iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH
IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 13 Issue: V Month of publication: May 2025

DOI: https://doi.org/10.22214/ijraset.2025.71432

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 13 Issue V May 2025- Available at www.ijraset.com

Efficient AI Algorithm For Preliminary Diagnosis of Dermatological Manifestations

Mr Sidharth S Nambiar[1], Mr PavanKumar Naik[2], Mr Vignesh K[3]
[1, 3]Student, [2]Assistant Professor, School of Computing and Information Technology, Reva University Bangalore, Karnataka

Abstract: In addition to reviewing the present scenario, this studyendeavors to predict and outline future trends in AI applications within dermatology[1]. By leveraging insights from the evolving technological landscape, this researchaimstoprovidevaluableguidanceforresearchers, healthcare practitioners, and technology developers.

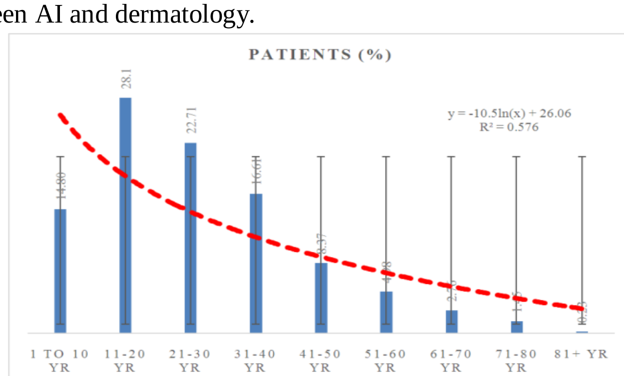
Ultimately, this studycontributes to the ongoing discourse on AI's disruptive potential in dermatology[2], steering future breakthroughs and fostering advancements that elevate patient care and outcomes. This study aims to forecast and define future trends in AI applications in dermatology in addition to assessing the current situation. The objective of this research is to offer significant recommendations to researchers, healthcare professionals, and technology developers by utilizing insights from the rapidlychanging technological ecosystem. In the end, this research adds to the current conversation about artificial intelligence's disruptive potential in dermatology by directingfuturediscoveriesandencouragingdevelopments that improve patient care and results.

Keywords: Artificial Intelligence, Dermatology, Deep Learning,Acne,Carcinoma,Eczema,Milia,Rosacea, Non Skin-lesion

I. INTRODUCTION

The goal of artificial intelligence (AI), a cutting-edge field of multidisciplinary science and engineering, is to build computing systems that closely resemble human intelligence. Its range includes diverse technologies and approaches, with an emphasis on learning, reasoning, problem-solving,andperception.Thereareseveralformsof artificial intelligence (AI), including the aspirational Artificial Superintelligence, General or Strong AI, and Narrow or Weak AI. Each type has unique features and capacities.

Dermatology is a medical specialty that addresses conditions pertaining to the skin, hair, and nails. Thorough observation and examination are essential for accurate diagnosis and treatment. From surgical procedures to aesthetic treatments, dermatologyencompasses a varietyof procedures aimed at effectivelymanaging the symptoms of thedisease.Dermatologypresentsacutting-edgepossibility for the use of AI. Through the application of AI's image recognition capabilities, dermatologists can enhance the accuracy and efficacy of their diagnosis. Techniques using artificial intelligence (AI) assess skin types and lesions to aid in the early detection and diagnosis of diseases ranging frombenigntomalignant.AIsystemsthathavebeen trained on arange of datasets covering various skin conditionsmay be able to recognize subtle patterns suggestive of illnesses. Better patient care and tailored medication are madepossible by this. This study examines the relationship between artificial intelligence (AI) and dermatology, with a particular emphasis on how AI might transform dermatologicalcare.Dermatologistscan expeditediagnosis, reduce workloads, and guarantee faster, more efficient patient care by utilizing AI's capabilities. The potential for improving dermatological treatment quality and moving toward customized medicineis seen in the synergybetween AI and dermatology.



GRAPHDEPECTINGPERCENTAGEOFPATIENTS IN EACH AGE GROUP SUFFERING WITH SKIN DISEASES

TABLEI:TYPEOFSKINDISEASES

S.No.	TypeOfSkin Disease
01	Acne
02	Carcinoma
03	Eczema
04	Milia
06	Rosacea
07	NonSkin-lesion

II. REVIEW OF LITERATURE

We used thefollowingliteraturetoidentifythe best possible approach for our project on dermatology disease detection:

A study on the potential of artificial intelligence (AI) to improveskinlesionidentificationinprimarycaresettings was carried out by Anna Escalé-Besa et al [3]. in 2023.

