SKIN DISEASE DETECTION AND CLASSIFICATION USING DEEP LEARNING

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ABSTRACT

The people health more than any other diseases. Skin diseases are mostly caused by fungal infections, bacteria, allergies, or viruses, etc. The lasers advancement and Photonics based medical technology is used in diagnosis of the skin diseases quickly and accurately. The medical equipment's for such diagnosis is limited and most expensive. So, Deep learning techniques helps in detection of skin disease at an initial stage. The feature extraction plays a key role in classification of skin diseases. The usage of Deep Learning algorithms has reduced the need for human labor, such as manual feature extraction and data reconstruction for classification purpose. A Dataset of 938 images has been taken for the Classification of Skin diseases. They include Melanoma, Nevus, Sebborheic Keratosis. By using CNN algorithms, 70% accuracy is achieved in classification of skin disease. We have also tried with AlexNet, which gives 80% accuracy.

1. INTRODUCTION

Skin is one in every of the most important and quickest developing tissues of the human body. The burden of skin disease is regarded as a multidimensional concept that comprehends psychological, social and economic significance of the skin disease at the sufferers and their households and on society. It is a contamination that takes place in humans of all ages. Skin is regularly broken due to the fact it's far a touchy a part of the body. There are more than 3000 skin diseases. A cosmetically look spoiler disease will have a big effect and might reason extensive ache and everlasting injury. Most of the chronic skin conditions, along with atopic eczema, psoriasis, vitiligo and leg ulcers, aren't right now deadly, they may be diagnosed as an extensive problem on fitness popularity which include physical, emotional and economic outcome. On the other hand, skin cancers are potentially lethal and their trouble is associated with the temporality that they carry. One of the most frequent ailments among people all over the world is skin disease. Basal cell carcinoma (BCC), melanoma, intraepithelial carcinoma, and squamous cell carcinoma are examples of skin cancers (SCC). The occurrence of skin cancer is currently greater than the occurrence of other new kinds of lung and breast cancer . Several skin illnesses have symptoms that can take a long time to treat since they can grow for months before being recognized. As a result, computer-based disease diagnosis comes into play since it can produce a result in a short period of time with more accuracy than human analysis utilizing laboratory procedures. Deep Learning is the most widely used technology for skin disease prediction. Deep learning models will use inferred data to identify and explore features in unexposed data patterns, resulting in significant efficiency even with low computational models. This study presents a robust mechanism for accurately identifying skin diseases using supervisory approaches that reduce diagnostic costs. This has prompted the researchers to consider using a deep learning model to categorize the skin disease based on the image of the affected region.The following is how the rest of the article is Organized. Section 2 delves more into the related studies on recent technologies for detecting skin illness. The proposed strategy of classifying the type of skin illness using deep learning techniques is discussed in Section 3. The results and discussion are described , followed by a conclusion and future work.

2. LITERATURE SURVEY

Manual diagnosis of skin diseases by visiting and consulting dermatologists is time consuming. Most rural areas do not have this option. These rural people need to travel to a nearby city for advice and diagnosis. This takes a lot of human effort. Not to mention, it costs a lot just to see your doctor. This also includes human contact, which is an unnecessary evil in this pandemic crisis. Few diseases are contagious. In the

existing system, body contact is unavoidable. The existing computer-aided diagnosis involves identifying burns and injuries as skin diseases. The accuracy of these methods is not as good as needed. Thus, there is a need to develop a computer-aided system that automatically diagnoses the skin disease problem and differentiates skin diseaseswith other skin issues. Quan Gan et.al [3] used image colour and Texture feature for the recognition of skin disease. Median filtering was used to pre-process the images. Denoise images are rotated to get the segments of the images. GLCM tool was used to extract text features and finally used SVM for classification of skin diseases herpes, dermatitis, and psoriasis. Md Nafiul Alam et al [4]., "Automatic Detection and Severity Measurement of Eczema Using Image Processing", suggested an automatic eczema detection and severity measurement model using image processing and computer algorithm. The system identified and determine the severity of eczema by allowing patients to input an image of the affected skin area. This system used image segmentation, feature extraction, and statistical classification to recognize and differentiate between mild and severe eczema. Once the eczema type was identified, a severity index was assigned to that image. Later Researches used Deep learning techniques for classifying the skin diseases. Parvathaneni Naga Srinivasu et.al [5] used deep learning based MobileNet V2 and Long Short Term Memory for classifying skin diseases. A grey level co-occurrence matrix was used to estimate the progress of disease growth. The system has achieved an accuracy of 85% on the HAM10000 skin disease dataset. S.Malliga et.al [6], used the CNN algorithm for training and classifying all kind of clinical images. They have taken three types of skin diseases. They are Melanoma, Nevus, Seborrheic keratosis and achieved an accuracy of 71%.Nazia Hameed et.al [7] designed, implemented and tested to classify skin lesion image into one of five categories, i.e. healthy, acne, eczema, benign, or malignant melanoma using AlexNET, a pre-trained CNN model to extract the features. SVM classifier was used for classification and the overall accuracy achieved is 86.21%.

