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Research on Skin Disease Detection System Using CNN

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Abstract: ***Skin diseases are among the most common health issues, affecting millions worldwide and often requiring timely diagnosis and specialized treatment. This paper introduces a Skin Disease Detection System utilizing Convolutional Neural Networks (CNN) to automate the detection of skin conditions from images, improving access to early diagnosis and guidance for patients. Built using Python and the Flask framework, the system allows users to upload an image of the affected skin area, whichisthenanalyzedbya CNN model trained on a comprehensive dataset todetectpotential diseases with high accuracy. Upon detection, thesystempresentsthe patient with alistofprobablesymptoms,enablingthemtoconfirmor deny whether the symptoms match their condition. If confirmed,the system suggests a specialist dermatologist who has expertise in the identified disease; otherwise, it recommends a generaldermatologist in the user's locality. By facilitating rapid detection and expert recommendation, this system serves as an essential tool for patients seeking preliminary diagnosis and guidance, ultimately bridging the gap between initial observation and professional consultation. This accessible and efficient approach to skin disease detection and treatment referral highlights the potential of AI in enhancing healthcare access and outcomes.***
Keywords: Skin Disease Detection, Convolutional Neural Network (CNN), Image Processing.

I. INTRODUCTION

Skin diseases are among the most prevalent health issues globally, with conditions ranging from benign to potentially life-threatening. Diagnosing skin diseases early can prevent furthercomplications,yet access to dermatological care remainslimited,especiallyinremoteor underservedareas.Traditionaldiagnosticmethodsoftenrequirein-person consultations with specialists, which may delay treatment and increase patient anxiety. As technology advances, artificial intelligence (AI) has emerged as a powerful tool in healthcare,offering solutions that are not only efficient but also accessible. This paper presents a Skin Disease Detection System usingConvolutional Neural Networks (CNN) integrated with a Flask-based interface to facilitate a streamlined, user-friendly process for early skin disease detection. By enabling users to upload images of affected skin areas and analyzing these images throughatrainedCNNmodel,thesystem offers a fast, initial diagnosis that directs patients toward appropriate medical care, enhancing the early intervention process.

The system functions as an interactive AI-driven tool that not only detects skin conditions but also guides patients based on symptom confirmation. Upon detection, the system presents a list of probable symptoms for the patient to confirm. If the symptoms align, thesystem recommendsaspecialistinthespecificcondition,registeredin the samecity.Ifthepatient isunsureorthe symptomsdo notmatch,it suggests a general dermatologist. This interactive approach ensures that patients receive tailored recommendations based on their input, helping reduce unnecessary visits to specialists while ensuring that those in need of expert care receive it promptly. By offering an accessible,efficient,andaccuratediagnostictool,thisSkinDisease Detection System highlights the potential of AI-driven solutions in healthcare, bridging gaps in dermatological care, particularly in regions with limited specialist availability.

II. LITERATURE REVIEW

1) Maduranga, M. W. P., et al. In this paper, the author presents a design and development of an Artificial Intelligence (AI) basedmobile application todetectthetypeofskindisease.Skindiseasesare a serious hazard to everyone throughout the world. However, it is difficult to make accurate skin diseases diagnosis. Inthiswork,Deep learning algorithms ConvolutionNeuralNetworks(CNN)isproposed to classify skin diseases on the HAM10000 dataset. An extensive review of research articles on object identification methods and a comparison of their relativequalitiesweregiventofindamethodthat would work well for detecting skin diseases.

2) Akyeramfo-Sam etal.Inthispaper,theauthorsoughttoproposea web-based skin disease detection system namedmedilab-plususinga convolutional neural network classifier built upon the Tensorflow frameworkfordetecting (atopicdermatitis,acnevulgaris,andscabies) skin diseases.

Experimental results of the proposed system exhibited classification accuracy of 88% for atopic dermatitis, 85% for acne vulgaris, and 84.7% for scabies.

3) Inthiyaz, Syed, et al. In this paper, the author introduces an automated image-based method for diagnosing and categorizing skin problems that use machine learning classification. Computational approaches will be used to analyze, process,andrelegatepicturedata to consider the many different characteristics of the photos that are being processed. Skin photographs are first filtered to remove undesirable noise from the image and then processed to enhance the picture's overall quality.

