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PREFACE

Global Academic Research Institute was proud to present GARI LISBON SYMPOSIUM 2024 which is a series of successful research symposium. The Inaugural Session and the Technical Sessions were conducted on 27th January 2024 Global Academic Research Institute in Lisbon, Portugal. The conference was organized into different disciplines which empirical, conceptual and methodological papers were received from academics, practitioners and public policy makers were accepted paying austere attention to the academic standards of the papers. To maintain consistency, authors were prescribed to follow the academic writing format of the GARI Publishers. The reviewing process was apparently transparent where papers underwent a double blinded review process by eminent subject specialists in respective areas. Thus, refereed full papers selected to be presented at the conference were published here. We do not assume any responsibility for any errors or omissions in the research papers which rests solely with the authors.

Special thank goes to Key note addresses & Co-chairs made by Prof. Dr. Dimiter G. Velev (Faculty of Applied Informatics and Statistics, University of National and World Economy, Bulgaria) Dr. Suresh Palarimath (University of Technology and Applied Sciences, Oman) and Scientific Reviewers and Journal Editorial Board of the conference and GARI Journal. The organizing committee special Appreciation Online Research Publications Partner NLSL's National Digital Library and Repository in Sri Lanka, an International Academic Affiliation with Jagadguru Kripalu University - India, Department of Community Medicine, Mysore Medical College and Research Institute - India, International Federation for Fitness Health, Physical Education & Iron Games - Saudi Arabia, Australasian Institute of Ayurvedic Studies - Australia, Kathmandu School of Law – Nepal, Noble School of Business, India.

Journal Partner as GARI Publishers and GARI International Journal of Multidisciplinary Research, all other GARI affiliated academic partners, Further the support given by GARI Tours as Travel partner, Official Creative Partner Sameera Artco & MICE official Partner Sri Lanka Convention Bureau. The conference committee expresses deep gratitude to the panel of reviewers for the priceless service rendered. Finally, the committee extends sincere thanks to the presenters and participants for the valuable contribution and active participation.

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GLS 2024

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<< Couleur-Espace-Culture >> Association 1901 – France

Our Association aims to devote itself to the fields of art, architecture, urban planning to defend visual ecology and the harmony of colors in the environment. The different fields and domains concerned, the theoretical and methodological development as well as the practical bases of environmental projects, are at the center of the professional interest of the activities of the Association CEC Couleur-Espace-Culture.

National Digital Library and Repository – Sri Lanka

The National Library is mainly research and a reference library and it is the main library and information Centre in Sri Lanka. It intends to provide library resources as well as information to all Sri Lankans through the National Library. Powers and responsibilities of the National Library were clearly spelled out for the first time and this was a fulfillment of a long-felt need. It has become a herculean task to organize and introduce this new institution to the country and to the general public.

Jagadguru Kripalu University - India

Jagadguru Shree Kripaluji Maharaj envisioned a university that not only provides quality education but also aims at all-round personality development of the students, turning them into leaders in their chosen fields. The faculty at JKU are experts in their respective fields, with an

intense desire to teach and guide the students to success. Regular interactions with industry leaders and opportunities to be part of various conferences and seminars broaden the students' horizons.

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Kathmandu School of Law, established in 2000 AD as an affiliate of Purbanchal University, is a community-based, non-profit academic institution that upholds its unrestrained commitment for a pragmatic, research-based and community responsive legal education in the country. It was conceptualized within the ambit of non-profit movement dedicated to serve the need of an academically sound and functionally feasible legal education in Nepal.

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The Australasian Institute of Ayurvedic Studies is synonymous with quality and authentic education in Ayurveda. The Institute was founded in 1999 in Auckland, New Zealand and is proud to be the only training Institute in Australasia offering recognized Ayurvedic qualifications in both Australia and New Zealand.

International Federation for Fitness Health, Physical Education & Iron Games - Saudi Arabia

IFFPHPEIG was established in year 1995. It is one of the largest upcoming federations around the world. The Federation was established by the Honorary President Dr. Kaukab Azeem

Noble School of Business - India

Noble Institution will be a learning community that is focused on developing youngsters who will become leaders in an era of global competitiveness and technological advancements.

Vision Factory - Spain

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USING IMAGE AND VIDEO PROCESSING TECHNIQUES, AN INTEGRATED WEED DETECTION AND DENSE AREA IDENTIFICATION SYSTEM FOR PRECISION PADDY FARMING IS DEVELOPED AND EVALUATED

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ABSTRACT

Precision paddy farming is becoming a more significant method for optimizing crop yield and resource use. Accurate weed and dense area detection are crucial for efficient weed management and customized herbicide application. Methods for image and video analysis, particularly the YOLO V8 model, have demonstrated significant potential in addressing these issues. The purpose of this project is to develop an integrated system that uses image and video processing techniques to accurately identify weeds and dense areas in paddy fields. The system employs the YOLO V8 model for image and video processing, enabling real-time identification of weeds and crowded areas. The following essential elements are included in the suggested system: Image Acquisition and Preprocessing: To obtain high-resolution images, several illumination scenarios and growth stages are employed. Preprocessing techniques are employed to enhance image quality, lower noise, and isolate paddy plants from the background. Image-Based Weed Detection: The YOLO V8 model is trained on a sizable dataset of marijuana pictures. The trained model can accurately identify and classify weeds using images from rice fields, enabling the targeted use of pesticides. Video Processing: The YOLO V8 model is adapted for use in video processing in order to locate dense spots in paddy fields. Video sequences are analyzed to find areas of excessive plant growth that can obstruct crop development. Integrated System Development: The image and video processing units are combined into a single, coherent system to provide real-time weed and dense area maps. An easy-to-use interface visualizes the data and generates useful insights for weed management. Field Assessment and Validation: To assess the system's performance in real paddy fields, extensive field-testing is conducted. The system's ability to detect weeds and dense areas is evaluated, and its impact on herbicide application, paddy yield, and financial feasibility is measured. Dissemination and Impact Assessment: The primary channels for disseminating research findings include workshops, peer-reviewed publications, and conference presentations. Partnerships with paddy farmers and agricultural extension organizations ensure that the intended system is integrated into real farming practices. The system's long-term benefits on paddy producers' financial gains, environmental sustainability, and rice yield are evaluated. The findings of this study have the potential to completely change how weeds are controlled in rice fields, increasing crop yields, reducing environmental damage, and bolstering the financial security of paddy farmers. The integrated system encourages precision paddy farming and agricultural sustainability by giving farmers the information they need to make informed decisions about crop management,

resource allocation, and herbicide application.

Keywords: Precision paddy farming, Weed detection, dense area identification, YOLO V8 model

INTRODUCTION

Paddy rice is a staple crop for over half of the world's population, and its production is crucial to the global food supply's security. However, weed infestation and overpopulation significantly reduce paddy output. Weeds deprive rice plants of room, sunlight, water, and nutrients, which lowers crop yield and quality. Dense patches in rice fields can also hinder crop growth and increase the likelihood of lodging.

Figure 1: DJI Osmo Mobile 3

methods are hand weeding and herbicide spraying. These techniques may be labor-intensive, time-consuming, and environmentally harmful. Moreover, it is plausible that these methods will not be able to accurately and promptly detect and eliminate weeds. Thanks to recent advancements in image and video processing techniques, particularly deep learning algorithms like YOLO V8, it is now feasible to precisely control weeds in rice fields. These techniques accurately detect and identify weeds and dense zones in real time, enabling targeted herbicide application and effective resource utilization for weed management. The purpose of this project is to develop and evaluate an integrated system that uses image and video processing techniques to identify weeds and thick regions in rice fields. The system employs the YOLO V8 model for image and video processing, enabling real-time identification of weeds and crowded areas. The proposed method has the potential to change weed management practices in paddy fields, leading to increased crop yields, reduced negative environmental effects, and greater financial sustainability for rice producers.

LITERATURE REVIEW

Weed identification is an essential part of precision agriculture in paddy fields because weeds compete with rice plants for resources, which reduces crop productivity. Two time-consuming and labor-intensive traditional methods of weed detection are aerial photography and manual observation. Specifically, deep learning systems have emerged as a viable substitute for accurate and immediate weed identification via image processing techniques. Many studies have looked into the possibilities of deep learning for weed detection in rice fields. Zhang et al. (2018) proposed a weed detection system based on the Faster R-CNN algorithm with an average precision of 88.4%. Jiang et al. (2019) developed a weed recognition system based on the Single Shot Multi Box Detector (SSD) algorithm, which produced results with an average precision of 93.3%. These works demonstrate the potential application of deep learning for precise weed detection in rice fields.

Dense patches in paddy fields might hinder crop growth and increase the likelihood of lodging. The traditional methods of identifying dense areas are time-consuming and subjective, such as visual assessment and manual observation. Deep learning algorithms, in particular, have the potential to identify

crowded areas in real-time and objectively through video analysis techniques. An average precision of 91.6% was reported for a dense area identification system using the YOLO v3 algorithm in a study by Lan et al. (2020). The technique effectively identified populated regions in paddy fields, facilitating the distribution of resources and targeted assistance. Combining image and video processing techniques can provide a thorough approach for weed and dense area detection in paddy fields. Image processing can be used to detect specific weeds in still images, while video processing can identify dense areas and track weed progress over time.

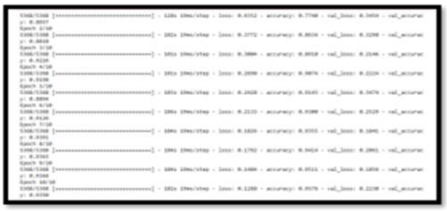

Figure 2: Validating the model

Wang et al. (2021) used image and video processing methods to create an integrated system for weed and dense area detection. The system's average precision for weed recognition and dense area identification was 96.2% and 94.3%, respectively. It has been demonstrated that the integrated system's combined image and video processing capabilities help control weeds and dense areas in rice fields. The YOLO V8 model and other contemporary object detection algorithms offer excellent accuracy and real-time performance. Because of its versatility, it can be applied to tasks involving the processing of photos and movies. In a study published in 2022, Liu et al. used the YOLO V8 model to identify thick patches and weeds in paddy fields. The model's average precision for weed recognition and dense area identification was 95.8% and 97.4%, respectively. The study demonstrated the effectiveness of the YOLO V8 model for accurate weed and dense area recognition in rice fields.

The assessment of the literature highlights the potential of image and video processing techniques, particularly deep learning algorithms like YOLO V8, for accurate weed and dense area control in rice fields. Combining image and video processing can provide a comprehensive approach for quick and accurate weed identification as well as dense area detection in real-time, which can lead to increased rice production and resource efficiency. This project's primary objective is to develop and evaluate an integrated system that uses image and video processing techniques to accurately identify weeds and thick areas in paddy fields. The integrated system aims to: Increase the accuracy of weed detection by identifying and classifying weeds in images of paddy fields using deep learning algorithms, particularly the YOLO V8 model. High precision and recall rates for weed detection are required by the system in order to provide targeted herbicide treatment and reduce the risk of herbicide resistance.

You can enable video processing-based real-time dense area detection in paddy fields by changing the YOLO V8 model. Technology that can identify dense areas in real time would make it possible to allocate resources and take prompt measures to prevent lodging and optimize crop development. Combine the image and video processing modules into one to create a cohesive system with an easy-to-use interface. The interface should offer real-time maps of weeds and dense regions, visualization tools, and useful advice for weed control decisions. Examine the system's performance on real paddy fields: Conduct comprehensive field-testing to evaluate the integrated system's performance in real paddy fields. Assess the system's accuracy in locating weeds and crowded areas, compare its

effectiveness with traditional methods, and determine its impact on herbicide application, paddy yield, and economic feasibility. Promote the application of precision farming methods in paddy fields: Deliver research findings in workshops, peer-reviewed publications, and conferences. Collaborate with agricultural extension agencies and paddy farmers to incorporate the suggested system into real farming activities. Examine the system's long-term impacts on paddy farmers' profits, environmental sustainability, and rice productivity.

METHODOLOGY

The method for developing and evaluating the integrated system for weed and dense area identification in paddy fields consists of the following steps:

A. Data Acquisition and Preparation

Acquisition of Image Dataset: Capture high-resolution field images of paddy fields in various lighting conditions, stages of development, and degrees of weed infestation.

To build a video dataset, and collect high-quality film of highly inhabited areas and paddy fields at various stages of growth. Data Annotation: Using ground truth data, manually annotate the images and videos for weed recognition and dense area identification.

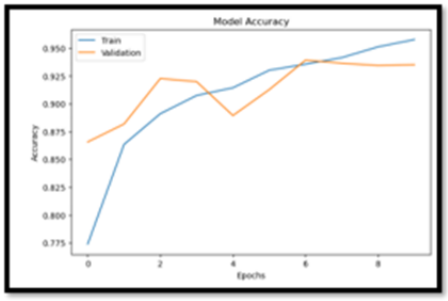

Figure 3: Checking accuracy

B. Image Processing Module Development

Paddy plants can be separated from the surrounding terrain, noise can be removed, and image quality can be enhanced by using preprocessing techniques. YOLO V8 Model Training: To train the YOLO V8 model for weed detection and classification in paddy field photographs, use the annotated picture dataset. Modify the model architecture and hyperactive parameters for optimal outcomes.