3. DATASET

A dataset of seven skin diseases was used in this study that includes Warts Mollusca, Systemic Disease, Seborrheic Keratosis, Nevus, Bullous, Actinic Keratosis, Acne and Rosacea. This dataset has over 7000 dermatoscopic images. The Dataset was expanded by adding new images (750), indicating skin burns and skin cuts. Existing systems have identified skin burns and skin cuts also as skin diseases. To Overcome this problem, the images representing cuts and burns were collected and added to the dataset. A random (rand) function is applied to split the data into the training data (5900) and validation data (1930).

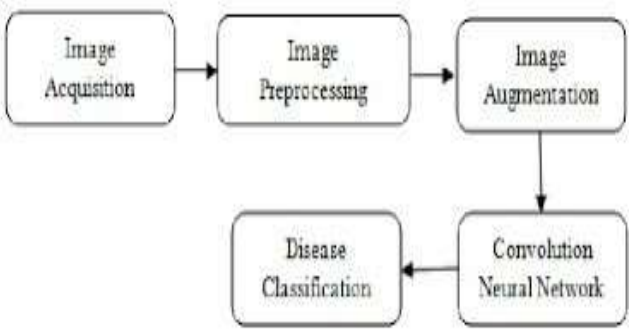
4. METHODOLOGY

Existing System

Many studies have applied deep learning algorithms in the classification of skin diseases. Daily soft drink consumption significantly increases the risk of moderate-to-severe acne in adolescents, especially when the sugar intake from any type of soft drink exceeds 100 g per day. Rosacea is one of the common chronic facial disorders that affects the patients health. The adjusted Chinese-version RosQol was easy to complete, well received by patients, and demonstrated acceptable validity and reliability. The results indicate that leptin plays a critical role in the development of autoimmune disorders and demonstrate that the transgenic leptin pigs will be act as a valuable model of SLE. Certain results argue strongly to include skin disease prevention and treatment in future global health strategies as a matter of urgency. The results in ''Symptoms of systemic lupus erythematosus are diagnosed in leptin transgenic pigs,'' indicate that leptin plays a critical role in the development of autoimmune disorders and demonstrate that our transgenic leptin pigs can act as a valuable model of SLE.

Proposed System

A neural network is a type of machine learning algorithm allows the computer to learn by incorporating new data. CNNs is very useful in image recognition in order to analyse visual imagery and are frequently used in classifying the images. It takes the given three classes of skin disease images as input and it gives the output of a probability that the input belongs to a particular class. CNN is now the go-to model on every image related problem. The main advantage of CNN 2 compared to its predecessors is that it automatically detects the important features without any human superintendence.

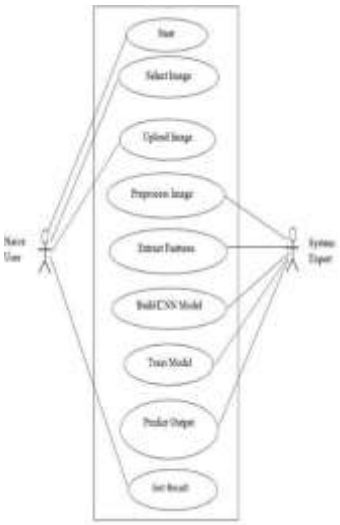


UML DIAGRAMS

UML stands for Unified Modeling Language. UML is a standardized general-purpose modelling language in the field of object-oriented software engineering. The standard is managed and was created by, the Object Management Group. The goal is for UML to become a common language for creating models of object-oriented computer software. In its current form, UML is comprised of two major components: a Meta-model and a notation. In the future, some form of method or process may also be added to; or associated with, UML. The Unified Modeling Language is a standard language for specifying, Visualization, Constructing and documenting the artefacts of software systems, as well as for business modelling and other non-software systems. The UML represents a collection of best engineering practices that have proven successful in the modelling of large and complex systems. The UML is a very important part of developing object-oriented software and the software development process. The UML uses mostly graphical notations to express the design of software projects.

USE CASE DIAGRAM

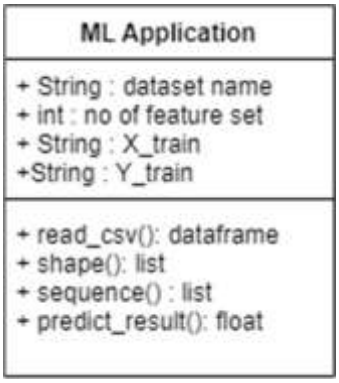
A use case diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The main purpose of a use case diagram is to show what system functions are performed for which actor. Roles of the actors in the system can be depicted



USE CASE DIAGRAM

CLASS DIAGRAM

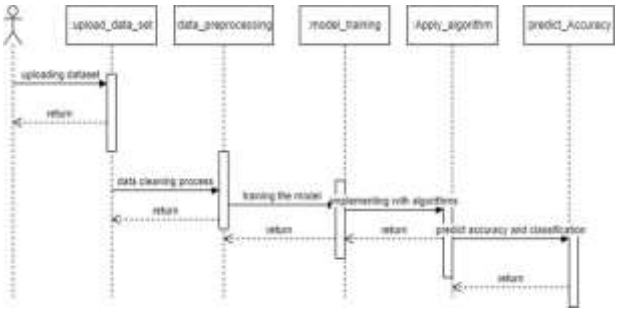
In software engineering, a class diagram in the Unified Modeling Language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, operations (or methods), and the relationships among the classes. It explains which class contains information.



