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Deep Learning-Based Skin Disease Detection on Raspberry Pi4

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ABSTRACT:

The goal of this project is to build an AI-Based Skin Disease Detection System. Skin diseases are common, and in many cases, can be diagnosed with relative difficulty and thus require sufficient medical assistance. However, most people don't have easy access to Dermatologists which leads to delayed detection, increased diagnosis time, which may lead to increased severe conditions in patients' skin. An AI-Based Skin Disease Detection System utilizes the Machine Learning, Deep Learning and Image Processing technologies to identify different types of Skin Diseases using the image of skin. The model is trained on skin disease datasets and predicts 94% accuracy allowing the system to give an instantaneous and reliable prediction result, the model can diagnose types of skin diseases like Actinic Keratosis, Atopic Dermatitis, Benign Keratosis, Dermatofibroma, Melanocytic Nevus, Melanoma, Squamous Cell Carcinoma and Vascular Lesion. The users are able to upload skin images on the web-application to immediately receive a prediction report on the respective skin disease. Also included is a Live video detection feature wherein live skin can be analyzed by using a webcam which will give real-time detection and a prediction will be delivered. Furthermore, the users can download the diagnosis reports once it is generated, and use it as a reference and for doctor's consultation. The entire web-application will be securely hosted and implemented on a Raspberry Pi 4 providing a cheap, compact and portable web-application which can be used to have real-time applications in healthcare. The fundamental goal of AI-Based Skin Disease Detection System is to assist users for early diagnosis and efficient predictions of skin diseases, in order to provide better support from the healthcare professionals. This project is very significant due to increase in awareness and accessibility for skin diseases, Artificial intelligence is proved to be of great assistance and benefit for healthcare professionals instead of being a replacement to them

KEYWORDS: Artificial Intelligence (AI), Machine Learning, Skin Disease detection, Deep Learning, Image Processing, Convolutional Neural Network (CNN), Medical Image Analysis, Dermatology assistance system, Disease classification, Skin lesion detection, Health care technology, Computer vision, Raspberry Pi 4, Secure Web Application, Photo Upload Detection System, Live Video detection, Medical report generation, Early disease detection, AI assisted Health Care.

I.INTRODUCTION:

Digital solutions are being employed worldwide within healthcare to provide more accurate diagnosis and care to patients. An example, skin diseases which represent one of the most common health issues in the world, where prompt and accurate detection is of critical importance, yet extremely difficult without help from expert dermatologists. Limited numbers of dermatology specialists available, there exist cases that diagnosis of the skin disease and treatment is often prolonged. Manual observation and inspection used to detect the skin disease takes time, and some do

not have access to them. Technologies such as Artificial Intelligence, Machine Learning, Deep Learning and Image Processing used for speedy and reliable health solutions. This is an AI-Based Skin Disease Detection System designed to detect different skin diseases by analyzing a skin image, finding a pattern, and determining the classification of skin conditions based on the analyzed information using Machine Learning and Deep Learning techniques. The dataset is trained by using the skin disease data and has detected various diseases like Actinic Keratosis, Atopic Dermatitis, Benign Keratosis, Dermatofibroma, Melanocytic Nevus, Melanoma, Squamous Cell Carcinoma, and Vascular lesion by 94% accurately. Patients can simply upload skin images, via a safe web platform and receive a predicted outcome from the AI. In addition to uploaded images, this platform supports live video detection, where real-time skin scan from camera is available in this web application for immediate prediction, and a downloadable medical report feature is also available to save the results for future usage or diagnosis by a medical professional. The entire web application is hosted in secure way within a web server with Raspberry Pi 4 which makes the system very compact, portable, cost effective and available for real-time usage. During the building of the project, issues like different image quality, skin color tones, improper image upload and limitations of data are sorted with proper image pre-processing techniques, optimized Machine Learning models, and secure data handling. The main goal of this project is to help people identify skin diseases at an earlier stage to decrease the diagnosis time and also to provide a health solution through the help of Artificial Intelligence to everyone around. This application is designed not to replace the medical health workers but support them and to identify skin diseases in a very short amount of time, increase public awareness and the medical diagnostic efficiency.