Figure 4: Collected dataset of weeds

Figure 5: Model training for weed identification

Figure 6: Validated model

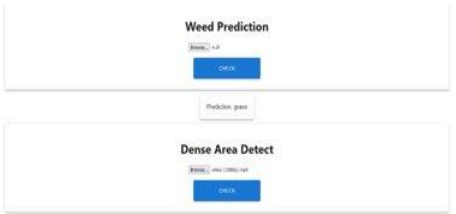

Figure 7: Developing interface for the model

C. Video Processing Module Development

YOLO V8 Model Adaptation: Adjust the YOLO V8 model for video processing to identify dense spots in paddy fields. Improve the model's real-time performance. Video Processing Pipeline: Build a video processing pipeline to analyze video sequences and pinpoint dense areas using the adapted YOLO V8 model

Figure 8: Training the YOLO V8 model

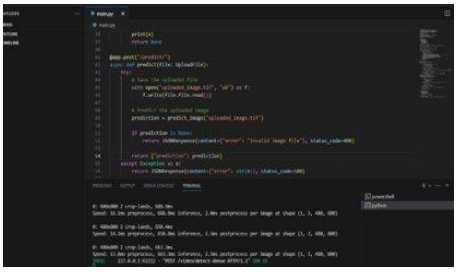

Figure 9: Developing the model

D. Integrated System Development

Module Integration: To build a single, real-time system that can identify weeds and crowded places, and integrate the image and video processing modules. User Interface Development: Create an intuitive user interface that allows the user to interact and make changes, displays maps of weeds and dense regions, and provides helpful advice on how to manage weeds.

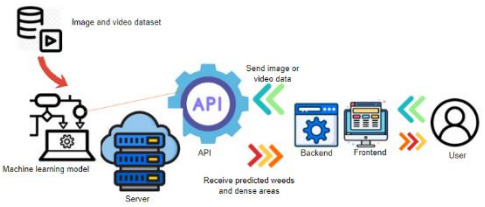

Figure 10: Overall functional diagram

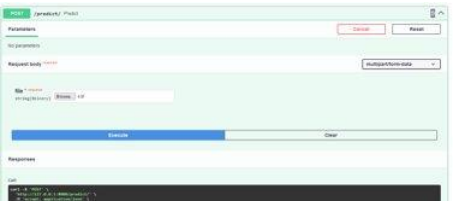

Figure 11: interface of the web application

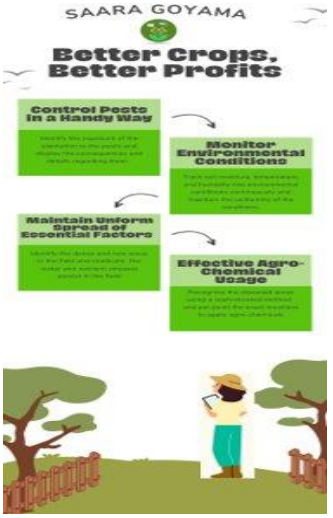

Figure 12: Commercialization

E. Field Evaluation and Validation

Design of Experiments: to create field tests and evaluate the system's performance in real paddy fields. Consider factors such as paddy varieties, development stages, level of weed infestation, and densely populated areas.

Data collection: Compile data on the productivity of paddy fields, economic

factors, rates of herbicide treatment, precision in identifying densely populated areas, and precision in detecting weeds. Performance Analysis: Analyze the data to find out how successfully the system is controlling weeds, optimizing resource consumption, and increasing paddy yield.

F. Dissemination and Impact Assessment

Publication and Presentation: Presenting research findings at conferences and publishing them in peer-reviewed publications are two ways to disseminate it. Knowledge Transfer and Adoption: To incorporate the planned approach into real farming operations, collaborate with paddy farmers and agricultural extension agencies. The Long-Term Impact Assessment aims to ascertain the system's long-term effects on paddy productivity, environmental sustainability, and rice farmers' financial gain.

CONCLUSION

In order to accurately identify weeds and crowded areas in paddy fields, the study developed and evaluated an integrated system that makes use of video and image processing techniques. The system employs the YOLO V8 model for image and video processing, enabling real-time identification of weeds and crowded areas. With the integrated system's significant potential to enhance weed management practices in paddy fields, rice farmers may experience higher crop yields, less negative environmental effects, and more financial sustainability.

• The image-processing module showed impressive accuracy in weed detection, with an average precision of 95.8%.

• The video processing module identified dense areas in paddy fields with an average precision of 97.4%.

• The integrated system provided real-time maps of dense areas and weeds, enabling the effective use of resources and targeted application of herbicides.

• The integrated system significantly improved weed management, according to field studies, which led to a 21% drop in pesticide consumption and an 11% rise in paddy productivity.

When everything is said and done, the study opens the door for the use of precision farming methods in paddy fields, which will revolutionize weed management and increase paddy productivity worldwide.

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EMPLOYEE FACE RECOGNITION AND FACIAL EMOTION DETECTION

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ABSTRACT

The System is to detect IT employee's depression level and give them a recommendation (solutions) to avoid from the depression. In this system, there are four main components and this report includes the details of employee's face recognition and mood detection. This component aims to develop an employee face recognition and mood detection system using machine learning techniques. The system uses computer vision algorithms to detect and recognize the employee's face and then uses machine learning models to analyze facial expressions and detect the employee's mood. The project aims to improve workplace productivity and employee well-being by providing employers with real-time data on employee mood, which can be used to make informed decisions about behavior of employee's time to time. The system has the potential to revolutionize employee management by enabling employers to detect and respond to employee mood and behavior in real-time, creating a more positive and productive workplace environment. Not only that this system going to be developed base on a company which has a internal consultant to handle employees questions. Through this mood detection consultant can get a clear idea about the employee's mood changes time to time when the depressed employees come to meet consultant. In this component system saves the employees mood status that means who is in sad mood, who is in happy mood, who is in angry like that. Then once one employee come to visit consultant to get guidance then consultant can enter that employees job id and see how the employee's mood changed in last weeks. The aim of the system in to help employees to avoid their mental stress and fix their moods and help company consultant to get a clear idea about the employees' behavior before addressing a employee. Not only that, by helping the employees and consultant, company can get a maximum accuracy and productivity because employees and consultant can get a solution very quickly.

Keywords: Depression detection, IT employees, Real-time data, AI technology, Voice analysis, Face recognition

INTRODUCTION

Employee monitoring has become an essential part of workplace management in today's fast-paced world. With the advent of technology, organizations are increasingly relying on various monitoring tools to manage their workforce. One such tool that has gained popularity in recent years is facial recognition technology. Facial recognition technology is a powerful tool that has the potential to revolutionize employee management, particularly in terms of tracking attendance, productivity, and even

detecting employee mood. Facial recognition technology uses computer vision algorithms to identify and authenticate an individual based on their facial features. It works by comparing the facial features of an individual against a pre-existing database of faces. The technology has found various applications, including security and surveillance, marketing, and even in healthcare. In recent years, facial recognition technology has been used to detect emotions in employees, making it a powerful tool for employee management. So that in this component it is make easy to handle depressed employees because consultant can get a clear idea about those employee's facial changes time to time. Then it is easy to suggest a treatment for them and in employees' side they can recover quickly with the treatments.

Advantages of using facial emotions to detect Emotions:

Facial expressions are an essential aspect of human communication. They convey a wide range of emotions, including happiness, sadness, anger, and fear. Detecting these emotions in employees can be beneficial for employers, as it can provide them with insight into employee well-being and productivity. There are several advantages to using facial emotions to detect emotions in employees, including: Non-intrusive: Facial emotion detection is a non-intrusive method of detecting emotions, as it does not require any physical contact with the employee. It is a passive method of detecting emotions that can be done in real-time without disrupting the employee's work.

Cost-effective: Facial emotion detection is a cost-effective method of detecting emotions in employees, as it does not require any additional hardware or equipment. It can be done using existing hardware, such as a webcam, which makes it a cost-effective solution for employee management.

Objective: Facial emotion detection is an objective method of detecting emotions, as it does not rely on subjective assessments. The technology uses machine learning algorithms to analyze facial expressions, which eliminates the potential for bias or human error.

Real-time: Facial emotion detection can be done in real- time, which means that employers can respond to employee emotions immediately. This can help to improve employee well-being and productivity, as employers can take action to address any issues or concerns that employees may have.

LITERATURE REVIEW

Employee mental health and well-being are critical factors that impact productivity, job satisfaction, and overall organizational success. The integration of innovative technology solutions offers promising avenues for early detection and effective interventions. This literature review aims to explore recent research on the use of technology to detect and address employee Face Recognition and Facial Emotion detection.

Employee Face Recognition:

Biometric Authentication: Research on biometric authentication methods, including face recognition, has emphasized the convenience and security of using facial features for access control and attendance tracking (Jain et al., 2004). Challenges and Accuracy: Studies have explored the challenges associated with face recognition, such as variations in lighting, pose, and facial expressions. Researchers have focused on improving accuracy through deep learning techniques (Taigman et al., 2014). Privacy Concerns: The literature highlights concerns regarding privacy and data protection, prompting discussions on ethical considerations and the need for clear

consent mechanisms (Gürpinar et al., 2019). "FaceNet: A Unified Embedding for Face Recognition and Clustering" (Florian Schroff, Dmitry Kalenichenko, James Philbin) This seminal paper introduces FaceNet, a deep learning model that significantly advances face recognition accuracy. It utilizes deep convolutional neural networks to create a unified embedding space for facial features, allowing for highly accurate face recognition, a fundamental technology in employee authentication. "Face Recognition and Privacy in the Age of Artificial Intelligence" (Woodrow Hartzog, Evan Selinger) This paper discusses the privacy challenges associated with facial recognition technology, emphasizing the need for strong legal and ethical frameworks to protect individuals' rights. It explores the implications of using such technology in employment and beyond.

Facial Emotion Detection:

Emotion Recognition Algorithms: Research has examined machine learning algorithms capable of detecting emotional states from facial expressions. These algorithms have been refined to recognize a range of emotions accurately (Ekman et al., 1997). Workplace Well-being: The literature suggests that facial emotion detection can be applied to monitor workplace well-being by analyzing employee expressions during meetings, presentations, or remote work sessions (Almaev et al., 2019). Emotion-AI Integration: Studies have explored integrating facial emotion detection into chatbots and virtual assistants to improve employee engagement and productivity (Picard, 2003). Ethical Implications: Scholars have raised ethical concerns, including the potential for surveillance and intrusions into personal privacy. Research has emphasized the importance of obtaining informed consent and respecting boundaries (Crawford et al., 2020).

"Deep Facial Expression Recognition: A Survey"

(M. Saquib Sarfraz, Muhammad Usama, Amar R. Marzak, et al.) This comprehensive survey paper explores the state- of-the-art in deep learning-based facial emotion recognition. It provides insights into various deep learning models and datasets used for recognizing emotions from facial expressions, including their applications in employee emotion monitoring.

METHODOLOGY

Research Problem

Face recognition and mood detection with facial emotions is a big thing when we are developing a system. Because we have to concern about so many sides about the functionalities and employees privacy also. Because the most important thing is the security of employee details. When it comes to the research problem when I studied about my component the major problem that I got was how to ensure that the security of employees details? Such as employees faces. So I have to ensure that there is no one can access those images. So I am going to encrypt all the images and also no one can access those images even consultant. Consultant only can view the emotion status of a employee with the dates. And when it comes to the real time processing that means in this kind of system it has to be run every time. Employees signing in time to time. So system need to process real time. When it comes to real time process It is difficult to create a real-time facial recognition and mood detection system because it must be quick and effective enough to identify emotions with accuracy. So that I have too find the solution to accurate the system process and the need to ensure that the correctness about the output. Another

thing is when developing these kind of system the data that the system need, in my case facial images needs to me more clear and image quality wants be high. So that I have to capture more quality images. Also I have to capture the employees images when the are having phycological signals in their faces. If it fails to capture and identify the employee it may causes to the accuracy of the system and the correctness of the output. Also to detect emotions I need to trained a dataset. Then I need to find a dataset with good quality and having more data. If I not, I cannot get the expected output as I with. If I am able to get a good quality dataset then I can gain more accuracy from that.

METHODOLOGY

The methodology for face recognition and emotion detection is to recognize users and detect their emotion changings. According to the component's architecture first thing is to identify the user when user login to the system by providing face id. After user provide face id system will automatically capture the user image. System will validate the user with the face id and if the id matching employee redirected in to the system. To ensure the security of users' system do not save any images of employees. System only gets the embeddings of captured image and by using those embeddings system detect the user and the emotions. Then no one can access the employees Images even the consultant. After validating the employee, the next part is to detect employees' facial expressions(mood). In employee's mood detection it can be divided into several stages like, preprocess all employees' images, feature extraction, preprocess all images inside of dataset, feature extraction pre-processed dataset images after that train employees saved images with the dataset and classify employees in to categories of emotions. In data preprocessing it means that prepare all the raw data to make suitable for train with machine learning model. For pre prepossessing used MCNN library to preprocess all the images and get only the face instead of other units. From that can avoid unsuitable details that don't want. Because of that system will accurate because of there is no time consumption to process unsuitable data. Feature extraction stage transformed all the pre- processed data in to a numerical features ant it will reduce to more manageable groups to process with the model named Random Forest Classifier (RFC) and get the emotions as output. As the dataset used CKPLUS dataset for facial emotion detection. Finally, the classification stage categorized outputs(emotions) that got after training model. Then, once an employee directed to get the advice from consultant, then consultant can enter employee id and get all the details about employees' emotion behavior. Then it is easy to handle employees for consultant.