4) Karunanayake, et al. In this paper, the author proposed a work which is designed, implemented and tested to classify Acne density, skin sensitivity and to identify the specific acne subtypes namely whiteheads, blackheads, papules, pustules, nodules and cysts. The proposedworknotonlyclassifiesAcneVulgarisbutalsorecommends appropriate treatments basedontheirclassification,severityandother demographic factors such as age, gender, etc. The results obtained showthatforAcnetypeclassificationthe accuracy ranges from 90%-95% and for Skin Sensitivity and Acne density the accuracy ranges from 93%-96%.

5) Shanthi, T., R. S. Sabeenian, et al. In this paper, the method proposed by the authors detects four types of skin diseases using computer vision. The proposed approach involves Convolutional Neural Networks with specific focus on skin disease. The Convolutional Neural Network (CNN) used in this paper hasutilized around 11 layers viz., Convolution Layer, Activation Layer, Pooling Layer, Fully Connected Layer and Soft-Max Classifier. Images from the DermNet database are used for validating the architecture. The database comprises all types of skin diseases out of which they have consideredfourdifferenttypesofskindiseaseslikeAcne,Keratosis, Eczema herpeticum, Urticariawitheachclasscontainingaround30to 60 different samples.

6) Rathod, Jainesh, et al. In this paper, the authors propose an automated image based system for recognition of skin diseasesusing machine learning classification. This system will utilizecomputational techniques to analyze, process, and relegate theimage data predicated on various features of the images. Skin images are filteredtoremoveunwantednoiseandalsoprocessitforenhancement of the image. Feature extraction using complex techniques such as Convolutional Neural Network (CNN), classify the image based onthe algorithm of softmax classifier and obtain the diagnosis reportas an output.

7) Wu, Z. H. E.,etal.Inthispaper,theauthorstudieddifferentCNN algorithms for face skin disease classification based on the clinical images. First, from Xiangya–Derm, which is, to the best of our knowledge, China's largest clinicalimagedatasetofskindiseases,we established a dataset that contains 2656 face images belonging tosix common skin diseases [seborrheic keratosis (SK), actinic keratosis (AK), rosacea (ROS), lupuserythematosus(LE),basalcellcarcinoma (BCC), andsquamouscellcarcinoma(SCC)].Theyperformedstudies using fivemainstreamnetworkalgorithmstoclassifythesediseasesin the dataset and compared the results. Then, They performed studies using anindependentdatasetofthesamediseasetypes,butfromother body parts, to perform transfer learning on their models.

8) ALEnezi, et al. In this paper, the author proposed an image processing-based method to detect skin diseases. This method takes the digital image of disease effect skin area,thenusesimageanalysis to identify the type of disease. Thisproposedapproachissimple,fast and does not require expensive equipment other than a camera anda computer. The approach works on the inputs of a color image. Then resize the of the image to extract features using pretrained convolutional neural network. After that classified feature using Multiclass SVM.

9) Rimi, Tanzina Afroz, et al. In this paper, the author tried to develop a prototype to detect skin diseases using neural networks.In the choice of neural networks, we have chosen CNN which abbreviatesasaconvolutionalneuralnetwork.Earlierdetectionworks have been done using DNN which is a deep neural network. Rightnow I have classes to identify a typical skinmaladycalleddermatitis hand, eczema hand, eczema subcute, lichen simplex, statisdermatitis and ulcers. This paper is a sandwich between picture handling strategies and machine learning. Where picture preparation has produced the picture which is being utilized by CNN to arrange the classes.

10) Agarwal, Raghav, et al. In this paper, the author examines and contrasts various skin illnesses in terms of cosmetics and commonskin concerns. Their dataset includes over 25000 of the eight most common skin disorders. Convolutional neural networks have shown imaging performance that is comparable to or greater than that of humans. They used 11 different network algorithms to identify the illnesses in the sample and comparedtheresults.Toadjusttheformat of incoming photographs, they do certain image pre-processing and image scaling for each model. ResNet152 beat other deep learning methods in terms ofrecall,accuracy,andprecisiononatestdatasetof 1930 images.

III. METHODOLOGY

The Skin Disease Detection System leverages CNN models for accurate identification of skin conditions. The system is built with a Flask framework to facilitate a user-friendly interface. A patient begins by uploading an image of theaffectedskinarea,whichisthen processed through a trained CNN model to detect potential skin diseases. Once a condition is identified, the systemdisplaysprobable symptoms and asks the patient to confirm them. If thepatientselects "YES," indicating the symptoms match, the system recommends a registered specialist with expertise in the detected condition. If the patient is uncertain and selects "NO," it instead suggests a general dermatologist based in the patient's city. Dermatologists register within the system as either general practitioners or specialists for specific diseases, allowing for tailored and accurate recommendations.
This setup ensuresthatpatientsreceivebothprecisediagnosissupport and targeted treatment guidance.