II.ALGORITHM:

Define Objectives:

The main aim of this project is to design and build a novel AI-Based Skin Disease Detection System to help both doctors and the general public to detect and classify skin diseases at an earlier stage with the help of Machine learning, Deep learning, and Image Processing techniques. The system analyzes skin images automatically and predicts the diseases quickly and accurately which helps the doctor save time. The developed system can identify skin diseases like Actinic Keratosis, Atopic Dermatitis, Benign Keratosis, Dermatofibroma, Melanocytic Nevus, Melanoma, Squamous Cell Carcinoma and Vascular lesion with an accuracy of 94%. It includes a safe and easy to use web application which works on a Raspberry Pi 4. The users can upload their skin images, run live video detection and download detailed reports of the disease detection. The primary goal is to help the public and also the doctor get the healthcare facilities more easily and efficiently, making them realize how AI can help the doctors, not replace them.

Literature Review:

The literature review consists of the analysis of technologies available today regarding detection of skin diseases, Machine Learning, Image Processing and medical diagnostic systems based on AI. Literature survey based on various papers, journals, conference articles and internet resources about the usage of Deep Learning networks like CNNs in classifying medical images, about existing systems for detecting skin disease, about the efficiency of these systems, about existing medical image diagnosis systems. Also discussed were existing applications in health care as real-time, the limitations associated with them. Other studies pertaining to secure medical web applications, Pi-based health care system, live video detection, automatic report generation have been analyzed in order to find advantages and limitations of today's applications.

Methodology Development:

The development methodology of AI-Based Skin Disease Detection System follows step by step approach. Firstly, collection of images of skin diseases and the enhancement of the image, resizing, normalizing are performed. Machine Learning and Deep Learning are used to build models from the processed skin disease dataset to classify each of them. Various parameters are evaluated such as the accuracy of prediction, speed of processing and the performance under different image qualities. A web application is then designed that keeps the details safe. Users are able to upload their skin images, do detection from live video, download report. The whole system is made portable by making the deployment and testing in Raspberry Pi 4 to keep the process secure and fast and real time operation. Evaluation of model, optimization of preprocessing and better interface are part of the developed system.

Data Collection:

The dataset that is being used for this project consist of images of skin disease; such as: Actinic Keratosis, Atopic Dermatitis, Benign Keratosis, Dermatofibroma, Melanocytic Nevus, Melanoma, Squamous cell carcinoma, and Vascular lesion. The image is obtained from authentic medical images datasets and used to train and test the Machine Learning model. Performance indicators such as; accuracy of the model, prediction time taken, processing performance and the time taken to generate a report are also being obtained. Further tests are done on other skin images and on a live video detection with the web application.

Analysis:

Analysis of the performance (accuracy, time and effectiveness) of the AI-Based Skin Disease Detection System was then done. Trained model has been tested and obtained accuracy of 94% for detection and classification of skin diseases. System performance was compared in terms of prediction speed, image processing quality, report generation, performance of live video detection and performance of system in varying image conditions. Such as issues as image quality, light effects and appearance of various skin diseases were compared. Stability and security of the Raspberry Pi 4 hosting environment was tested.

Conclusion:

This AI-Based Skin Disease Detection System illustrates that Artificial Intelligence, Machine Learning and Image Processing technologies can enhance the health sector as it helps doctors and patients in quick identification and detection of skin diseases while reducing the manual work. Using image upload detection, live video detection, secure web technologies and Deep Learning model. This application system helps to make the health sector faster, effective and easy to use. Raspberry Pi 4 deployment makes the application system secure, compact and apt for live medical application. The project aims to support health practitioners and doctors for preliminary identification and diagnosis. But does not claim to replace medical practitioners or doctors, rather it serves as a helpful tool for faster initial diagnosis. Research and studies with effective AI models with larger data sets and security in healthcare technologies may also lead to advancement of the medical intelligent diagnostic systems in the future.

III. PROPOSED SYSTEM:

SkinDisease Image and Live video detection:

The paper proposed system implements the concepts of Machine Learning, Deep Learning and Image processing to perform skin disease detection through uploaded image of the skin and from live video feed of the skin. Different from the current process which involves visual inspection, the skin disease is processed automatically through skin images and by live video detection through camera which provide quick and accurate diagnosis.