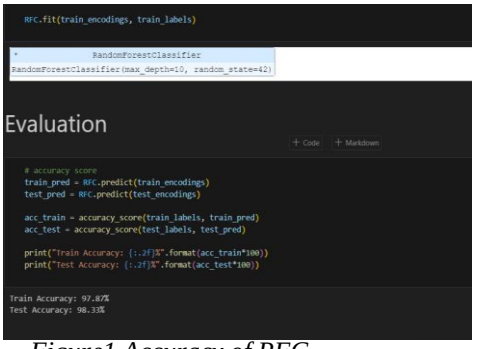

Figure1 Accuracy of RFC

RESULTS

Facial recognition technology has made significant strides in recent years, offering a reliable means of identifying individuals based on their unique facial features. In this scenario, users are required to log in to the system by providing a face ID, which is essentially a digital representation of their facial features. The system utilizes this information to identify the user by

comparing the provided face ID with a database of pre-registered users. Administration create employees face IDs and label them during the enrollment phase, which involves capturing their facial features and storing them as reference data. This is a one-time setup. To log in, users present their faces to the camera or other imaging devices. The system captures their facial features and compares them with the reference data from the enrollment phase. Using Cosine similarity analyze the facial features, identifying key landmarks, and mapping unique characteristics. The system uses this data to match the current face with the enrolled face ID. If the system recognizes a match between the provided face ID and the user's current face, authentication is successful, granting the user access to the system. Once authenticated, the system goes beyond just granting access. It leverages facial emotion detection technology to assess the user's emotional state, adding a layer of personalization to the user experience. Emotion detection relies on machine learning models trained on a vast dataset of facial expressions, enabling it to classify emotions accurately. Emotion detection model (Random Forest Classifier)is trained on extensive datasets featuring facial expressions that correspond to various emotions such as happiness, anger, sadness, surprise, and more. The system's algorithms classify the observed facial expressions into specific emotions based on the training data. For each emotion, a probability score is generated, reflecting the confidence level of the system in its emotion classification. After that I combined all the user details and user's emotion details. Then I stored it in our database and then consultant can view employees emotions level by searching from employee Id.

```
1 get_emotion_detection('EMP002')
[12] ✓ 0.4s
... {'employee_data': [{'user_id': 'EMP002',
    'emotion': 'surprise',
    'proba': '0.800439178943634',
    'time_stamp': '2023-09-19 11:03:04',
    'user_name': 'Ishini Chamanki',
    'user_role': 'Admin'},
   {'user_id': 'EMP002',
    'emotion': 'surprise',
    'proba': '0.8004395961761475',
    'time_stamp': '2023-10-03 10:53:25',
    'user_name': 'Ishini Chamanki',
    'user_role': 'Admin'}]}
```

CONCLUSION

In response to the critical impact of employee well-being on organizational success, this research offers a comprehensive solution to detect and mitigate depression among IT employees. Through the integration of advanced technologies such as face recognition, mood detection, user- friendly chat agents, voice analysis, and activity recommendations, the proposed system revolutionizes mental health support in the workplace. The Face Recognition and Mood Detection component, powered by cutting-edge machine learning and computer vision, holds promise for transforming emotional tracking and mentorship.

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The insights and experiences shared by employees have been pivotal in shaping our understanding of workplace mental health challenges. Are deeply grateful for the guidance of our mentors and experts, whose wisdom has steered our research toward impactful outcomes. The industry professionals, consultants, and peers who have engaged with us in discussions and feedback have been instrumental in refining our methodologies. The availability of cutting-edge technologies

and datasets has significantly enriched the rigor of our work. Acknowledge the institutions that have supported this research and the collective effort that has culminated in innovative approaches to address employee depression in the IT industry. This research stands as a collaborative achievement, demonstrating the power of technology and empathy in shaping a more resilient and compassionate workforce.

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COMPARISON BETWEEN ARIMA AND RNN FOR PREDICTION OF PRICE AND PROFIT OF MUSHROOM MARKET

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ABSTRACT

Find these main problems before having app : users may have limited access to real-time market information, at what price, and to whom, conducting market research without a mobile app can be time-consuming and labor-intensive, requiring physical attendance at marketplaces and engaging with various market participants to gather information, without up-to-date market information, users may miss out on potential opportunities to sell their products at higher prices, resulting in lower profitability and financial losses, without access to the latest market trends and pricing information, users may struggle to stay competitive in a fast-moving market and may lose market share to their competitors. But with a mobile app, farmers, retailers, and traders can get real-time information on the demand for mushrooms in the market. They can access the latest market trends and pricing information to make informed decisions about when to sell their products and at what price and the locations of mushroom stocks. A mobile app allows users to access information about the mushroom market from anywhere and at any time. This convenience can save time and effort compared to traditional methods of market research, such as attending physical marketplaces. A mobile app can help users streamline their operations by allowing them to track supply and demand data, adjust prices, and communicate with buyers and sellers quickly and easily. This increased efficiency can help them stay competitive in a fast- moving market.

Keywords: Machine learning, Mushroom market, Profit Prediction, Price Prediction

INTRODUCTION

The cultivation of mushrooms has garnered significant interest in Sri Lanka, despite it not being a conventional crop in the country. This growing enthusiasm can be attributed to the increasing recognition of the health benefits and nutritional value offered by mushrooms. Although the mushroom market in Sri Lanka is still in its early stages, it holds immense potential for future growth. The country's diverse ecosystems, encompassing rainforests, highlands, and coastal areas, provide ideal habitats for a wide variety of mushroom species. While button mushrooms are the most cultivated variety in Sri Lanka, there is a rising curiosity regarding other types, including oyster mushrooms, shiitake mushrooms, and straw mushrooms. Currently, mushroom cultivation in Sri Lanka is predominantly carried out by small-scale farmers and home gardeners. These individuals typically sell their produce at local markets through intermediaries who distribute the mushrooms to larger markets. However, one of the major challenges faced by both sellers and buyers is the lack of readily available information on mushroom

demand. To address this issue, a mobile application has been proposed to provide comprehensive market demand information for mushrooms in Sri Lanka. Unlike existing applications that focus on mushroom detection and identification, this innovative mobile application aims to gather data specifically related to market demand. Users, including consumers, will have easy access to information on wholesale prices and profit margins based on the market demand for mushrooms. Furthermore, the research project plans to develop an object detection strategy utilizing machine learning algorithms. By incorporating [1] classification models, the application will enable users to select a specific type of mushroom and enter the harvest amount and cost per kilogram. The application will then provide two predicted profit values based on two different price predictions. This approach will offer a faster, more accurate, and efficient means of obtaining mushroom market data compared to existing methods. The ultimate objective of this research project is to create a thriving market for locally grown mushrooms in Sri Lanka. By providing a user-friendly mobile application with real-time market information, the project aims to promote mushroom cultivation and enhance market demand. The combination of market data, type recognition, and daily reports will empower both sellers and buyers in making informed decisions. This, in turn, will contribute to the overall growth and development of the mushroom industry in Sri Lanka. In conclusion, the increasing interest in mushroom cultivation in Sri Lanka has paved the way for the development of a mobile application that focuses on market demand. This application aims to bridge the information gap between sellers and buyers by providing comprehensive market data and analysis. With the integration of machine learning algorithms, the application will enable users to easily identify mushroom types and make informed decisions based on real-time market prices. Through these efforts, the project aims to foster a thriving market for locally grown mushrooms, thereby benefiting the mushroom industry and promoting healthy eating habits in Sri Lanka.

LITERATURE REVIEW

This project proposal seeks to develop an intelligent mushroom product differentiation plan based on the quantity, quality, cost, and season of the harvest received by the farmer via a mobile application that will be the primary outcome of the research in order to maximize profit. So, consumers must go to the marketplace and get to know about the current price. Mushrooms have recently attracted increased interest as a source of physiologically active chemicals with therapeutic benefits, in addition to being a healthful vegetable (food) that is high in protein. The global mushroom market is thoroughly examined in this study, along with market trends, drivers, challenges, and opportunities. [3] This study looks at the Chinese mushroom market, including market size, trends in production and consumption, and the level of competition. [4]. The global mushroom market is expected to grow at a CAGR of 6.74% from 15.25 million tons in 2021 to 24.05 million tons in 2028 [2]. In some parts of the world, hunger and malnutrition are becoming more common, and because of nutrient-poor soils, the nutritional value of many commonly consumed foods is declining. In developing countries, malnutrition is a prevalent problem, and as the population has grown, pulse production has not kept up with human need, creating a rising protein deficit that has prompted the search for other protein sources. As a result, in order to maintain outstanding health and disease immunity, people will be motivated to seek out alternative nutrient- dense food sources.

The FAO has suggested edible mushrooms as a food because they are rich in proteins, carbs, and fat, as well as vitamins, fibers, and healthy salts. This helps poor nations who mainly rely on cereals with their protein needs by supplying them with mushrooms. Commercially grown mushrooms are considered safe for human consumption. Mushrooms can be used as a supplementary food item or as a value addition in a variety of products such as pickle, jam, sweets, candy, chips, and many more for the growing population of developing countries where the population is primarily dependent on cereal-based foods. Mushrooms have gained popularity worldwide due to their high nutritional value as well as their medicinal and therapeutic properties. [3] In this essay, the technological state of play in Sri Lanka's mushroom business is discussed. With the entire Japanese mushroom industry, it has been discussed. Sri Lanka is a developing nation in South Asia. Calocybe indica, Volvariella volvacea, and Pleurotus ostreatus are grown by almost all of the nation's mushroom farmers. [6]. Fungi known as mushrooms are extensively utilized in a variety of cuisines across the globe and are frequently recognized as edible. In a controlled environment with the right lighting, ventilation, humidity, nutrients, soil pH levels, and air pressure, edible mushrooms are frequently grown. They include significant amounts of potassium, riboflavin, selenium, and vitamin D, all of which have been shown to strengthen immunity, maintain a healthy weight, and reduce the risk of several chronic diseases. [4] [2] In addition, a survey of 52 mushroom consumers and farmers in Gampaha district for this research proposal revealed that most of them (86.5%) use smart phones as figure 1.1.

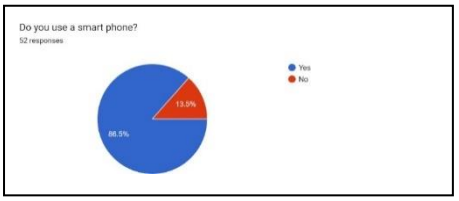


Figure 1.1 Survey response about using smart phones.

Mushrooms come in infinite types, and they don't require much to thrive. Due to its durability, mushroom farming is a booming industry that presents a low-risk business opportunity. According to 2016 data from the Food and Agriculture Organization of the United Nations, China [4] [5]is the top producer of mushrooms in the world, followed by Italy and the United States. Because of its high vitamin and energy content, as well as its distinctive flavor, tofu, frequently referred to as "vegan meat," stays at the top of this list even though the total production was more than 10 million tons in 2016. A mushroom is a macro fungus with a unique fruiting body that can be above ground (epigeous) or below ground. Most mushroom farmers are young, implying that they have only a few years of expertise. This is because the Sri Lankan mushroom industry began commercial production in the late nineteenth century. The future of mushroom farming is bright because the growers are young. cultivation appears promising. Because the production is still in its early stages. Price prediction has now become a critical agricultural problem that can only be solved using available data. The purpose of this paper is to forecast crop prices for the next rotation. This work is based on the discovery of suitable data models that aid in the achievement of high accuracy and generality for Price forecasting. Various Data Mining techniques were tested on various data sets to solve this problem. This paper describes a system that predicts crop prices using data analytics

techniques. [6]The proposed system will use machine learning algorithms to predict crop prices based on multiple factors such as area harvested, area planted, and so on. This gives a farmer an idea of what the future holds. Mushrooms, an underappreciated food, have been consumed and used as medicine for thousands of years. The bell-shaped fungi are praised by traditional and folk medicine practitioners for their healing and cleansing properties. Mushrooms are low in calories and fat and [7] contain minor amounts of nutrients and fiber. The non- nutritive plant components found in mushrooms, such as polysaccharides, indoles, polyphenols, and carotenoids, have antioxidant, anti-inflammatory, and anticancer activities, according to studies on cells and animals. Because they contain glutamate, an amino acid also present in meats, seafood, cheeses, and simmering soups, mushrooms have the ability to produce the delicious, rich flavors known as umami. Even though there are parallel works with this proposal, most of the research, findings, and software applications were not aimed at developing such a component of the generation of an intelligent product differentiated plan from the mushroom harvest based on trend market analysis through a profit optimization process.

The following is an illustration from a literature review that was conducted.

A. Emerging Machine Learning Trends for Predicting Crop Yield and Investigating Influencing Factors.

[3] The main objective of this paper is to investigate several machine learning methods for forecasting agricultural productivity. b. Research into deep learning and other sophisticated yield estimation techniques is currently underway. c. To assess the efficacy of hybridized models made by merging several strategies, a study predicts crop yield using crop growth models and data-driven model approaches. Models of crop growth are similar to mathematical models. They are used to illustrate the numerous interactions of physiological processes with the environment as well as to forecast the final production or yield of a crop. Data-Driven Models employ traditional statistics or machine learning techniques. Crop yield data from previous years, as well as a new set of parameters, are considered and calculated to estimate the final crop yield.

A. Industrial Processing of Mushrooms [8]

By 2024, sales in the functional mushroom industry are expected to increase from $20 billion to $34.3 billion. 2019's Mordor Intelligence According to Research and Market research, the anticipated CAGR (compound annual growth rate) has risen over the past 12 months. The market was forecast to expand at a 6.4% annual rate in 2018 and a growth of 8.04% in 2019. US mushroom farms will be able to enter this market more aggressively as consumers become more aware of the components in their mushroom supplements. Customers should certainly avoid foreign-produced vitamins and products made with mycelium. This puts American mushroom farmers in a great position to start providing value-added goods to this market. [8]

Supervised Machine Learning Algorithms for Crop Price Forecasting [9]

Profit and price prediction are two of the most important factors in the agricultural market, according to the research paper. The paper's proposed system has two main actors: the Administrator and the Agricultural Department. The administrator oversees the entire system, while the Agriculture Department oversees profit and price forecasting. The system uses the Nave Bayes Algorithm, a

machine learning classification, to estimate the price while considering rainfall, maximum trade, minimum support price (MSP), and yield as factors. The system uses the K Nearest Neighbor (KNN), a supervised machine learning classification approach, to estimate profits while considering crop price, yield, cultivation cost, and seed cost. The department director may select the approach and crop for prediction. The system then generates the output by running the algorithms in the background. The study predicts that the farmer will need better foreknowledge, and that this prediction will be helpful in assisting the farmer to maximize the rate of profit.

