentricity, color and shape. The automated plant identification feature, akin to a digital herbalist, functions as a scanner, enabling users to effortlessly detect and learn about various Ayurvedic plants. This fusion of Artificial Intelligence and Ayurvedic knowledge not only bridges awareness gaps but also nurtures a deeper connection between individuals and the healing properties of nature. Additionally, this project draws inspiration from recent advancements in automated plant identification. From algorithms utilizing Gaussian distribution for precise classification to innovative combinations of Speeded Up Robust Features (SURF) and Histogram of Oriented Gradients (HOG) achieving near-perfect accuracy rates, these technological strides underscore the potential for a cultural resurgence. This convergence represents not only a technological leap but also a harmonious integration where ancient wisdom synergizes with modern scientific methodologies. By seamlessly blending tradition with innovation, this transformative system revitalizes the understanding of Ayurvedic plants, ensuring the enduring legacy of their healing properties. This endeavor transcends technological innovation; it signifies a cultural revival where the echoes of Ayurveda resonate through the corridors of modernity, emphasizing the invaluable treasures nature provides for holistic well-being. This research contributes to the ongoing discourse in the intersection of traditional medicinal knowledge and contemporary technological solutions, offering a promising avenue for the preservation and dissemination of Ayurvedic wisdom.

LITERATURE REVIEW

The intersection of machine learning, deep learning and Image processing has seen significant exploration in the domain of medicinal plant classification, particularly employing convolutional neural networks (CNNs). Previous research has predominantly relied on CNNs for the recognition of plant species based on leaf characteristics, demonstrating commendable accuracy in various studies. However, inherent limitations, particularly in handling complex backgrounds and smaller leaves observed in the papers proposed by R. Upendar Rao et al., have prompted the need for advancements in this field. Our proposed application represents a substantial leap beyond these constraints, incorporating state-of-the-art technologies such as Tensor Flow and advanced CNN architectures. A critical analysis of prior literature projects proposed by Nilesh Bhelkar et al., that the algorithms employed were often deemed insufficient and inaccurate, impeding their overall efficiency. In stark contrast, our application employs CNN, achieving an outstanding accuracy of 94%, thereby transcending the limitations of prior projects proposed by Dinesh Shitole et al., and Rakibul Sk et al., significantly enhancing efficiency in Ayurvedic plant recognition. The distinctiveness of the application lies in its user-centric features, designed to facilitate active engagement in plant identification and learning. Noteworthy is the incorporation of a comprehensive database, setting our application apart by providing users with extensive information beyond mere plant identification. This synthesis of advanced technology precision and user-centric design collectively positions our application as a pioneering and distinctive solution in the landscape of Ayurvedic plant recognition. In conclusion, while earlier projects proposed by Fadil Chady et al., laid the foundational groundwork, proposed application signifies a substantial advancement, overcoming the inefficiencies of past algorithms and delivering a more accurate and efficient platform for Ayurvedic plant classification. This research contribution establishes a new paradigm, fostering a seamless blend of technological sophistication and user engagement in the exploration and dissemination of herbal medicine knowledge.

Problem Statement
In the realm of natural remedies, Ayurvedic plants pose a significant challenge for recognition and accessibility, attributed to complex identification methods and the inadequacies of existing plant recognition apps. The intricate nature of Ayurvedic knowledge exacerbates this issue, leading to a substantial gap in understanding and utilization. Our research identifies this pressing problem and endeavors to bridge the gap by employing artificial intelligence. Through the development of a user-friendly application, we aim to empower individuals spanning from enthusiasts to practitioners, to overcome the hurdles of Ayurvedic plant recognition. The objective is to create a comprehensive solution that not only addresses the complexities of identification but also fosters a deeper connection with the healing potential of Ayurvedic flora.