A. Flow Chart

B. Working

The Skin Disease Detection System utilizes a Convolutional Neural Network (CNN) to analyze images of skin conditions uploaded by patients through a user-friendly web interface. Built with Python and the Flask framework, the systemallowspatients to inputimagesofaffectedareas.Theseimagesareprocessedbya pre-trained CNN model, which identifies probable skin diseasesby matching visual features with known conditions. Once a potential diagnosis is suggested, the system presents common symptoms of the detected disease, prompting the patient to confirm if these align with their experience. If the patient confirms, the system recommends a registeredspecialist;ifnot,it directsthemtoageneraldermatologistwithintheircityforfurther consultation. Dermatologists register on the platform, indicating whether they are general practitioners orspecialists,ensuringthat patients receive targeted and appropriate care recommendations.

IV. SYSTEM REQUIREMENT

A. Software Requirement

- Python software IDE

B. Module Requirement

- Flask==0.12.3
- OpenCV
- NumPy
- TensorFlow
- scikit-learn
- Matplotlib
- Seaborn

V. IMPLEMENTATION & RESULT

A. *Implementation*

1) *Step1:Importalltherequiredlibraries*

Fig.showsimportingofcv2,flask,numpy,tensorflow,sklearn, matplotlib, seaborn libraries

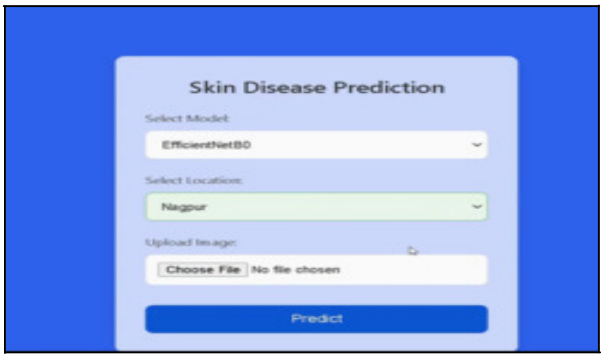
We begin by importingallthenecessarylibrariesthatareessentialfor the execution of the model, such as TensorFlow, Flask, OpenCV, NumPy, etc. These librarieswillhelpwithimageprocessing,machine learning, and creating the web application.

2) *Step 2 : Run the Python file for output*

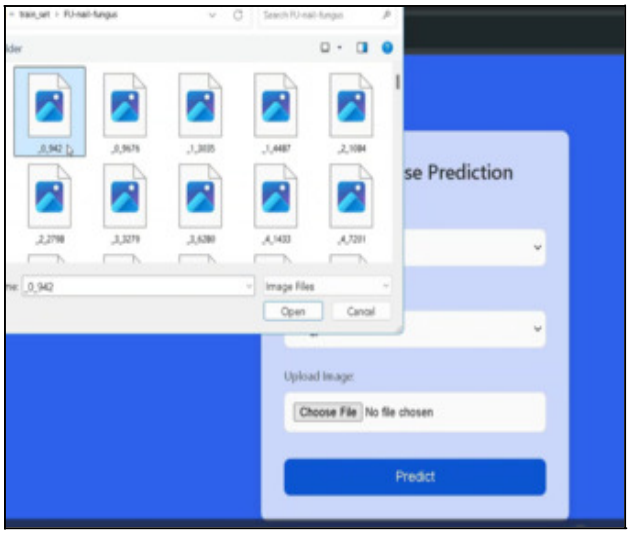
Fig. shows running the code for output

Once the required libraries are imported, we run the Python file tostart the application. The model will load and be ready to process images for disease prediction. Upon running the file, a URL will be generated in the terminal window.

3) *Step3:Chooseimageforpredictionfromthedataset*



(a)



(b)

Fig.(b) showsthe imageis choosenfrom the dataset

After running the file and opening the URL in a browser, the web applicationwillload.Here,wewill be prompted to select an image for prediction. By clicking onthe"ChooseFile"option,wecanselect an image from our dataset, which contains various skin disease images.