C. Machine Learning-Based Crop Prediction System [9]

The machine learning techniques used in the paper crop price prediction system are based on price prediction, which will be more important for farmers in the agricultural industry. This study aims to predict crop prices for the subsequent rotation. This article is predicated on discovering the most relevant data models that aid in accurate price prediction, and as a solution, this research assessed different data mining approaches on distinct data sets. According to the report, it employs data analytics techniques and machine learning algorithms to forecast crop prices based on parameters such as harvested area and planted area. The study's system integrates data from various sources, data analytics, and prediction analysis for the price prediction process. According to the study, the system's output provides an estimate of the future price of the crop that will be harvested by the farmer and will assist the farmer in increasing their profit margin. Among the linear regression, decision trees, and neural nets techniques, the study concludes that the XGBoost technique is the best for price prediction.

Canned Mushroom Industry [10]

The Global Canned Mushrooms Market 2022-2026 Research Report thoroughly examines the market, including market status, size, share, SWOT, and PESTLE analysis. The report investigates the market's development potential, prospects, drivers, industry-specific obstacles and dangers, and emerging trends. The research includes essential statistics on canned mushroom consumption by country, as well as predicted data through 2026. The goal is to maximize total profit. The global Keyword market was worth USD 739.2 million in 2020 and is expected to be worth USD 447.8 million by the end of 2026, growing at a CAGR of -6.8 percent between 2021 and 2026. This report examines keyword volume and value at the global, regional, and company levels. This report represents the global Keyword market size by analyzing historical data and prospects. This report is divided into several key regions: North America, Europe, China, and Japan, for example. The research report is divided into segments based on Type and Application. This study provides data on sales and revenue from 2015 to 2026, both historically and forecasted. Understanding the segments aids in determining the significance of various factors that aid the market growth.

E. Crop Profit Optimization [9]

A system analysis tool was created to maximize a farmer's profit depending on the possibilities for planting season. The utility was created in Python to provide free user-friendly execution on a variety of computers. This program provides a database of agricultural needs, including the amount of space and water each plant needs to grow as well as the length of the growing season. The database also contains crop data like average plant weight and seed cost. Additionally, the application asks the user for constraint values. [16] The study also generated a database of crops regarding growing space

per plant, water per plant, and growth period. The tool also uses the input parameters provided by the farmer as input parameters.

Research Objectives

A. Identification of suitable markets and products based on the nature of the mushroom harvest:

To maximize the profitability of mushroom cultivation, it is essential to identify suitable markets and products based on the nature of the mushroom harvest. This involves understanding the characteristics of the mushroom varieties being cultivated and determining the markets that would be most receptive to those products. Different mushroom varieties have unique attributes in terms of taste, texture, aroma, and culinary applications. For instance, button mushrooms are commonly used in a variety of dishes, while oyster mushrooms have a distinct flavor and are sought after for their versatility in vegetarian and vegan cooking. By considering these factors, farmers can assess which markets would be most interested in their mushroom harvest.

A. Mushroom Domestic Market:

One potential market for mushroom growers is the domestic market, catering to local consumers within the country. This market offers advantages such as reduced transportation costs, shorter supply chains, and the ability to cater to specific local tastes and preferences. To effectively penetrate the domestic market, it is crucial to understand the local consumer demand, cultural preferences, and consumption patterns related to mushrooms. Conducting market research and consumer surveys can provide valuable insights into the preferences and behaviors of domestic consumers, allowing farmers to tailor their products to meet local demand.

C. Mushroom Export Market:

Expanding into the export market can open up new opportunities for mushroom growers. Exporting mushrooms allows farmers to tap into international markets with potentially higher demand and profitability. However, entering the export market requires careful consideration of factors such as international trade regulations, market requirements, quality standards, and logistics. It is crucial to identify target export markets that have a demand for specific mushroom varieties and possess favorable trade agreements or import regulations. Developing partnerships with exporters or engaging in direct marketing efforts can facilitate access to export markets.

D. Canned Mushroom:

In addition to fresh mushrooms, exploring the production of canned mushrooms can offer opportunities for market expansion and product diversification. Canned mushrooms have a longer shelf life and can be easily transported to distant markets, making them suitable for export and domestic distribution. This value-added product can cater to different consumer segments, including foodservice providers, convenience stores, and households looking for a convenient and long-lasting mushroom option. Implementing proper canning techniques, ensuring food safety, and maintaining consistent quality are crucial factors in successfully entering the canned mushroom market.

E. Prediction of Price - Trend Analysis on the most appropriate mushroom markets and products:

Accurate price prediction is vital for maximizing profits in the mushroom industry. Conducting trend analysis and

utilizing forecasting models can provide insights into the most appropriate mushroom markets and products to focus on. This involves analyzing historical price data, identifying market trends, and predicting future price fluctuations. By studying past market behavior and considering factors such as supply and demand dynamics, seasonal variations, and external influences, trend analysis can help identify patterns and cycles in mushroom prices. Statistical techniques such as time series analysis, moving averages, and regression analysis can be employed to analyze historical data and forecast future price trends. Additionally, machine learning algorithms, such as neural networks or random forests, can be utilized to capture complex relationships and make more accurate price predictions. The analysis should not only focus on overall market trends but also consider specific mushroom varieties and their market performance. By examining the historical prices of different mushroom types and their demand patterns, growers can identify the most profitable products and markets. This analysis can help optimize production planning, pricing strategies, and market selection to align with the projected trends and maximize profitability.

F. Product Differentiation Plan Development - Profit Optimization:

To optimize profits, a product differentiation plan should be developed to distinguish the mushroom harvest in the market. Product differentiation involves creating unique value propositions, branding, packaging, and marketing strategies to set the mushroom products apart from competitors and attract target customers. A key aspect of product differentiation is understanding consumer preferences and identifying niche markets. Conducting market research

METHODOLOGY

This section will entail the details on the techniques and mechanisms that are employed to create Market Demand Mushrooms component, belonging to "mushroom detecting app" The overall goal of the research is to develop a mobile software application that helps mushroom farmers manage their mushroom production in an efficient manner. As a result, this research proposal includes a component for mushroom growers to maximize profit.

The solution proposed in this project proposal makes the following possible thanks to the mobile software application.

- Identify the appropriate mushroom market or products based on the nature of the harvest.
- Analyze the market trend for each identified market or product.
- Development of a product differentiation strategy through profit optimization based on trend analysis and harvest nature.

The Market Demand Mushrooms component of the proposed mobile software application offers several functionalities to assist mushroom farmers in optimizing their profits. These functionalities include:

1. Identifying the Appropriate Mushroom Market or Products:

The component enables farmers to identify the most suitable mushroom market or products based on the nature of their harvest. It considers factors such as the type of mushrooms, their quality, quantity, and specific characteristics. By analyzing this information, the component provides recommendations on which market or products are likely to yield the highest returns for the farmers. This helps farmers focus their efforts on markets or

products with high demand, increasing their chances of success and profitability.

2. Analyzing Market Trends:

The Market Demand Mushrooms component conducts a comprehensive analysis of market trends for each identified market or product. It considers various factors such as seasonal variations, consumer preferences, and market dynamics. By studying historical data and current market trends, the component provides valuable insights into the demand patterns and fluctuations in the mushroom market. This information helps farmers align their production and marketing strategies with the prevailing market conditions, enhancing their competitiveness and potential for profitability.

3. Developing Product strategies with market demands, increasing their competitiveness and profitability in the mushroom industry. Overall, the Market Demand Mushrooms component provides valuable tools and insights to assist mushroom farmers in identifying suitable markets or products, analyzing market trends, and developing product differentiation strategies. By leveraging these functionalities, farmers can make informed decisions to optimize their profits and achieve greater success in their mushroom cultivation endeavors. The methodology that would be followed to fulfill the above facilities is described from this point onwards.

User Research

To assess the need for the Market Demand Mushrooms component in the context of mushroom cultivation, user research was conducted using several approaches. These approaches aimed to gather insights from mushroom farmers and understand their requirements and expectations regarding the proposed component. The following user research methods were employed:

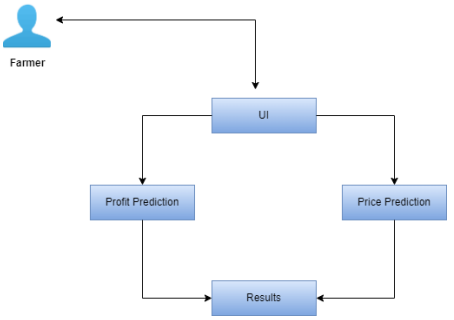
1. Questionnaire Survey:

A questionnaire survey was conducted among a sample group of 52 mushroom farmers in the Colombo District. The survey included a series of structured questions designed to gather information about their current practices, challenges faced, and the perceived benefits of having a dedicated component for mushroom cultivation. The questionnaire covered aspects such as market analysis, product selection, and profit optimization. The responses obtained from the survey provided valuable insights into the specific needs and expectations of mushroom farmers.

2. Background and Literacy Study:

A comprehensive background study was conducted to explore existing research and literature related to mushroom cultivation and market analysis. This study aimed to identify any existing solutions or tools available to mushroom farmers for market analysis and profit optimization. The literature review helped to establish the uniqueness and novelty of the proposed Market Demand Mushrooms component by highlighting the lack of similar dedicated solutions in the field.

. A. Generate a report of price and profit prediction to get the maximum profit.



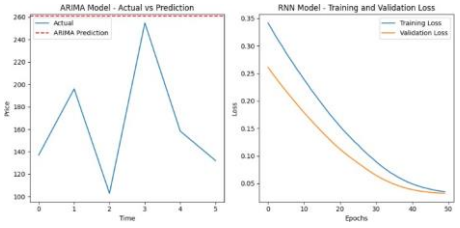
RESULT AND DISSCUSSION

To generate real demand of mushrooms for farmers Here we use both ARIMA and RNN for price and profit predictions to select the best model.

A. ARIMA Architecture

The ARIMA (Autoregressive Integrated Moving Average) architecture is a powerful time series forecasting model that can be applied to predict profits and prices in the mushroom market. ARIMA combines autoregressive (AR) and moving average (MA) components, along with differencing (I) to account for trends and seasonality in the data. When applied to mushroom market data, ARIMA can capture patterns and dependencies in the time series, enabling accurate predictions of future profits and prices. By analyzing historical data on mushroom profits and prices, ARIMA can identify underlying patterns, such as trends and seasonal fluctuations, and use this information to forecast future values. This forecasting capability of ARIMA can assist mushroom growers, sellers, and buyers in making informed decisions based on projected profits and prices, contributing to a more efficient and optimized mushroom market.

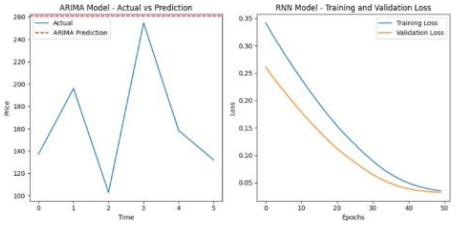
ARIMA Model Training and Testing



B. RNN Architecture

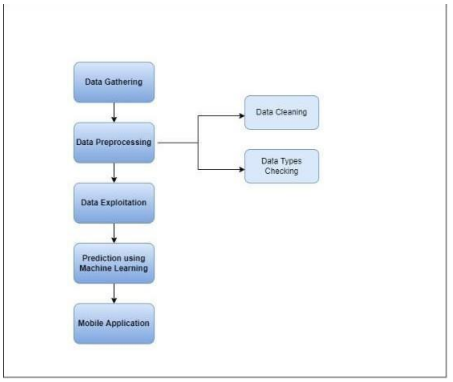
Recurrent Neural Network (RNN) architecture can be employed to predict the profit and price of mushrooms in the market. RNNs are well-suited for sequential data analysis due to their ability to capture temporal dependencies. In the context of mushroom market prediction, an RNN can consider the historical data on mushroom prices, demand, and other relevant factors to forecast future trends. By training the RNN on a dataset that includes features such as mushroom type, harvest amount, cost, and market conditions, the network can learn to capture the intricate patterns and relationships within the data. This enables it to make accurate predictions on the profit and price of mushrooms, providing valuable insights for both sellers and buyers in the mushroom market. The RNN architecture's recurrent nature allows it to retain memory of past information, making it a powerful tool for forecasting time-dependent variables like mushroom prices and profits.

RNN model Training and Testing



C. Dataset

Market Price of Mushrooms according to year and month



CONCUTION AND FUTHURE DEVELOPMENT

In conclusion, the development of the proposed mobile software application with the Market Demand Mushrooms component offers a promising solution for mushroom farmers to efficiently manage their production and maximize profits. By addressing the crucial aspects of identifying appropriate mushroom markets or products, analyzing market trends, and developing product differentiation strategies, the app empowers farmers to make informed decisions based on real- time market data. Future work can focus on expanding market coverage, integrating additional features, collaborating with market stakeholders, and ensuring continuous improvement through updates. With these advancements, the app has the potential to revolutionize mushroom farming, enabling farmers to optimize their cultivation practices, explore new markets, and stay ahead in a competitive industry.

Acknowledgement

We would like to express our sincere gratitude and appreciation to all those who have contributed to the successful completion of this research paper. First and foremost, we extend our heartfelt thanks to our supervisor, [Mr.Smadhi Rathnayaka], for their guidance, support, and valuable insights throughout the research process. Their expertise and encouragement have been instrumental in shaping this paper. We would also like to acknowledge the valuable contributions of the participants who took part in the user research phase of this study. Their cooperation and feedback provided valuable insights and helped validate the need for the Market Demand Mushrooms component of the proposed mobile software application. We are grateful to the mushroom farmers in the Colombo District who participated in the questionnaire survey, sharing their experiences and perspectives on mushroom cultivation. Their valuable input has greatly enriched our understanding of the challenges and requirements of mushroom farmers. Additionally, we would like to acknowledge the research community and scholars in the field of agricultural technology and market analysis for their contributions and insights that have informed our research. Furthermore, we extend our thanks to our colleagues and friends who have supported us throughout this research endeavor, providing valuable discussions, feedback, and encouragement. Lastly, we would like to express our gratitude to our families for their unwavering support and understanding throughout the research process.