PROPOSED METHODOLOGY

This innovative application's methodology is centered around cutting-edge technologies, prominently computer vision and deep learning algorithms, facilitating the scanning, identification, and comprehensive analysis of Ayurvedic plants. The process begins with the capture of high-resolution plant images, subjected to pre-processing techniques to enhance clarity and quality. Leveraging the Convolutional Neural Networks (CNN), a robust deep learning algorithm, the application conducts intricate plant recognition, discerning unique features such as leaf patterns, shapes, and textures. Implemented in Python using TensorFlow, the CNN algorithm plays a central role in the precise identification of Ayurvedic plants. TensorFlow provides a robust framework for the development and training of deep neural networks, enhancing the efficiency and accuracy of the identification process. The integration of Android Studio, utilizing Kotlin, facilitates seamless application development for Android devices. Upon successful identification specialized algorithms are deployed for image detection and processing employing complex pattern recognition methodologies to extract essential characteristics from the plant images. The CNN architecture that is designed for image classification tasks, ensures precise feature extraction contributing to accurate plant classification. Subsequent to identification, the application retrieves comprehensive information about the recognized plant from an extensive database.

This database includes the plant's local name, uses, different properties and botanical information. The intention is to empower common users with the ability to easily identify and understand Ayurvedic plants. This information is presented in distinct sections within the application, each dedicated to specific aspects such as plant recognition and detailed analysis of medicinal properties. The app operates by performing all algorithms in the backend, and upon completion, it displays the output by presenting the matching plant's information, including its uses. In cases where the scanned plant is not identified as an Ayurvedic plant, the application connects to Google and provides relevant results, indicating that it is not an Ayurvedaplant. The significance of utilizing CNN, TensorFlow and Android Studio lies in their combined efficiency. CNN excels in image recognition tasks, TensorFlow provides a robust deep learning framework, and Android Studio facilitates user-friendly application development. Python serves as a versatile language for seamless implementation. The meticulous design of the application ensures not only the accurate scanning and identification of Ayurvedic plants but also the dissemination of valuable information, fostering a deeper understanding of these natural resources in the context of holistic healthcare.

Architecture
In the proposed research application, users initiate plant identification by capturing an image, subsequently undergoing pre-processing for image enhancement. The Convolutional Neural Network (CNN) then scrutinizes the extracted features for precise plant recognition. Upon successful identification, comprehensive plant information is retrieved from a dedicated database. The user-friendly interface systematically categorizes and presents this information, enabling user exploration. Users engage further by interacting with the application, saving, and sharing plant profiles, fostering a deeper understanding of Ayurvedic plants. This architecture seamlessly integrates image processing, deep learning, and database retrieval, offering an efficient and user-friendly solution for Ayurvedic plant recognition.

Work Flow
Image Capture: High-resolution images of Ayurvedic plants are captured.
Pre-processing: Images undergo enhancement and noise removal.
Feature Extraction: Key plant features like patterns and textures are extracted.
CNN Implementation: Convolutional Neural Network analyzes features for plant recognition.
Plant Identification: CNN matches features with a trained dataset for accurate identification.
Information Retrieval: Comprehensive data, including medicinal benefits, is retrieved from a database.
Data Presentation: User-friendly interface categorizes and presents plant information.
User Interaction: Users can explore, save, and share plant profiles.

RESULT ANALYSIS
Comparison Of Existing Models Vs Proposed Model

CONCLUSION

In conclusion, the work is poised to address identified shortcomings in Ayurvedic plant classification through an innovative application. Through a thorough literature survey, challenges in handling complex backgrounds and achieving precise plant recognition have been recognized, paving the way for the proposed solution. The forthcoming application will represent a groundbreaking leap forward by leveraging cutting-edge technologies, including TensorFlow Lite and advanced CNN architectures. The critical analysis undertaken in this research underscores a commitment to overcoming algorithmic inefficiencies and ensuring enhanced accuracy and efficiency in Ayurvedic plant recognition. The uniqueness of the future application will be evident in its user-centric features and the integration of a comprehensive database, promising users extensive information beyond mere plant identification. By acknowledging and proactively addressing the limitations identified in the literature survey, the work is set to contribute a transformative and efficient platform for Ayurvedic plant classification. In essence, the work endeavors to establish a new standard, harmonizing traditional wisdom with modern technology. Through this ongoing work, we anticipate offering a significant advancement in the exploration and dissemination of herbal medicine knowledge, ensuring the preservation of Ayurvedic botanical treasures for generations to come.