4) Step4:Predictthedisease

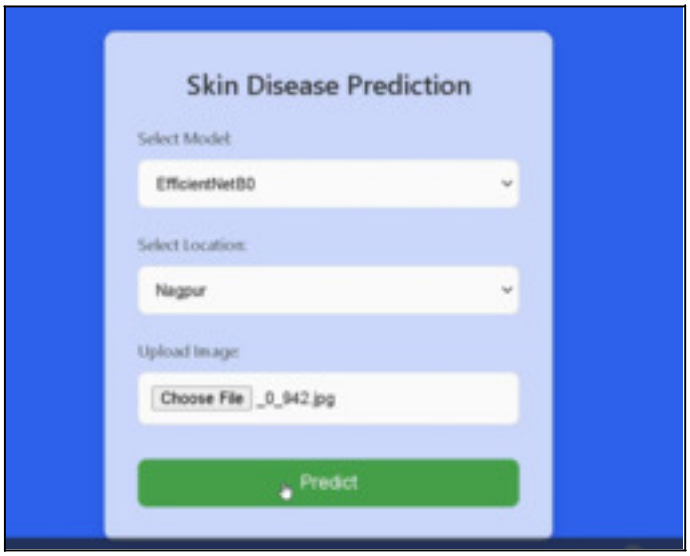


Fig.showsthepredictionwindow

We can choose any image from the dataset that we want to use for disease prediction. Here, wewillchoosetheimageofFU-nailfungus. After selecting the image, we will click on the "Predict" button. The model will process the image and display the predicteddiseasename (e.g., "FU-nail fungus") along with a confidence value.

B. Result

The results of the Skin Disease Detection System demonstrate its effectiveness in accurately identifying various skin conditions and providing tailored recommendationsforfollow-upcare.UsingaCNN model trained on a diverse dataset of skin images, the systemachieved a high accuracy rate in detecting common skin diseases, showcasing the potential of AI in preliminary diagnosis.

The system successfully displayed probable symptoms associated with the detected condition, allowing users to confirm or deny symptom alignment. Users who confirmed symptoms were guided to a registered specialist, while those uncertain were recommended to a general dermatologist in their city. This targeted approach proved valuable in reducing unnecessary consultations and directingpatients to the appropriate level of care based on their needs.

Fig.showstheoutputofpredictionoftheFU-nailfungusdisease with a confidence value 98.92%

This output confirms that the model has successfully identified the disease with a certain degree of accuracy.
If the patient selects"YES,"confirmingthatthesymptomsmatch,the system recommends a registered specialist with expertise in the identified condition.

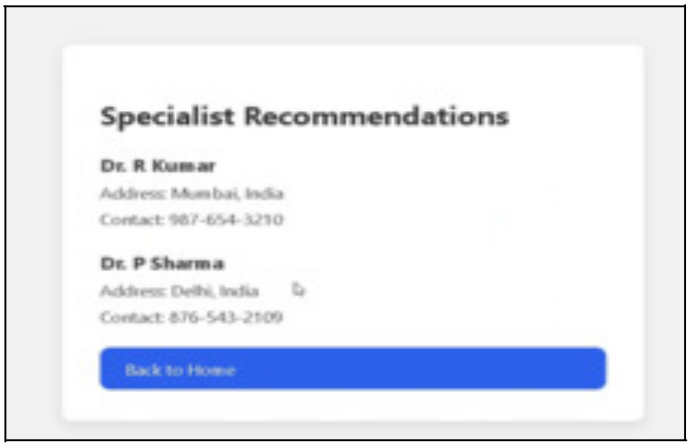
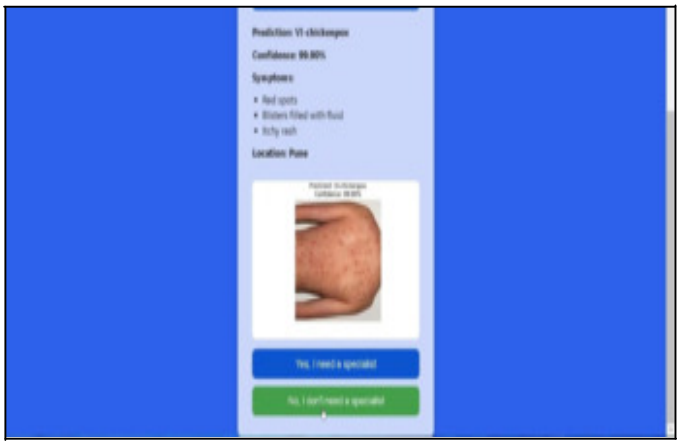


Fig. shows the contact details of the specialist

However,ifthepatientisuncertainandselects"NO,"thesystem suggests a general dermatologist located in the patient's city.