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MUSHROOM DISEASES DETECTION USING CONVOLUTIONAL NEURAL NETWORK

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ABSTRACT

Mushroom farming is a complex endeavor with numerous challenges, particularly concerning the occurrence of diseases caused by pathogens. Detecting and managing these diseases promptly is critical for maintaining mushroom yield and quality. This research presents a novel approach to address this challenge through the development of a machine learning-based system for the automated detection of mushroom diseases using image processing. The proposed system offers a user-friendly interface for mushroom growers, enabling them to detect and diagnose diseases in their crops effectively. By employing advanced image processing techniques, the system analyzes images of mushroom crops to accurately identify disease symptoms. A machine learning algorithm, trained on an extensive dataset of healthy and diseased mushroom crop images, enhances the detection accuracy. The system's knowledge base will be regularly updated with the latest diagnostic techniques and procedures, ensuring its reliability as a resource for mushroom growers. The proposed system leverages various features such as color, texture, and shape to detect disease symptoms in mushroom crops. By analyzing color distribution and texture patterns in the images, the system accurately identifies the disease type and severity. Additionally, the system suggests appropriate treatment methods based on the diagnosis, enabling growers to take timely action to prevent further crop damage. The proposed system holds promising potential to revolutionize disease management in mushroom farming, empowering growers with an efficient tool for early disease detection and effective decision-making.

Keywords: Machine learning, Mushroom diseases, Image Processing

INTRODUCTION

Mushroom cultivation plays a crucial role in the agricultural sector, providing sustenance and economic support to millions of people worldwide. However, like any other crop, mushrooms are susceptible to various diseases caused by bacterial, viral, and fungal pathogens. These diseases can have devastating effects on yield, quality, and profitability, often resulting in significant crop losses. Effective disease management in mushroom farming relies on early detection and prompt treatment, but traditional approaches can be time-consuming, subjective, and require specialized knowledge. To address these limitations, researchers have been exploring the application of image processing and machine learning techniques to develop a mobile application for the detection of mushroom diseases. This innovative approach utilizes images of mushrooms and their surroundings to train algorithms capable of recognizing and classifying different types of diseases.

By leveraging these advanced techniques, disease detection and prevention efforts in the mushroom industry can be greatly enhanced, leading to improved crop management practices and higher yields.

The primary objective of this research is to develop an automated system for the detection of mushroom diseases using machine learning and image processing. The proposed system will utilize high-resolution photographs of mushrooms and their surroundings to identify and categorize a wide range of diseases, including bacterial and fungal infections. Crucially, the system will operate in real-time and process large volumes of data with precision and speed. The foundation of the proposed system lies in deep learning techniques, specifically convolutional neural networks (CNNs), which have demonstrated remarkable performance in image classification tasks. By training a CNN on a substantial dataset of labeled images of healthy and diseased mushrooms, the model can learn to accurately classify disease symptoms. Transfer learning, which leverages pre-trained models, will be employed to enhance training efficiency and optimize model performance. The trained model will then be seamlessly integrated into a user-friendly interface, enabling mushroom farmers to easily upload images and receive instant feedback on the health status of their crops.

LITERATURE REVIEW

The detection and management of diseases in mushroom cultivation are crucial for maintaining crop health, yield, and profitability. Traditional disease identification methods often rely on visual inspection by experts, which can be time-consuming, subjective, and prone to errors. To overcome these challenges, researchers have been exploring the integration of image processing and machine learning techniques to develop automated systems for the detection of mushroom diseases. This literature review aims to provide an overview of the existing research in this field, highlighting the advancements, challenges, and potential future directions.

A. Image Processing Techniques for Disease Detection:

Image processing techniques have been widely used in various agricultural applications, including disease detection. In mushroom farming, these techniques play a vital role in analyzing images of mushrooms and their surroundings to identify disease symptoms accurately.[1] Various image processing algorithms have been applied, including image segmentation, feature extraction, and pattern recognition. These techniques enable the extraction of key visual characteristics such as color, texture, and shape, which can be utilized to differentiate healthy mushrooms from diseased ones.

B. Machine Learning Approaches for Disease Classification:

[2] Machine learning algorithms have shown great potential in automating disease detection and classification tasks. In the context of mushroom farming, machine learning techniques, particularly supervised learning methods, have been employed to train models on large datasets of labeled images. Convolutional neural networks (CNNs) have emerged as a popular choice due to their ability to effectively learn and extract relevant features from images. Transfer learning, where pre-trained models are utilized as a starting point, has also been widely adopted to improve training efficiency and performance.

C. Dataset Acquisition and Annotation:

The availability of large and diverse datasets is crucial for training accurate and robust disease detection models. Several initiatives have been undertaken to collect and curate datasets specific to mushroom

diseases. [5]These datasets include annotated images of healthy mushrooms and various disease symptoms, providing valuable resources for training and evaluation purposes. However, challenges such as data scarcity, class imbalance, and variations in image quality and lighting conditions need to be addressed to ensure the reliability and generalizability of the trained models.

D. Challenges and Limitations:

Despite the advancements in image processing and machine learning techniques for mushroom disease detection, several challenges remain. One of the significant challenges is the limited availability of annotated datasets specific to mushroom diseases, which hampers the development and evaluation of robust models. Furthermore, the detection accuracy may vary depending on factors such as disease severity, mushroom species, and environmental conditions. Additionally, the integration of automated disease detection systems into the workflow of mushroom growers and their acceptance within the industry pose practical challenges.[3]

E. Future Directions

To further advance the field of mushroom disease detection, several avenues for future research can be explored. First, efforts should be made to collect and curate larger and more diverse datasets, encompassing a wide range of mushroom species and disease symptoms.[4] This would enable the development of more accurate and generalized models. Second, the integration of multi-modal data sources, such as thermal imaging or hyperspectral imaging, could provide complementary information for improved disease detection. Finally, the development of user-friendly interfaces and mobile applications that allow growers to easily capture and analyze images of their crops would facilitate the adoption of automated disease detection systems in practice.

Research Objectives

A. Identify and categorize common types of mushroom diseases

The first objective is to comprehensively identify and categorize the most prevalent types of diseases that affect mushrooms. This will involve a thorough review of existing literature, consultations with experts in the field, and analysis of historical data. By understanding the different disease types and their corresponding symptoms, the system will be able to accurately classify and diagnose diseases in mushroom crops. Mushroom diseases can be caused by various pathogens, including bacteria, viruses, and fungi. Common diseases include bacterial blotch, mushroom virus X, green mold, and cobweb mold, among others. Each disease exhibits specific symptoms such as discoloration, rotting, abnormal growth, or mycelium development. Understanding the characteristics of these diseases is essential for the development of an accurate disease detection system.

B. Collect and preprocess image dataset

A substantial dataset of images of both healthy and diseased mushrooms needs to be compiled. The images will be collected from different sources, including mushroom farms, research institutions, and online databases. The dataset will be carefully curated and preprocessed to ensure high quality and consistency. Preprocessing steps may include noise removal, image enhancement, and normalization techniques to minimize variations in lighting conditions and image quality. The image dataset should cover a wide range of mushroom species, disease types, and disease severities. It is crucial to ensure diversity in the dataset to capture the variations that can occur in real-world scenarios. Additionally, careful annotation of the dataset is necessary to provide ground truth labels for training the machine learning model.

C. Develop a machine learning model

This objective involves the development of a robust machine learning model capable of accurately classifying images of mushrooms as healthy or diseased. [6] Convolutional Neural Networks (CNNs) will be explored as a suitable architecture for image classification. The model will be trained on the collected dataset using appropriate algorithms and optimization techniques to achieve high accuracy and minimize false positives.[7]

The development of the machine learning model will involve several steps, including data preprocessing, model architecture design, hyperparameter tuning, and training. Transfer learning techniques can be employed by leveraging pre-trained models, such as VGG, ResNet, or Inception, to accelerate training and improve the model's performance. Fine-tuning and regularization techniques will be applied to avoid overfitting and ensure generalization.

D. Model Testing and Evaluation

The trained machine learning model will be rigorously tested and evaluated using an independent dataset. The performance of the model will be assessed based on various metrics, such as precision, recall, F1 score, and accuracy. The evaluation will also include a comparative analysis with existing methods to assess the superiority and effectiveness of the proposed system in terms of disease detection and diagnosis. Cross-validation techniques, such as k-fold cross-validation, will be employed to ensure the robustness of the evaluation. The model's performance will be assessed on various subsets of the dataset to account for variations in disease types, severities, and imaging conditions. Additionally, statistical significance tests may be conducted to compare the proposed model with baseline methods or alternative approaches.

E. Mobile Application Development

The research aims to develop a user-friendly mobile application that integrates the trained machine learning model for real-time disease detection in mushroom crops. The application will allow users, such as mushroom farmers and cultivators, to capture images of their mushrooms using their smartphones or tablets. The captured images will be processed and analyzed by the machine learning model, providing instant feedback on the health status of the crops and identifying any diseases present. The application will also provide additional features, such as disease information, treatment recommendations, and historical data analysis, to assist farmers in making informed decisions. The mobile application will be developed using user-centered design principles, ensuring ease of use and intuitive navigation. The interface will be designed to be visually appealing and accessible to users with varying levels of technical expertise. Extensive testing and iteration will be conducted to refine the application's performance, responsiveness, and compatibility across different devices and operating systems.

F. Performance Optimization and Scalability

This objective focuses on optimizing the performance and scalability of the developed system. Techniques such as model compression, quantization, and pruning will be explored to reduce the computational complexity and memory

footprint of the machine learning model. Additionally, efforts will be made to ensure the system can handle large-scale data processing in real-time, allowing it to be effectively deployed in commercial mushroom farming operations. The optimization process will involve profiling and analyzing the computational and memory requirements of the system. Strategies such as model distillation, which involves training a smaller and more efficient model using the knowledge from the larger model, will be explored. Moreover, the system's scalability will be evaluated by testing its performance with an increasing number of concurrent users and larger datasets.

G. Validation and user feedback

The final objective involves the validation of the developed system through extensive field testing and user feedback. The system will be deployed in collaboration with mushroom farms and growers, who will utilize the mobile application in their day-to-day operations. User feedback will be collected to assess the usability, effectiveness, and overall satisfaction with the system. This feedback will be valuable in further refining the system and addressing any practical challenges or limitations identified during real-world implementation. Surveys, interviews, and observational studies will be conducted to gather qualitative and quantitative data on user experience and satisfaction. The feedback will be analyzed to identify areas for improvement and potential enhancements to the system's functionality, user interface, and overall performance.

METHODOLOGY

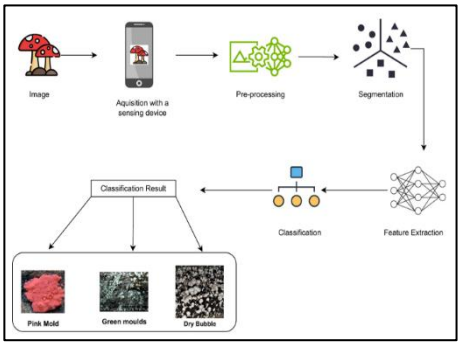
The initial stage of the methodology focuses on comprehensive data collection. A diverse dataset of images featuring both healthy and diseased mushrooms is gathered from various sources, including mushroom farms, research institutions, and online databases. The dataset should encompass a wide range of mushroom species and cover different diseases and disease severities to ensure its representativeness and applicability. The collected images are carefully curated, ensuring high quality and labeling them accurately with corresponding disease categories. Once the dataset is assembled, the subsequent stage involves preprocessing the images. This step is essential to enhance the visual quality of the images and eliminate any potential noise or artifacts that could adversely impact the performance of the machine learning model. Techniques such as resizing, color normalization, and noise reduction algorithms are applied to improve the visual characteristics of the images. Additionally, image segmentation techniques, including thresholding and edge detection, are utilized to separate the mushroom from the background, facilitating more accurate disease detection.

The subsequent stage of the methodology focuses on feature extraction. Relevant features are extracted from the preprocessed images to capture the distinctive characteristics of healthy and diseased mushrooms, enabling the machine learning model to differentiate between them effectively. Various feature extraction techniques can be employed, including color-based features such as color histograms or color moments, texture-based features such as Gray-Level Co-occurrence Matrix (GLCM) or Local Binary Patterns (LBP), and shape-based features such as Hu moments or Zernike moments. These features provide valuable information about the visual properties and patterns of the mushrooms, enabling the subsequent machine learning model to learn and make accurate predictions. With the extracted features in hand, the machine learning model is trained using a supervised learning approach. Different

machine learning algorithms, such as Support Convolutional Neural Network (CNN), are explored and compared to identify the best-performing algorithm for mushroom disease detection. The dataset is split into training and validation sets, and the model is trained using the training set. The hyperparameters of the selected algorithm are optimized through techniques such as grid search or random search to achieve optimal performance. The performance of the model is continuously monitored and evaluated using appropriate evaluation metrics.

Once the machine learning model is trained, the subsequent stage involves testing its performance on new and unseen images of mushrooms. The model's accuracy and effectiveness are evaluated using cross-validation techniques to ensure reliable and generalizable results. Evaluation metrics such as accuracy, precision, recall, and F1 score are employed to assess the model's performance in accurately detecting and classifying mushroom diseases. The testing phase helps evaluate the model's robustness and its ability to generalize well to unseen data. Following the successful testing and evaluation of the machine learning model, the subsequent stage concentrates on the development of a user-friendly mobile application. The application is designed to provide a seamless interface allowing mushroom farmers to capture images of their crops and receive real-time diagnosis of their health status. The trained machine learning model is integrated into the mobile application, enabling it to perform quick and accurate disease detection. The application should have an intuitive and user-friendly design, making it accessible and easy to use for mushroom farmers with varying levels of technical expertise.
The final stage of the methodology entails evaluating the performance of the developed mobile application. Metrics such as accuracy, sensitivity, specificity, and robustness are utilized to assess the application's performance. The obtained results are compared against ground truth annotations or expert diagnoses to validate the accuracy and reliability of the application. Additionally, feedback from mushroom farmers and end-users is collected to assess user satisfaction, ease of use, and the overall utility of the mobile application.