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Research Paper Name	**Drawback of Existing System**	**Proposed System**
System To Detect Ayurvedic Plants and it is Medicinal Values	The proper result was not generated when the leaf images were rotated.	Designed to provide most accurate result irrespective of dimension
Identification Of Plants Using Deep Learning	Size of the dataset is limited. Samples of different classes of the plants leaf to be added	Most of the dataset has been tried to collect which are available in surrounding irrespective of classes
Worldwide Research Trends on Medicinal Plants	Discussed only about the development of medicinal plants over English medicine	Includes many other features compare to this model like identification of plant, image, information with use and benefits
Literature searches on Ayurveda	It only concentrates on Ayurveda literature search and strategy to retrieve maximum publications	It is devoid of any of the practical use that our model is proposing it is specifically designed only to search
The Significance of Ayurvedic Medicinal Plants	It discusses only on the importance, availability and caution before using the plants	Considering this information briefly our app consists a scanner to identify the plant using CNN technique and retrieve the data.
Medicinal plant classification using a convolution neural network	Identify only one plant leaf at a time and also automata plant recognition is most difficult in complex backgrounds	It is designed to identify an ayurvedic plant irrespective of complex backgrounds and also provide complete information about the plant
A mobile app for recognition	This app is only designed for plants	It is done using CNN which has highest

of medicinal plants from Republic of Mauritius using deep learning in real time	from Republic of Mauritius and it is done in MATLAB platform where they perform poorly under normal environment	of 94% accuracy and the best model for plant detection and also our app contain many features with lot of benefits

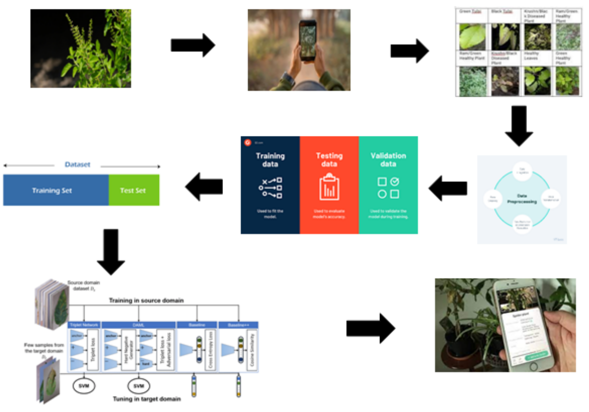

Figure1 Procedure involved to recognize the Ayurvedic plants

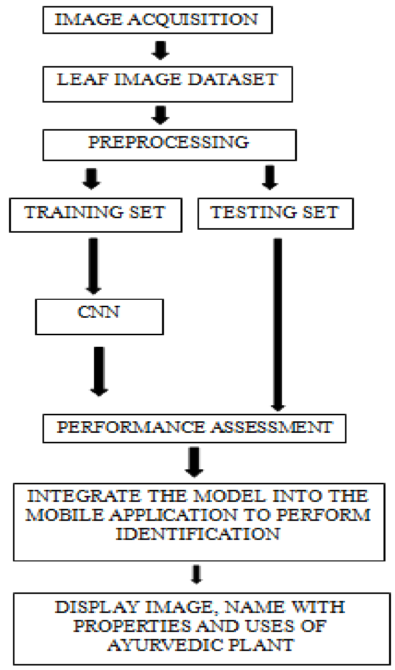

Figure2 Proposed integrated model to identify the Ayurvedic plants