Automated Skin Disease Classification:

Once the skin image is uploaded or if live video detection is used, the state of the skin is determined by using a Deep Learning model that has been trained and developed. The system is able to detect diseases like Actinic Keratosis, Atopic Dermatitis, Benign Keratosis, Dermatofibroma, Melanocytic Nevus, Melanoma, Squamous cell carcinoma, Vascular Lesion etc. The AI looks at the skin textures, pattern and specific skin properties in order to determine prediction results which achieve up to 94% accuracy.

Interactive Detection Dashboard:

Users can interact with the system through a safe and intuitive web interface where they can upload their skin image, see the real-time camera-based detection, and have an instant display of the predictions. The dashboard clearly outlines disease information, confidence prediction and the diagnosis to make the system more user friendly and accessible.

Report Generation and Download System:

When the detection finishes, the system can automatically create a medical report, in which contains the results of diagnosis and the prediction about diseases. The report can be download, printed and shared with physicians and other medical people.

Continuous Model Improvement:

With the constant input of more skin disease training data and under varying conditions for images, the model is under continuous enhancement. By continually evaluating the model, optimizing it and testing it, the accuracy of prediction, the processing quality of images and live video detection will improve in.

Secure Raspberry Pi 4 Deployment:

The entire web application is hosted on a raspberry pi 4 and safely installed. The entire application can be portable, cost efficient and feasible for real-time

healthcare services. The platform secures the sensitive data and maintains user privacy along with its stable performance while performing image uploading, live video processing and report generation.

Conclusion:

AI Based skin disease detection system utilizes ML, DL, image processing, real-time video detection and secure web technologies to enable quick and accurate skin disease analysis. This enables saving doctor's manual diagnostic time, enabling timely detection of skin diseases and increasing access to healthcare services. Doctors can make quick AI based pre-diagnosis through a secure and user friendly health care platform.

IV.FLOWCHART:

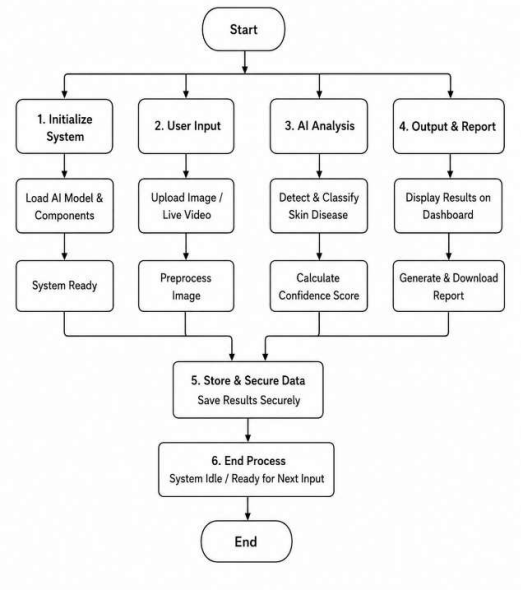

Fig 1

V. EXPERIMENTAL RESULT:

In this project experiments were performed and to measure and analyze the performance and effectiveness of the AI Based Skin Disease Detection System in terms of detection and processing skin disease Images quickly and effectively. The system was evaluated by prediction accuracy, image processing, real time video detection, performance and ease of use on the web interface, and deployment on raspberry pi 4 by using several images and videos from real time.

Experiment 1: Accuracy in Detecting skin diseases: In first experiment the trained AI model accuracy on detecting and classifying skin diseases on skin images, provided by user has been analyzed.

Results: 94% was the overall accuracy on skin disease classification for the trained model. Most diseases was detected with reasonable precision with clear images. With blurred images the accuracy was lowered with very small fraction, and improved with the preprocessing of images (image enhancement and normalization).

Experiment 2: Skin Disease detection on Live Video: In this experiment, we tested the live skin disease detection capability by providing real-time camera input. It detected the live video frame and gave predicted possibilities for skin disease on immediate basis.

Results: The live video detection worked well, and produced fluent real-time detection results. System could successfully detect skin problems from live video camera feed within limited delay time. With better lighting and focused camera, the system's detecting rate would get higher and response speed would get faster.