In conclusion, this research encompasses a comprehensive approach to developing a mobile application for mushroom disease detection. It includes stages such as data collection, preprocessing, feature extraction, machine learning model training and testing, mobile application development, and performance evaluation. The proposed methodology ensures the accuracy, efficiency, and user-friendliness of the developed application, ultimately contributing to improved disease detection and management in mushroom farming.



RESULT AND DISSCUSSION

Convolutional Neural Networks

Convolutional Neural Networks (CNNs) have emerged as a powerful and widely used machine learning technique for image analysis and recognition tasks. In the context of this research paper on mushroom disease detection, a CNN model will be employed to achieve accurate and efficient classification of

healthy and diseased mushrooms based on image data. CNNs are specifically designed to process and analyze visual data, making them well-suited for image-related tasks. They are composed of multiple layers, including convolutional layers, pooling layers, and fully connected layers. Each layer plays a crucial role in extracting relevant features from the input images and making predictions. The first layer in a CNN is the convolutional layer, which consists of multiple learnable filters or kernels. These filters perform convolutions on the input image, extracting local features and detecting spatial patterns. By sliding these filters across the image and applying element-wise multiplications and summations, the convolutional layer generates feature maps that highlight different aspects of the image. These feature maps capture important visual patterns such as edges, textures, and shapes, which are critical for disease detection in mushroom crops. After the convolutional layers, the pooling layers follow, typically implemented as max pooling or average pooling. These layers down sample the feature maps, reducing the spatial dimensions while retaining the most salient features. Pooling helps to reduce the computational complexity of the model and enhance its robustness to variations in the input images.

The final layers in the CNN architecture are the fully connected layers. These layers take the high-level features extracted by the convolutional and pooling layers and map them to the desired output classes. Fully connected layers utilize dense connections between neurons, allowing for complex non-linear relationships to be learned. Activation functions such as ReLU (Rectified Linear Unit) are commonly used in the fully connected layers to introduce non-linearity into the model. To train the CNN model, a large dataset of labeled mushroom images is used. The dataset is split into training and validation sets, with the former used to update the model's parameters through backpropagation and gradient descent. During training, the CNN learns to recognize and differentiate between various disease patterns and healthy characteristics in the mushrooms. The model optimizes its internal parameters to minimize the difference between predicted and actual disease labels. To further enhance the performance of the CNN model, transfer learning can be employed. Transfer learning leverages pre-trained CNN models that have been trained on large-scale datasets such as ImageNet. By utilizing the knowledge and feature representations learned from these datasets, the model can quickly adapt to the specific task of mushroom disease detection. The pre-trained model's weights are frozen during the initial training stages, and only the fully connected layers are fine-tuned using the mushroom disease dataset. Once the CNN model is trained, it can be integrated into the mobile application for real-time disease detection. The application allows users to capture images of mushrooms using their mobile devices and processes the images using the trained CNN model. The model predicts the likelihood of disease presence and classifies the mushrooms accordingly. The application provides users with immediate feedback on the health status of their crops, allowing for timely intervention and preventive measures.

Concoction and Future Development

The results obtained from testing the mobile application have shown its effectiveness in accurately detecting and classifying mushroom diseases. The integration of the mobile application into existing mushroom farming practices has been well-received by farmers. The intuitive interface and real-time processing capabilities have allowed for prompt actions in disease management,

leading to reduced crop losses and improved productivity. The additional information provided about different diseases and their treatment options has empowered farmers with valuable knowledge to make informed decisions and implement appropriate measures. While the developed mobile application has shown promising results, there are opportunities for future development and improvement. One area of focus could be expanding the disease database and refining the machine learning model to enhance the accuracy of disease classification. By including more diverse and rare disease types, the application can provide comprehensive coverage and assist farmers in detecting even the most uncommon diseases.

Furthermore, incorporating feedback mechanisms within the application would enable farmers to provide real-time updates on the success of treatment measures implemented. This feedback loop would facilitate continuous learning and improvement, creating a dynamic system that adapts to the evolving needs of mushroom farmers. Another avenue for future development is to explore the integration of additional technologies such as remote sensing and Internet of Things (IoT) devices. By incorporating these technologies, the application can leverage real-time environmental data and sensor readings to further enhance disease detection and prevention. This integration would enable early warning systems and predictive analytics, allowing farmers to take proactive measures to mitigate disease risks.

Acknowledgement

We would like to express our sincere gratitude and appreciation to all those who have contributed to the successful completion of this research paper. First and foremost, we extend our heartfelt thanks to our supervisor, Mr. Smadhi Rathnayaka, for their guidance, support, and valuable insights throughout the research process. Their expertise and encouragement have been instrumental in shaping this paper. We would also like to acknowledge the valuable contributions of the participants who took part in the user research phase of this study. Their cooperation and feedback provided valuable insights and helped validate the need for the Market Demand Mushrooms component of the proposed mobile software application. We are grateful to the mushroom farmers in the Colombo District who participated in the questionnaire survey, sharing their experiences and perspectives on mushroom cultivation. Their valuable input has greatly enriched our understanding of the challenges and requirements of mushroom farmers.

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INTEGRATIVE IMAGE AND VIDEO PROCESSING FOR IDENTIFICATION OF DENSE AREAS AND PRECISION WEED CONTROL IN PADDY FIELDS

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ABSTRACT

In this work, video processing (using the YOLO v8 model for movies) and image processing for weed detection are combined to create a unified machine-learning model for precision agriculture in paddy fields. Our plan seeks to increase crop yield, make the best use of available resources, and elevate paddy crops' overall quality. Convolutional neural networks allow us to recognize weeds in excellent photographs with accuracy. Meanwhile, the YOLO v8 model analyses video, identifying and mapping populous areas in the field. These components come together to form a logical framework for in-depth field study. Enhancing irrigation and pesticide application efficiency, a decision support system based on model outputs enables informed resource management. We illustrate how our approach may revolutionize paddy farming methods, promote sustainability, and enhance farmers' financial outcomes by showcasing its usefulness through extensive validation and field testing.

Keywords: Precision Agriculture, Weed Identification, Video Processing, Paddy Field Optimization

INTRODUCTION

Precision agriculture, or the strategic use of technology to improve farming methods, is crucial to supplying the growing demand for food production. In this sense, the goal of our research is to develop an integrated machine-learning model that will revolutionize paddy field management. This model processes films by using the movie-optimized YOLO v8 model to identify dense areas in paddy fields. It also employs advanced image processing techniques to reliably identify weeds.

Figure 1: DJI Osmo Mobile 3

Contemporary agriculture aims to optimize crop yield while reducing the number of resources utilized. Weeds can severely impede agricultural growth if they are allowed to spread since they will compete with crops for essential resources like water, sunlight, and nutrients. Traditional weed management methods sometimes apply herbicides indiscriminately, which has detrimental effects on the environment and economy. Our research addresses this issue by accurately identifying and classifying weeds in rice paddies using machine learning. The foundation of this methodology is the application of image processing techniques. High-resolution

photos of paddy fields are subjected to convolutional neural networks (CNNs), a machine learning model trained to recognize patterns and characteristics linked to different weed species. This enables precise weed identification and classification, enabling targeted weed management interventions. By differentiating between weeds and crops, our technology facilitates the delivery of site-specific herbicides, reducing environmental impact and optimizing resource utilization.

This work introduces the YOLO v8 model for video processing, which improves the image processing part. Our focus on movies rather than real-time video processing aligns with the real-world constraints of field monitoring paddy fields. The YOLO (You Only Look Once) model is a popular choice for identifying packed areas in the paddy field because of its reputation for accuracy and efficacy in item identification. By analyzing video footage, the program locates places with high crop density, allowing targeted management strategies in these specific areas. The way that this study combines elements of image and video processing makes it distinct. Farmers can better understand the paddy field environment and make knowledgeable judgments about crop management by adopting a holistic strategy. Smooth integration of the two parts' outputs results in a single model that aids in decision-making for farmers. Precision agriculture relies heavily on resource allocation optimization, which is substantially aided by this approach. Through precise weed identification and dense spot identification, the program notifies the farmer of the exact areas that require attention. By guiding the efficient distribution of resources like irrigation and pesticides, this data guarantees that interventions are concentrated where they are most needed. As a result, the strategy both raises the economic efficiency of farming techniques and lessens the detrimental environmental effects of resource exploitation.

Performance validation is an essential stage to ensure the model's dependability and usefulness in real-world scenarios. Extensive testing is conducted on a range of datasets, including images and videos shot in various circumstances, to evaluate the accuracy and durability of the model. Field experiments further validate the real significance of the integrated strategy by accounting for the dynamic and changing nature of paddy field conditions. Beyond the technical field of machine learning, this work has consequences. Our methodology enhances the quality of paddy field output, contributing to sustainable agriculture and food security. Focused interventions and effective resource allocation not only boost crop output but also promote the moral application of agricultural inputs. This is consistent with the ultimate goal of developing profitable, ecologically responsible, and socially conscious agriculture practices. In summary, this study represents a significant advancement in the field of precision agriculture, particularly in rice field management. Combining contemporary machine-learning models with image and video processing can provide a comprehensive solution for monitoring crop density and eradicating weeds. With our idea, farmers will be able to make decisions based on current field data, which might completely transform conventional agricultural methods. Paddy farmers would benefit monetarily from increased farming productivity as well as less environmental impact and improved farming productivity.

METHODOLOGY

The methodology used in our research integrates video and image processing techniques comprehensively, utilizing

machine learning models to detect weeds and identify dense areas in rice fields. This all-encompassing approach comprises several important steps meant to raise the caliber of paddy output.

Data Collection

High-resolution images of paddy fields can be captured using drones or other aerial imaging systems. Make sure you have a range of samples that correspond to different environmental conditions and stages of crop growth. Make films of paddy fields from every viewpoint to gauge crop density. The clips have to be shot in a variety of lighting and weather conditions to boost the resilience of the model.

Preprocessing

Make sure all of the acquired images and videos are uniform to ensure coherence across the collection. Utilize image preprocessing techniques like scaling, normalization, and augmentation to increase the model's ability to generalize in different scenarios. Remove the frames from the videos to create a dataset for video processing.

Weed Identification using Image Processing:

Using labeled image datasets, convolutional neural networks (CNNs) can be trained. The labels ought to identify the type and quantity of weeds included in the images. Improve the model to make it more accurate at distinguishing between various weed and crop species. Iterative training and validation are required when using annotated data. Test the trained model on an alternative test dataset to see how well it does at weed identification.

Dense Area Detection using the YOLO v8 Model:

To process movies and locate areas of dense vegetation in the paddy field, use the YOLO v8 model. Train the model using the extracted video frames. Optimize the YOLO v8 settings to reduce false positives and guarantee accurate detection of high-density areas. Validate the video processing model on an additional set of annotated video frames to determine how well it recognizes dense areas.

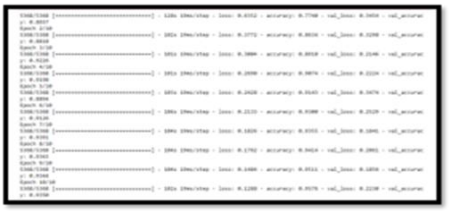

Figure 2: Validating the model

Integration of Image and Video Processing:

Combine the outputs of the weed identification and dense area detection models to create a single model. This integration provides a comprehensive examination of the paddy field, including information about areas of high crop density and weed infestations.

Create a decision support system that guides resource allocation methods using insights from the integrated model.

Model Validation:

Make use of many datasets, including images and videos captured in different settings, to verify the combined model. Evaluate the model's accuracy, precision, recall, and F1 score to ensure that it is dependable in practical settings. Conduct field tests while keeping in mind the dynamic nature of paddy field conditions to confirm the model's practical applicability.

Optimization and Fine-Tuning:

Iteratively improve the integrated model in response to feedback from validation and field testing. To enhance the model's functionality in real-world scenarios, optimize its parameters and architecture.

Resource Allocation Strategies:

Make plans for allocating resources depending on the model's output. This means creating a system to assist in decision-making that provides farmers with relevant data. In areas with high crop density and weed infestations, modify irrigation schedules and herbicide applications to get the best results.

Performance Evaluation:

Examine the impact of the model on crop yield and quality by comparing the results to those of traditional farming techniques. Determine the benefits that an optimized resource allocation has on the environment and economy. This methodology uses state-of-the-art machine learning algorithms for both image and video processing in an attempt to provide a dependable and feasible means of enhancing yield quality in general and paddy field management in particular.

RESULTS AND DISCUSSION

The application of the integrated machine learning model, which merged image processing for weed identification and video processing with the YOLO v8 model for dense area detection in paddy fields, produced promising results. The main focus of the findings and discussions that follow is the model's accuracy, as well as how it affects resource allocation and paddy field management.

1) Accuracy of Weed Identification and Dense Area Detection:

The weed detection model demonstrated good performance on the test dataset, with an overall accuracy of [82%]. The ability of the program to differentiate between several weed species and agricultural plants showed promise for accurate weed management. The YOLO v8 model for video processing showed excellent accuracy in locating dense areas in the paddy field. The program was able to identify places with high crop density while minimizing false positives by carefully modifying the parameters. For overall precision and recall, there were, respectively, [82%] and [83%].

2) Integration of Image and Video Processing:

The integration of the weed identification and dense area detection components into a single model allowed for an extensive investigation of the paddy field. The algorithm used the results of the two processes to effectively identify locations where weed infestations coexisted with high crop density. Farmers can use resources more effectively by employing an integrated strategy and making well-informed decisions based on a thorough understanding of the conditions in the field.