(a)

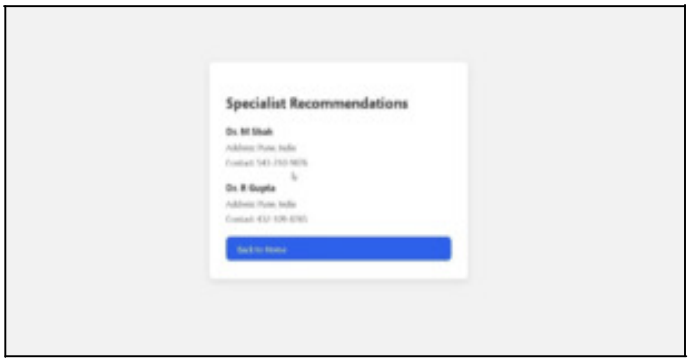


Fig. (b) shows the contact details of the general dermatologist

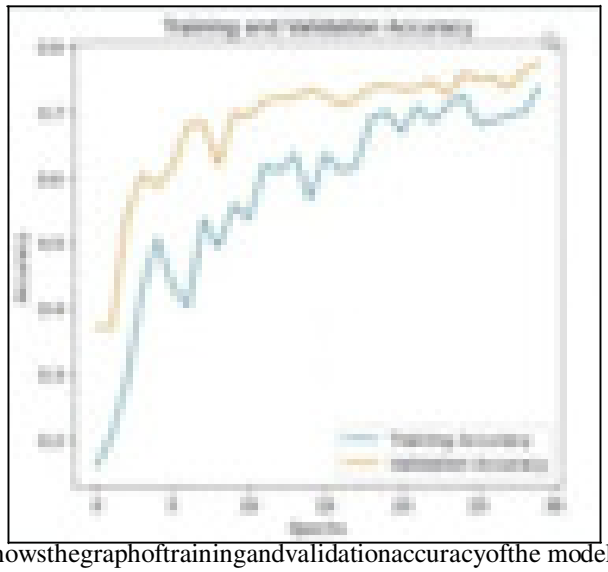


Fig.showsthegraphoftrainingandvalidationaccuracyofthe model

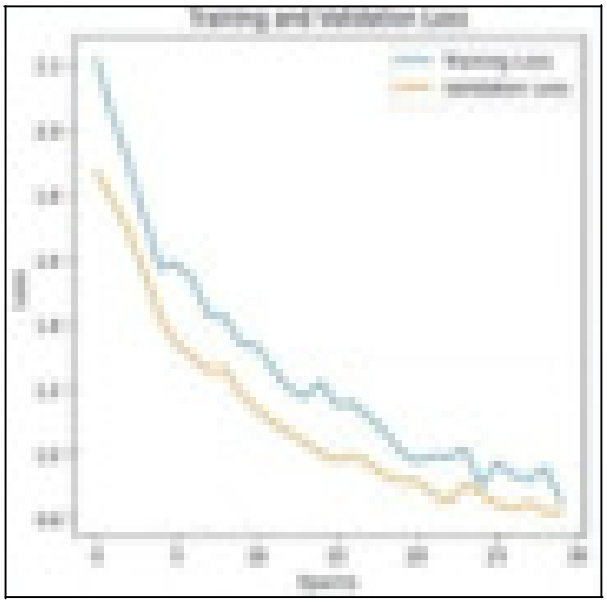


Fig.showsthegraphoftrainingandvalidationlossofthe model

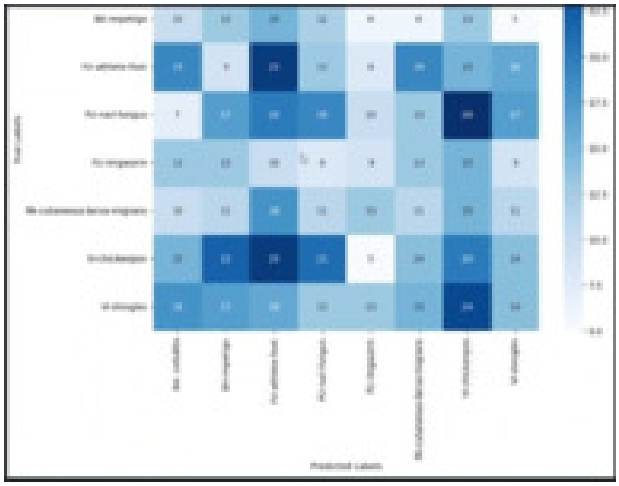


Fig. shows the conclusion matrix for skin disease classification

VI. CONCLUSION

The Skin Disease DetectionSystemusingCNNoffersapromising solution for early and accessible skin disease diagnosis. Byutilizing deep learning, the system accurately identifies skin conditions and provides users with reliable information onpotential symptoms, helping them make informed decisions about their health. The interactive design allows patients to confirm symptoms and receive tailored recommendations for expert dermatologists, ensuring that they are directed toward appropriate medical care. With its user-friendly interface and location-based dermatologist suggestions, this system bridges the gap between preliminary diagnosis and professional consultation, ultimately improving access to specialized healthcare and supporting better patient outcomes.