CLASS DIAGRAM

SEQUENCE DIAGRAM

A sequence diagram in Unified Modeling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. Sequence diagrams are sometimes called event diagrams, event scenarios, and timing diagrams.



SEQUENCE DIAGRAM

SYSTEM STUDY

FEASIBILITY STUDY

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential.

Three key considerations involved in the feasibility analysis are

- ECONOMICAL FEASIBILITY
- TECHNICAL FEASIBILITY
- SOCIAL FEASIBILITY

ECONOMICAL FEASIBILITY

This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus the developed system as well within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

TECHNICAL FEASIBILITY

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands on the available technical resources. This will lead to high demands being placed on the client. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.

SOCIAL FEASIBILITY

The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity. The level of acceptance by the users solely depends on the methods that are employed to educate the user about the system and to make him familiar with it. His level of confidence must be raised so that he is also able to make some constructive criticism, which is welcomed, as he is the final user of the system.

SYSTEM TESTING

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, sub-assemblies, assemblies and/or a finished product It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail unacceptably. There are various types of tests.

TYPES OF TESTS

Unit testing

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application. Unit tests perform basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expectedresults.

Integration testing

Integration tests are designed to test integrated software components to determine if they actually run as one program. Testing is event driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfaction, as shown by successfully unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components

Functional testing

Functional tests provide systematic demonstrations

that functions tested are available as specified by the business and technical requirements, system documentation, and user manuals.

System Testing

System testing ensures that the entire integrated software system meets requirements. It tests a configuration to ensure known and predictable results. An example of system testing is the configuration-oriented system integration test. System testing is based on process descriptions and flows, emphasizing pre-driven process links and integration points.

White Box Testing

White Box Testing is a testing in which in which the software tester has knowledge of the inner workings, structure and language of the software, or at least its purpose. It is purpose. It is used to test areas that cannot be reached from a black box level.

Black Box Testing

Black Box Testing is testing the software without any knowledge of the inner workings, structure or language of the module being tested. Black box tests, as most other kinds of tests, must be written from a definitive source document, such as specification or requirements document, such as specification or requirements document. It is a testing in which the software under test is treated, as a black box .you cannot "see" into it. The test provides inputs and responds to outputs without considering how the software works.

Unit Testing

Unit testing is usually conducted as part of a combined code and unit test phase of the software lifecycle, although it is not uncommon for coding and unit testing to be conducted as two distinct phases.

Integration testing

Software integration testing is the incremental integration testing of two or more integratedsoftware components on a single platform to produce failures caused by interface defects.
The task of the integration test is to check that components or software applications, e.g., components in a software system or – one step up – software applications at the company level – interact without error.

Acceptance Testing

User Acceptance Testing is a critical phase of any project and requires significant participationby the end user. It also ensures that the system meets the functional requirements.

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6. CONCLUSION AND FUTURE SCOPE
CONCLUSION

CONCLUSION

The feasibility of building a universal skin disease classification system has been investigated using CNN, Resnet, Alex net and Inceptionv3. CNN has outperformed over training data but not on testing data. Better accuracy can be obtained by providing a training set with more variance and also by increasing its size. It is also found that Resnet has given better accuracy compared to other networks in the diagnosis of skin diseases. The journey to develop a skin disease detection and classification system using deep learning algorithms is one of great promise. By continuously improving the system, ensuring transparency, and fostering collaboration between technology and healthcare, we stand poised to make a substantial impact on healthcare outcomes and the well-being of patients around the world. As we look to the future, let us keep the well-being of patients at the forefront of our efforts, and may our work continue to advance the frontiers of medical technology for the betterment of all.

FUTURE SCOPE

The proposed model is computationally efficient as it is designed to work on top of lightweight capability devices. The proposed MobileNet V2 with the LSTM model needs a more significant number of parameters for better accuracy. The considered input image and the MobileNet V2 with LSTM model's resultant outputs have no significant randomness to explore all possible patterns in the assessment process. Alongside the bottleneck in residual connections in the proposed architecture, the model yields higher accuracy with minimal effort. The model can be further improved by incorporating the self-learning capability and knowledge acquisition from its previous experiences. The efforts on training the model can be considerably reduced. However, the model must be mechanized to assess the impact of features extracted for each

strategy, and the incorporation of randomizing components is necessary. The researchers recommend that future research be performed to examine the feature extraction actions based on biomarkers, even though there is ample data, depending on the specific findings. Biomarkers effectively identify the disease from the supplementary data like the genomic, protein sequences, and pathological data in addition to the imaging data. It is recommended to consider lightweight security when transmitting physiological and biological data in health networks, and a user-friendly smart device app, which can display alarms and communicate between patients and physicians in eHealth and telehealth environments to securely exchange and transmit data.

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