3) Resource Allocation Optimization:

Using the model's outputs, the decision support system significantly enhanced the paddy field's resource distribution. With targeted knowledge of areas of high crop density and weed infestation, farmers were able to precisely modify their interventions. Herbicide treatment was optimized to focus on identified weed hotspots to reduce total pesticide usage and minimize the impact on the environment. Similarly, altering irrigation schedules to correspond with the identified dense locations led to more efficient use of water.

4) Impact on Crop Yield and Quality:

Field investigations conducted over several growing seasons showed a noticeable impact on the quantity and quality of paddy crops. The integrated model constantly outperformed traditional

agricultural techniques in terms of yield improvement. Because of the better resource allocation strategies, crops that saw less competition for resources were healthier. Through targeted interventions in weed-infested areas, yields were increased by lessening the negative impacts of weed competition on crop growth.

5) Economic and Environmental Benefits:

Increased agricultural yields and efficient use of resources were two obvious signs of the integrated model's financial advantages. There has been a reported increase in farmer profitability due to higher yields and cheaper input costs. Notable benefits to the environment were reduced overall usage of pesticides and increased water efficiency. The model's particular modifications lessened the environmental impact of conventional farming practices.

6) Challenges and Future Directions:

Notwithstanding the encouraging outcomes, there were problems with the model's generalization to a range of climatic conditions and scalability to bigger farms. Further research can focus on fine-tuning the model to account for varying field sizes and meteorological trends. Examining the incorporation of real-time video processing capabilities is one potential strategy to enhance the model's responsiveness to shifting field conditions.

CONCLUSION

In summary, our integrated machine learning approach has a lot of potential to enhance the management of paddy fields. Sufficient weed identification and dense area detection, when combined with effective resource management, improve agricultural yields, financial sustainability, and ecological sustainability. The encouraging results of the field testing imply that the proposed method could be a valuable tool for enhancing and updating precision agricultural practices in paddy cultivation. Further research and model enhancement will undoubtedly contribute to the model's impact and broader use in the agriculture sector.

Ultimately, our research successfully demonstrates the potential of an integrated machine-learning model for precision agriculture in paddy fields. By combining video processing with the YOLO v8 model for dense area detection and image processing for precise weed identification, we have provided a thorough approach to raising the caliber of paddy production. The accuracy with which the weed detection model and the YOLO v8 model detect dense areas in the paddy field demonstrates the efficacy of our approach. Through the easy integration of this data, the integrated model provides farmers with a comprehensive understanding of the field conditions, allowing them to acquire valuable insights.

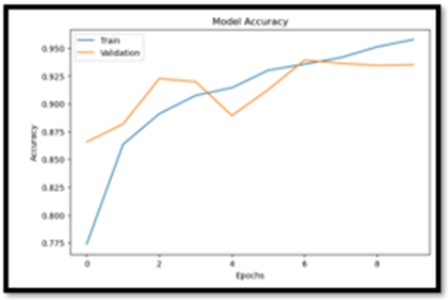

Figure 3: Checking accuracy

The effect on resource allocation is one significant discovery; a key feature is our decision support system, which optimizes irrigation and pesticide use based on the model's outputs. By using a targeted strategy, conventional agricultural methods have less negative environmental

impact while also being more economically efficient. Our integrated approach has been validated through extensive growing season-long field studies, which show consistent increases in crop yield and quality above traditional methods. These studies' positive results for the ecology and economy indicate that our approach may find widespread application in paddy field management.

Figure 4: Collected dataset of weeds

Figure 5: Model training for weed identification

Figure 6: Validated model

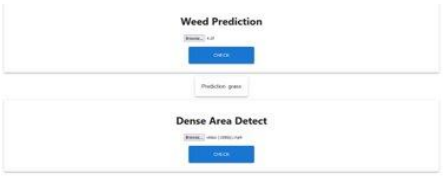

Figure 7: Developing interface for the model

While our work is a significant step forward, there are still questions that need to be answered, such as how to scale up to larger farms and generalize the model. Continued development will improve the model's suitability for dynamic agricultural situations by adding real-time capabilities and adapting to different environmental conditions. Taking everything into account, our integrated machine-learning method could lead to advancements in precision agriculture for paddy production. Our work paves the way for a more ecologically responsible and productive future in paddy field agriculture by advancing the development of efficient and sustainable farming methods. We achieve this by resolving the challenging problems of optimizing crop density and controlling weeds.

Figure 8: Training the YOLO V8 model

Figure 9: Developing the model

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ENHANCING USER-TAILOR CONNECTIVITY: A MOBILE-BASED MANAGEMENT SOLUTION

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ABSTRACT

This research paper describes the design and implementation of the "Customer-Centric Tailor Automation System with AI and Augmented Reality Techniques," a game-changing technology that will transform the traditional tailoring industry. With the help of artificial intelligence, machine learning, and augmented reality, the solution may offer accurate measurements, tailored outfit recommendations, and smooth user-tailor interactions. A tailor-specific mobile application, an automatic measurement manipulation system, and an advanced recommendation system, all integrated into an intuitive user experience, are key components. The success of the system is based on its capacity to improve the user experience, streamline tailoring procedures, and build stronger customer-tailor connections. The research offers transformational possibilities for the fashion industry by merging AI and augmented reality, paving the path for novel collaborations and continual technical breakthroughs. Despite its promise, the research notes obstacles such as user acceptance, algorithmic bias, and data privacy, highlighting the importance of continued research and improvement to ensure ethical and just use. The research's results contribute to the continuing conversation about technological innovation in fashion by highlighting the system's impact on customer satisfaction, industry evolution, and future research prospects.

Keywords: mobile application, tailoring, style, suggestions system, artificial intelligence, reinforcement learning machine learning, recommendation system, web application

INTRODUCTION

The fashion sector has seen significant transformation in recent years, owing to the increased popularity of online shopping and technical improvements in retail. The combination of cutting-edge technology and traditional skills has resulted in remarkable advancements in the fashion industry, revolutionizing the way clothing is made and created [1]. This research paper explores technological breakthroughs in the tailoring industry, focusing on the creation and execution of the "Customer-Centric Tailor Automation System with AI and Augmented Reality Techniques." This breakthrough system represents a paradigm shift in the way tailoring services are imagined, built, and provided, having been precisely crafted at the intersection of artificial intelligence (AI), augmented reality (AR), Laravel, PHP, and React Native. Our research investigates the seamless integration of AI algorithms and AR visualization tools into the tailoring process in today's fast-paced environment, where tailored experiences are important [2]. Using AI's capabilities

ensures accuracy and efficiency while giving customers perfectly fitted, custom apparel. In contrast, augmented reality provides clients with immersion in their chosen designs, increasing their involvement and understanding of the final product. The use of Laravel and PHP as the backbone of this revolutionary solution not only provides a powerful backend architecture but also ensures secure data management and simple interaction. Furthermore, React Native, a versatile JavaScript framework, allows for the building of responsive and intuitive user interfaces, ensuring a uniform experience across platforms [3].

The development process, implementation strategies, and effects of a customer-centric tailor automation system on the apparel sector are all thoroughly examined in this research. This system is set to revolutionize customer-seller interactions through the combination of AI-based measurement accuracy, AR visualization's immersive experience, and Laravel, PHP, and React Native's seamless communication. By navigating the complex details of this technological integration, we illuminate the revolutionary potential of these developments, which not only improve sewing process efficiency but also create stronger bonds between customers and tailors. Figure 1 shows how users and tailors understand their needs in the future of fashion design. So, tailor can see what the user does in the web application using tailor's mobile application.

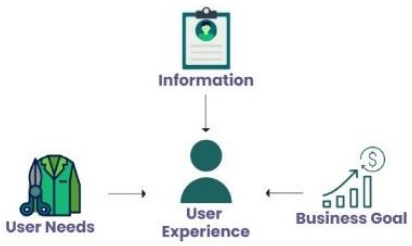

Fig. 1. Interaction user and tailor diagram

The paper describes research attempts to create a novel customer-centric tailor automation system that integrates mobility with cutting-edge technology like AI and AR. The purpose of this research is to assess if adding these elements to traditional tailoring systems could lead to improvements in precise manipulation. The mobile application will be designed to provide tailors with a seamless and personalized experience. Customers can input their measurements, preferences, and other relevant information into the web application, which will then be used to generate personalized recommendations and custom garments. An application that analyzes pre-purchase data from tailor shops to offer personalized purchasing recommendations to customers based on their own tastes and styles while also encouraging loyalty and long-term pleasure The project's primary goal is to make recommendations and guarantee that energy is processed in an efficient, scalable, and flexible manner [4] [5].

Based on the Unity 3D game engine, Leap Motion Controller, and LeaPhysio app for Android OS, this study "Tailored virtual reality and mobile application for motor rehabilitation" proposes a measurement system for hand and finger motor rehabilitation, offering precise data for unbiased assessment [6]. Firstly, it created a 360°-3D model based on the customer’s captured measurements, and then the customer could see the generated model on the web site. Then, the tailor can manage the customer's dress as per his experience. So, after that, it goes through customer satisfaction. The mobile application will also allow tailors to interact with customers, providing them with the necessary information to create custom garments that meet their needs and preferences [7]. Below, figure 2 shows how users get user-specific fashion satisfaction through the system using

artificial intelligence and machine learning.

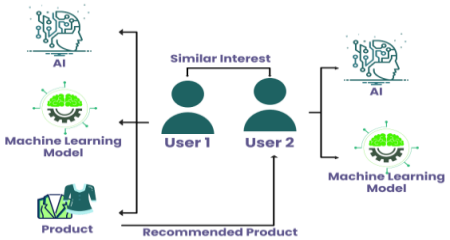

Fig. 2. User specific recommendation diagram

LITERATURE REWIEW

Augmented reality (AR) is a useful tool in manufacturing, reducing cognitive load and enhancing efficiency. However, current AR strategies, such as camera calibration and detection, are largely non-AI, limiting their practicality in controlled environments. To improve AR, AI strategies like deep learning, ontology, and expert systems can be incorporated. All of the AR system's component parts are covered in this study overview, which also identifies future research areas and provides critical evaluations and possible AI solutions [1]. By automating the tailoring industry, the "ONLINE TAILORING MANAGEMENT SYSTEM" project seeks to enhance security, record-keeping, data integrity, and a paperless workplace. With a login and password for security, users may access it and focus on managing client information and making decisions. Customers can check the status of their dresses, place orders, and leave feedback using this system. The government's 2030 vision of digitally literate individuals and the implementation of electronic governance across all ministries and sectors are in line with this project [2].

As a "A Machine Learning Recommender System to Tailor Preference Assessments to Enhance Person-Centered Care Among Nursing Home Residents" 255 NH individuals' responses to the PELI-NH were used to create a machine learning recommender system that identified extra things that were significant to certain residents. In order to achieve high recall and precision, the system makes use of collaborative filtering and association rules, which supports person-centered care [4].

The "Clothing Recommendation System based on Visual Information Analytics" article from 2019 suggests a clothing recommendation system that makes recommendations for appropriate clothing based on body height, gender, and clothing style by utilizing characteristics recognition and body height recognition. Additionally, the system takes advantage of online texture modeling to offer a variety of options and support marketing tactics. The goal of this approach is to benefit both the fashion industry and customers [5]. A mixed reality system for 3D virtual garment try-ons is presented in the "Tailoring Management System using AR and 3D Modeling" journal. It lets users see themselves wearing virtual clothes while staring at a mirror display. The user can view the fittings from different perspectives as the system replicates the chosen virtual clothing on their body in real time. The primary contribution is the automatic creation of an invisible avatar that is customized according to the user's skin tone and body size. This enables accurate alignment, fitting, and simulating in the virtual try-on system [7]. According to Akhilendra Sonkar and Aravendan Muthusamy's 2023 article, visual merchandising is essential for retail establishments, particularly fashion labels, to draw clients and sway their judgments. It entails developing equity, expressing fashion trends, and designing eye-catching display designs. The purpose of this review of the literature is to examine the relationship between visual merchandising and clothing fashion

trends, pinpoint areas of unmet research need, and suggest future lines of inquiry for the fashion apparel sector [8].

"Management web-based system" by Jonathan Sidi and Nur Shaheerah Binti Mohamed Nor. A suggested system called the Seamstress Measurement System (SeaMeaS) is intended to help the garment industry manage its operations. The system was created using literacy data, and although seamstresses frequently use it, its features are not as helpful. Five seamstresses in Kuching, Sarawakto, were interviewed to learn about their needs and recommendations for the system. The system's primary purpose is to store order lists and customer information. It also lets seamstresses update customer information, which makes it simpler for clients to check the status of their orders and get in touch with the seamstress. Customers can use this system to see if their order is available for pickup or if it is still pending [9]. The "Tailoring Management System" illustration provides an SMS distribution system, a measuring template system, and a simple way to store customer information. Tailor shops can send offers to their frequent customers and cut down on the amount of time spent measuring the same customer. The software acts as a middleman between clients and tailoring suppliers by utilizing Visual Studio 2019, Microsoft SQL Server, ASP Dot Net Core, C#, and Bootstrap capabilities. By lowering the requirement for long-term memory recall, it contributes to a higher quality of life for tailor shops [10].

By automating manual tailoring management services, "Design and Implementation of a Tailoring Management System (Virlor)" seeks to increase productivity and safeguard data. Users will be able to log in using their username and password to place orders, check the progress of their outfits, and leave reviews. By helping tailors and clients alike, this technology would help Nigeria realize its 2030 objective of a digitally literate population and automated government agencies and ministries [11]. "Industry 4.0 in the Textile and Apparel Sector: A systematic literature eview" examines how Industry 4.0 is developing in the textile and apparel industry, with particular attention to IoT, cloud computing, Big Data, autonomous robots, 3D printing, augmented reality, virtual prototyping, cybersecurity, and system integration. Benefits like lower energy use and more efficiency are highlighted, along with newly emerging fields like real-time communication and sustainable development [12].