Experiment 3: Secure web application and report generation: This experiment tested the ease of use of the secure web application; how simple is image upload and displaying of results, and also downloading of the reports.

Results: The web application interface, most of users felt, was convenient, safe to use and quite simple. It had options for uploading images and live detection, downloading a report. The diagnosis report showed the predicted diseases in quite an explicit form to be saved or even mailed to a health professional.

Experiment 4: The last experiment aimed to determine the performance and stability of the system at runtime on Raspberry Pi 4.

Results: Raspberry Pi 4 was able to run the web application and perform image processing and live video detection simultaneously. The performance was steady and stable indicating that Raspberry Pi 4 is a viable hardware choice for compact, portable, and inexpensive medical application.

Conclusion: The experiment clearly shows that AI-Based Skin Disease Detection System is capable of achieving efficient, precise and reliable detection of skin diseases using Artificial Intelligence, Deep

Learning and Image Processing technologies. Real-time healthcare application is enabled by the live video detection feature and secure web technologies in conjunction with Raspberry Pi 4 deployment. It helps in early diagnosis and thereby reducing the manual work of healthcare professionals to a large extent. With secure and user friendly platform, this project aids medical professionals with AI-powered analysis which improves accessibility.

VI. CONTRIBUTION TO RISK MANAGEMENT:

Contribution to Risk Management:

The AI-Based Skin Disease Detection System helps to manage risks by supporting early disease detection, decreasing errors in manual diagnosis and providing access to medical diagnosis through Artificial Intelligence and Machine Learning technologies. It assists the user and the medical professional to quickly recognize possible skin disease thereby mitigating risk by the delayed diagnosis and treatment of the disease. Integrating secure web technology, automation of diagnosis using AI, the project increases reliability, efficiency and user care in the system.

Early Detection and Reducing Risk:

Among the key contribution of the system to risk management is the capability of early detection of possible skin diseases including, Actinic Keratosis, Atopic Dermatitis, Benign Keratosis, Dermatofibroma, Melanocytic Nevus, Melanoma, Squamous Cell Carcinoma and Vascular Lesion. Early detection decreases risk by allowing user to obtain necessary medical assistance without delay. The AI model performs the initial and swift prediction thus minimizing delays in diagnosis.

Decreasing Errors of Manual Diagnosis:

Manual diagnosis is prone to human errors which can lead to the incorrect results. With ML and Image Processing techniques, the AI-Based Skin Disease Detection System is able to predict possibilities more reliably without human interference, minimizing the risk of erroneous manual diagnosis. The prediction accuracy achieved by the system trained using the dataset was 94%, which increases the reliability of disease prediction, thus assists doctors and user.

Safe handling of Data and Protecting user Privacy:

The risk is decreased by safely handling user's medical information. Using a secure web application, medical diagnosis report and uploaded skin images uploaded are protected by login security measures. The sensitive user data is securely handled thus ensuring user privacy is maintained.

Real-time Detection by Live Video Detection:

The risk can also be minimized by use of live video detection feature which allow the user to scan his skin in real time using his device. Early detection can minimize risk through the rapid prediction made thereby helping the user seek for medical attention when it’s required.

System Performance Monitoring and Reliability:

The system continually reduces risks by tracking the model performance through the testing and optimizing of the dataset. By utilizing techniques like image pre-processing, ML and DL, incorrect predictions can be reduced due to various image issues and variations, and by continuously analyzing the performance of the system.

Accessible Medical Assistance at low cost:

Deploying the web application on Raspberry Pi 4 ensures the medical assistance is readily available, portable and inexpensive thereby reducing the risk of inadequate medical facilities.

The AI-Based Skin Disease Detection System helps manage medical risk by enabling earlier detection of skin diseases, decreasing risks of manual errors in diagnosis, ensuring safety of data and improving medical access using AI driven technologies and a simple interface.

VII. CONCLUSION:

In this project an "AI-Based Skin Disease Detection System" is designed to assist in the detection of skin diseases at the early stages and provide accurate results by using Machine Learning, Deep Learning and Image Processing techniques. Skin diseases are the prevalent health issues and late detection results in major complications in the body. In this system an attempt is made to minimize the manual diagnose time with the aid of AI to process the skin images uploaded by the user and live video to determine faster and reliable predictions.