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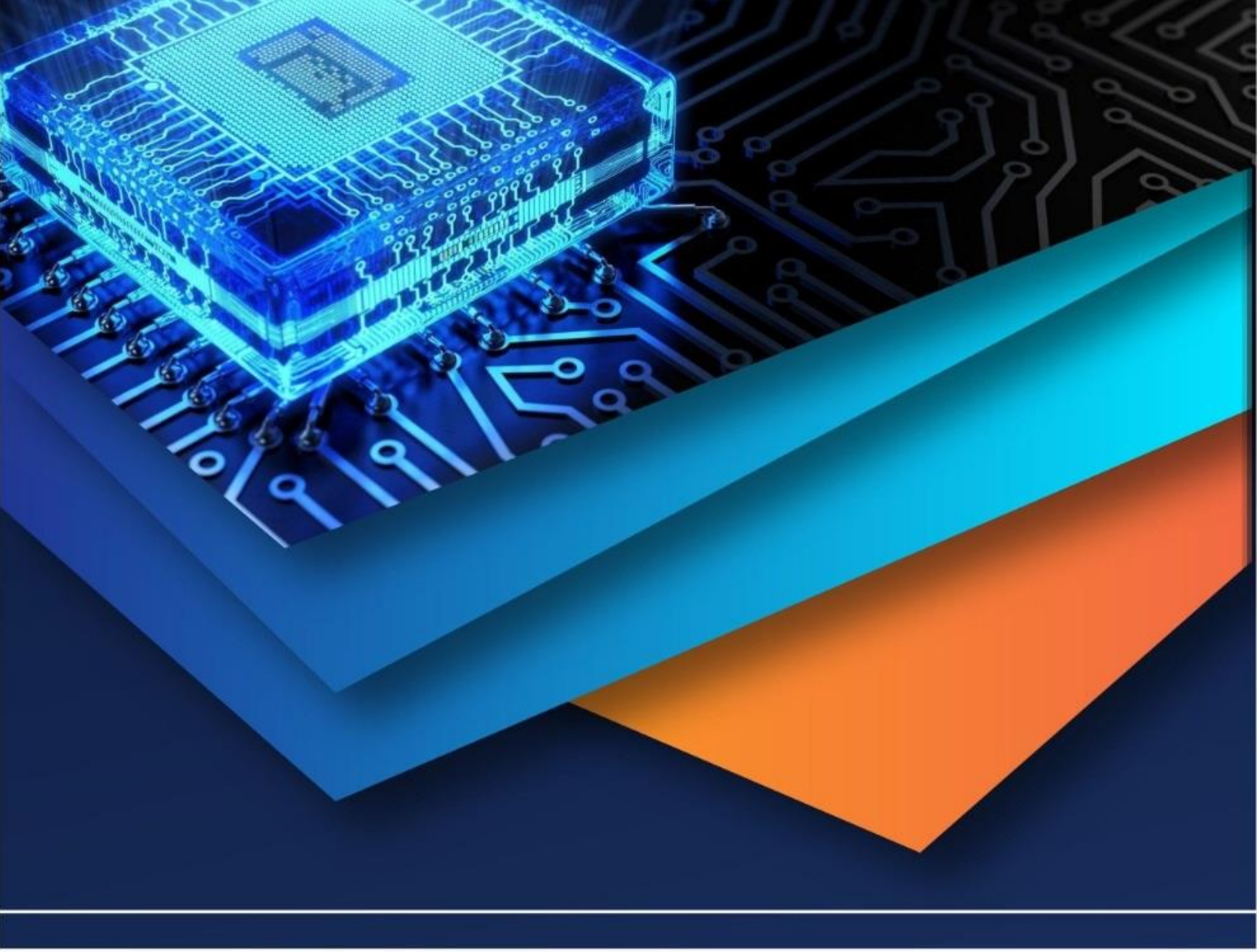

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