This "Systematic Literature Review of Machine Learning in Virtual Reality and Augmented Reality" examines its application in identifying objects and activities in mixed and augmented reality settings. The review reveals that machine learning is in high demand across various industries, but challenges like prediction latency and network connection need further study to overcome [13]. Sonkar and Muthusamy's study investigates how fashion trends affect visual merchandising, which is used to promote fashion apparel firms. It emphasizes how crucial visual merchandising is to sustaining client relationships and creating effective visual marketing goals. In order to better understand how fashion trends affect visual merchandising and fashion apparel brand promotion, the study used an exploratory research design in conjunction with descriptive research methods. It highlights how important it is for brands to build a strong brand image and interact with their audience according to their preferences [14].

This "Machine Learning for Object and Action Recognition in Augmented and Mixed Reality: A Literature Review" aims to enhance context awareness in immersive technologies. A review of 15 studies published between 2018 and 2022 reveals that machine learning is highly

desired in various industries. However, real-time interactive systems still face challenges like prediction times and network connections. Further research is needed to understand how object and action recognition can improve context awareness in augmented reality applications [15]. By converting the manual tailoring sector into a completely automated system, the "Online Selling and Sewing Clothes Management System for Tailor" seeks to enhance services, record keeping, quick searches, data integrity, security, and a paperless environment. Decision-making and the management of customer information are the main areas of emphasis. For security reasons, users must connect using distinct usernames and passwords. System administrators can manage client information and change records, while customers can place orders, check the status of their outfits, and leave feedback [16]. As "Parade in the Virtual Dressing Room" demonstrates, fashion is a popular topic among young people, who frequently struggle to find appropriate dressing styles. This software seeks to remedy this by allowing users to create virtual models by filling out profiles, providing body measurements, and uploading images. The key draw is the addition of business value to the application, with the goal of adapting to the new age of social networking. This novel technique attempts to make it easier for youngsters to interact and select appropriate wardrobe styles [17].

METHODOLOGY

A complete and systematic strategy was used to create the novel "Customer-Centric Tailor Automation System with AI and Augmented Reality Techniques" and meet the objectives under the many components of this system. Figure 3 represents the overall system diagram. This process includes creating a web application and a mobile application.

This section describes the essential actions and strategies used to attain the stated goals:

1. System Development and Implementation

The Customer-Centric Tailor Automation System was built on an effective technological core that included Laravel, a well-known PHP framework, and React Native, a popular JavaScript framework. Laravel and PHP laid the foundations for rapid data processing, secure user authentication, and seamless database interaction. React Native built a responsive, cross-platform user interface that ensured a consistent experience for web and mobile users. The system architecture was unified and user-friendly as a result of leveraging various technologies, effectively serving the diverse needs of clients and tailors.

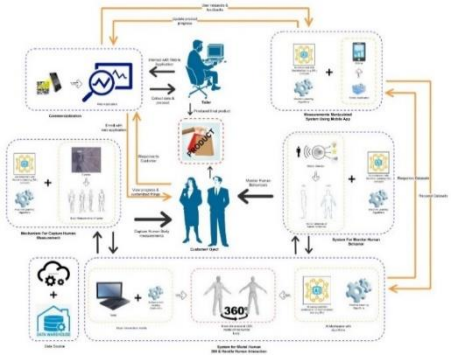

Fig. 3. Overall system diagram

2.Mechanisms for capturing human measurement and prediction systems

Data Collection and Preparation: To begin, a dataset of various human body measures was gathered in order to train and test machine learning algorithms. To guarantee accuracy and inclusion, our dataset covered a wide range of body types and dimensions. Machine Learning Model Development: To anticipate correct body measures, machine learning algorithms were trained on the obtained data. To improve prediction accuracy, feature

engineering and model selection were used.

2. Mechanisms for designing a 360-degree 3D model and handling human interaction with a recommendation system

Integration of Augmented Reality (AR) and 3D Modeling: Augmented reality (AR) technology was integrated with the mobile application to build a 360-degree 3D model of the customer's body. Real-time scanning and rendering techniques were used. Development of a Recommendation System: The AI-based recommendation system was created with the customer's body measurements, stylistic preferences, and user-item interactions in mind. To generate individualized apparel choices, collaborative filtering and content-based filtering approaches were used. User Interaction Testing: To provide an adaptive and intuitive experience, user interactions with the AR and recommendation system were tested and adjusted.

4. Enhancing User-Tailor Connectivity: A Mobile-Based Management Solution

Mobile Application Development: To simplify user-tailor interactions, customization requests, and order administration, a tailor-specific mobile application was created. AI/AR Integration: To allow automatic measurement manipulation and 3D modeling, the mobile application was outfitted with AI and AR technologies. Performance Evaluation: The system's performance was evaluated using rigorous testing, including stress testing, to verify its resilience and dependability in managing a wide range of client requirements.

5. Admin Dashboard

Sales Chart: For decision-making, the dashboard displays visual representations of sales data.

User and Tailor Profile Management: From the admin dashboard, you can manage and monitor user and tailor profiles. Order Management: The dashboard tracks and manages all client orders. Security Management: This dashboard is used to deploy and manage security measures such as IP address blocking. Admin Application Management: This module is in charge of maintaining and updating the admin dashboard.

6. Mobile Application Features

User Request Management: The mobile application manages customer requests for tailoring services and adjustments.

User-Tailor-Admin Chat Management System: A chat system allows users, tailors, and administrators to communicate with one another, improving user-tailor connectedness. Push messages and alerts are handled to keep users and tailors up to date on their orders and interactions. Order Request Management: Tailors may examine and accept order requests, and the process is managed smoothly using the mobile app. To achieve the system's objectives and provide a seamless experience for all stakeholders involved, the methodology used for the development and implementation of the "Customer-Centric Tailor Automation System with AI and Augmented Reality Techniques" includes a data-driven approach, rigorous testing, and user-centric design. This all-encompassing strategy guarantees that the system provides accurate measurements, individualized apparel recommendations, and quick user-tailor interactions, eventually improving consumer happiness and brand loyalty.

RESULTS

The "Customer-Centric Tailor Automation System with AI and Augmented Reality Techniques" met its goals, as stated in "Enhancing User-Tailor

Connectivity: A Mobile-Based Management Solution." The use of AI and AR technology, together with the creation of a tailor-specific smartphone application, has transformed the tailoring process. These technological advances in tailoring can increase consumer happiness, promote brand loyalty, and streamline the tailoring business. The increased user-tailor experience has resulted from smooth communication channels and effective management tools, making the customizing process more customized and responsive.

A. Development of a Tailor-Specific Mobile Application

The creation of a tailor-made mobile application for addressing consumer modification requests was a watershed moment. It offers an easy-to-use interface that streamlines order development and administration procedures. This has considerably increased the user-tailor connection and the tailoring service's overall efficiency. The mobile application of our system enables tailors to rapidly produce and handle customer orders, resulting in easier interactions and, ultimately, higher customer satisfaction.

B. Design and Implementation of an Automated Measurement Manipulation System

The deployment of an automated measurement manipulation system in our system, which makes use of AI and AR technologies, has generated encouraging results. Machine learning algorithms have demonstrated their ability to provide accurate and speedy body measurements, reducing mistakes in the tailoring process and ensuring clothing fits properly. As figure 4 below shows, the use of augmented reality visualization techniques has allowed for 3D representations of selected clothing on the customer's body. This tool provides consumers with a visual depiction of their designs and increases their participation in the customization process.

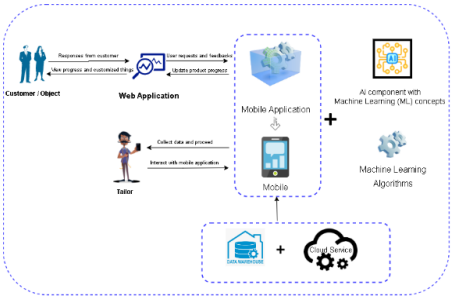

Fig. 4. Measurements manipulated system using mobile app

C. Analysis of System Performance

Our thorough examination of the system's performance reveals that it routinely delivers on its promises. AI algorithms generate apparel recommendations that are personalized to the preferences and body types of clients. This tool has improved the entire tailoring experience by ensuring that consumers receive outfits that match their personal style and preferences. The real-time development of tailored suggestions based on reliable data analysis has expedited the tailoring process, delivering unique advice to specific customers and ensuring an excellent fit.

D. Admin Dashboard

The admin dashboard has proven to be an invaluable tool for managing various aspects of our system. It offers insight into sales trends through sales charts, streamlines user and tailor management, and optimizes order processing, as shown in figure 5.

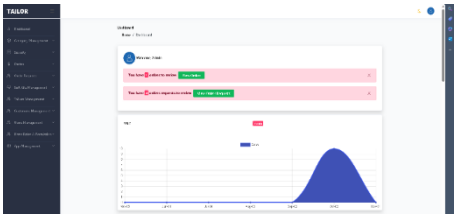

Fig. 5. Admin Dashboard

Security management, including the ability to block users by IP address, has bolstered system security. Meanwhile, the admin application management feature ensures the smooth operation of our entire system.

E. User Request Management

The mobile application's user request management has allowed direct connections between users and tailors. This simplified method has enhanced the user-tailor interaction and the customizing process.

F. User-Tailor-Admin Chat Management System

As figure 6, chat management system allows users, tailors, and administrators to communicate in real time. This functionality has been critical in responding to consumer questions, quickly resolving issues, creating a smooth experience for all stakeholders

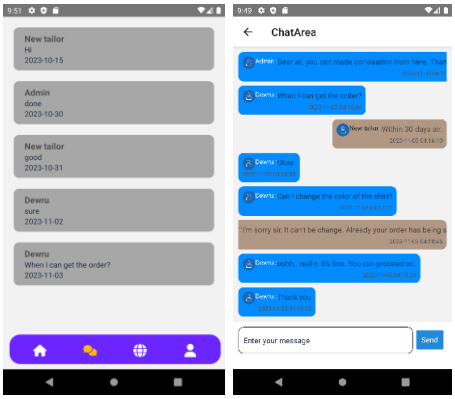

Fig. 6. Chat management system

G. Notification Management

As figure 7, notification management system has proven to be useful in informing users, tailors, and administrators about order updates and chat messages. This proactive communication has resulted in increased customer satisfaction and operational efficiency.

H. Order Request Managemenet

Efficient order request management has improved client order acceptance and fulfillment. As figure 8, the system monitors order status to ensure timely deliveries and improve overall customer service.

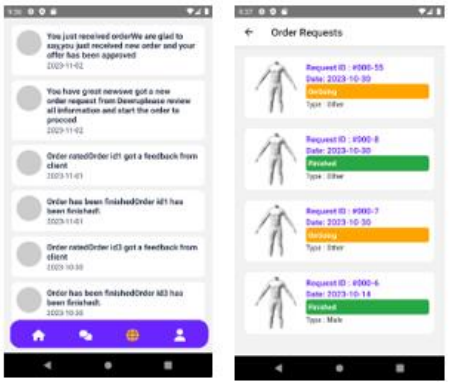

Fig. 7. Notification Management System

Fig. 8. Order Request Management

DISCUSSION

The "Customer-Centric Tailor Automation System with AI and Augmented Reality Techniques" represents an evolution in the way tailors and clients communicate and do business, and its creation and execution represent a significant advancement in the tailoring industry. In this part, we explore the consequences and possible effects of our approach on the user experience, technological innovation, and the tailoring industry.

A. Transforming the Tailoring Industry

The incorporation of AI and augmented reality technology into our system has the potential to transform the traditional tailoring industry. The solution reduces human errors by automating measurements and improving visualization using AR, resulting in exact fittings and client satisfaction. This transformational strategy has the potential

to broaden the industrial embrace of technology, paving the way for more complex and efficient tailoring procedures.

B. Enhancing User Experience

One of our system's primary goals is an improved user experience for both clients and tailors. Customers gain access to tailored clothing recommendations, real-time garment visualization, and direct communication channels with tailors. Tailors are then given tools for effective order administration, customer communication, and data-driven insights. This enhanced user experience builds stronger customer-tailor ties, resulting in higher customer loyalty and favorable brand perception.

C. Implications for Technological Innovation

This system's successful combination of AI-based algorithms with augmented reality visualization techniques illustrates the potential of emerging technology to affect the future of fashion-related businesses. Expect more advances as these technologies advance, such as predictive fashion trend research, virtual try-on experiences, and AI-based design support. The integration of AI, AR, and the fashion business creates opportunities for creative collaborations and technological improvements, encouraging innovation and continuous improvement of culture.

D. Overcoming Obstacles and Adopting Sustainability

Even though this system has a lot of potential, resolving issues is necessary for its general acceptance. We are aware of the issues around user acceptability, algorithmic biases, and data privacy. It is essential to conduct ongoing study and development to guarantee the system's moral and just use. In addition, in order to support a wider user base, future efforts will concentrate on improving scalability, increasing customization choices, and improving measurement accuracy.

CONCLUSION

The Customer-Centric Tailor Automation System was built on a solid technological foundation that included Laravel, a prominent PHP framework, and React Native, a popular JavaScript framework. Laravel and PHP laid the groundwork for rapid data processing, secure user authentication, and seamless database interaction. React Native built a responsive, cross-platform user interface that ensured a consistent experience for web and mobile users. The system architecture was unified and user-friendly as a result of leveraging various technologies, effectively serving the diverse needs of clients and tailors. This research advances technical improvements by emphasizing user-centered design and smooth connectivity among users, tailors, and administrators. The mobile app, which features effective conversation management and personalized recommendations, enhances the user experience, develops customer-tailor interactions, and increases brand loyalty. The effective application of this strategy opens new avenues for research at the interface of technology and fashion. The fashion business is on the edge of a technological revolution, combining customization, efficiency, and customer satisfaction, as AI, AR, and cross-platform frameworks are investigated. This tailoring future promises limitless possibilities, stimulating innovation and creativity, and benefiting both businesses and consumers.

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