The system provides four basic functionalities which are AI based disease classification, Web

Technologies used, Live Video Detection and Report generation in one accessible place. The system is integrated to detect all kinds of skin diseases like: Actinic Keratosis, Atopic Dermatitis, Benign Keratosis, Dermatofibroma, Melanocytic Nevus, Melanoma, Squamous Cell Carcinoma, and Vascular lesion with 94% of accuracy proves the role of artificial intelligence in medical services. Through the integrated and secure web application hosted in the Raspberry Pi 4 users are allowed to upload skin image of the diseases and detection can be done in live video and report could also be downloaded with an ease of three simple steps.

The system has brought changes by facilitating a better health service, helps in early detection of the disease, provides quick preliminary diagnosis to users as well as the doctors and due to the presence of raspberry pi 4 it is compact and suitable for portable usage in a live health environment. This system would not be an alternative to the dermatologists or doctors but an aid to help doctors for quick decisions to provide faster health support. This project represents the way that AI based medical system can ease in for the overall welfare of the humans.

VIII.REFERENCE:

[1] F. Ajesh and R. Ravi, "Hybrid Features and Optimization-Driven Recurrent Neural Network for Glaucoma Detection," *International Journal of Imaging Systems and Technology*, vol. 30, no. 4, pp. 1143–1161, 2020.

[2] F. Ajesh, R. Tino Merlin, G. Raja Kumar, R. Ravi, and R. Janani Abinaya, "FPGA-based Parallel Hardware Architecture for Real-time Glaucoma Diagnosis," *International Conference on Emerging Trends in Applications of Computing*, pp. 383–389, 2022.

[3] M. Esakkiraj, R. Ravi, and G. Rajakumar, "A Comprehensive Survey on Diagnosis of Diseases from Retinal Fundus Images," *International Journal on Engineering Technology and Sciences*, vol. 7, no. 2, pp. 4–7, 2020.

[4]A.Lavanya Mathiyalagi, R. Malliga@pandeeswari, P. Rahul Raja, and Dr. R. Ravi, "A Survey on Lung Cancer Detection," *International Journal on Engineering Technology and Sciences*, vol. 8, no. 9, pp. 35–40, 2021.

[5] D. Priyadharshini and R. Ravi, "Deep Learning: A Survey and Techniques for Language Processing, Image, Speech and Text," *Francis Xavier Journal of Science Engineering and Management*, vol. 1, no. 1, pp. 11–14, 2020.

[6] Kaggle, "Skin Disease Image Dataset for Deep Learning," [Online]. Available: Kaggle Official Website, Accessed: 2025.

[7] S. Kumar and R. Sharma, "Machine Learning Approaches for Skin Disease Detection Using Medical Images," *International Journal of Advanced Computer Science and Applications*, vol. 13, no. 4, pp. 45–53, 2022.

[8] P. Verma and A. Singh, "Convolutional Neural Networks for Skin Lesion Classification," *Journal of Medical Systems*, vol. 46, no. 8, pp. 1–12, 2022.

[9] Raspberry Pi Foundation, "Raspberry Pi 4 Documentation," [Online]. Available: Raspberry Pi Official Website, Accessed: 2025.

[10] M. Patel and K. Roy, "Secure Web Applications for Healthcare Systems Using AI Technologies," *International Journal of Healthcare Informatics*, vol. 15, no. 2, pp. 88–97, 2023.

[11] J. Lee and H. Kim, "Real-Time Medical Image Analysis Using Deep Learning Techniques," *IEEE Transactions on Medical Imaging*, vol. 41, no. 5, pp. 1023–1034, 2022.

[12] National Institutes of Health, "Medical Image Databases for Skin Disease Research," [Online]. Available: NIH Official Website, Accessed: 2025.

[13] R. Gupta and S. Nair, "AI-Powered Healthcare Systems for Early Disease Detection," *International Journal of Artificial Intelligence in Healthcare*, vol. 7, no. 1, pp. 25–39, 2023.