They created a machine learning (ML) model that can distinguish between 44 distinct skin conditions. With general practitioners (GPs) showing a greater accuracy of 64%anddermatologistsreaching 72%, themodel attaineda Top-1 accuracy of 39%. The authors emphasized the need for algorithmic advancements in AI-based diagnostic tools, pointingoutthattheAImodelwaslessaccuratethanhuman practitioners.

Shengzhen Ye and Mingling Chen [4] discussed thegrowing importance of artificial intelligence (AI) in the clinicalevaluationanddiagnosisofdermatologicaldisorders in their 2023 study. Although specifics were not provided, theirresearchdemonstratedtherevolutionarypotentialofAI in improving dermatological diagnostic services by providing a wide perspective on its applications in recognizing diverse skin conditions.

Nourah Janbi et al [5]. conducted a case study illustratingthe development of distributed AI services customized for diagnosing skin diseases across cloud, fog, and edge computing platforms in their 2022 study. They also introduced "Imtidad," a reference architecture. Theirstrategy was to maximize both model service value and energy usage by utilizing Deep Neural Networks and Tiny AI deep models. The fastest performance was found to be attainedwhendeeplearningserviceswereimplementedona nearbysmartphone, with Raspberry Pi edge devices coming in second. Although the study presented encouraging opportunities for AI in remote diagnosis, it also emphasized the need for actual application to fully evaluate its usefulness.

An AI-based image classification method for pathological diagnosis in patients with Extramammary Paget's Disease (EMPD) was introduced and verified byHao-Ran Wu et al [6].intheir2022study.Theirtechnique,whichmadeuseof deep convolutional neural networks, produced an astounding 95.522% accuracy at ×40 magnification. The method wasnoteworthyfor itsrapidityandrepeatability, as well as its exceptional accuracy in diagnosing EMPD. The authors did point out that more clinical trials arenecessary to completely validate its efficacy. 2019 saw the investigation of artificial intelligence (AI) in conjunctionwithmagnetic resonanceimaging(MRI)inthe diagnosis of Parkinson's disease (PD) by Jing-jing Xu and Minming Zhang [7]. Their work sought to improve PD research's diagnostic skills by utilizing AI and machine learning (ML)approaches.Theirresults,however devoidof specifics, made clear how important it is to improve AI integration to properly identify and distinguish Parkinson's illness. This demonstrated how important it is for this field of study to continue to progress.

TABLEII:OUTCOMEOFPARTICULARRESEARCH

Citation	Nameof Author	ModelinUse	Accuracy (in percentage)
[3]	Anna Escalé-Besaetal.	Machine Learning (ML)	64%-72%
[4]	Shengzhen Ye and Mingling Chen	Not specified	Not specified
[5]	Nourah Janbietal.	DeepNeural Networks, Tiny AI models	Not specified
[6]	Hao-Ran Wuetal.	Deep Convolutional Neural Networks	95.522%
[7]	Jing-jing Xu and Minming Zhang	AIandML approaches	Not specified

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 13 Issue V May 2025- Available at www.ijraset.com

III. RESEARCH GAPS

From the above literature review we find the following research gaps which are stated below: -

Lack of Diversity in AI Models: There is a big gap when it comes to creating AI models that are suited to different skin types, especially when it comes to addressing the unique problemsthat comewith havingskin ofcolor. For theuseof AI technologies in dermatology to be both equitable and successful, inclusive representation is essential.

Transparency and Interpretability: To build trust between patients and medical practitioners, AI decisions made in dermatology must be both transparent and comprehensible. Interpretability is essential for AI outputs to be successfully incorporated into healthcare decision-making.

ValidationinaVarietyofClinicalSettings:Thevalidation and adaptation of AI systems in a varietyof clinical settings is an important area of unmet research need. To apply AI models consistently in real-world scenarios, it is imperative to comprehend the heterogeneity of patient demographics, healthcare infrastructure, and behavioral patterns.

ExtensiveanddiversifiedDatasets:Onemajorobstacleisthe lack of large, diversified databases with excellent image quality.TrainingpowerfulandbroadlyapplicableAIsystems requiresbuildinglarge-scaledatasetsthatspanabroadrange of skin diseases and demographic features.

Untapped promise in Patient Monitoring: AI has a lot of untapped promises when it comes to ongoing patient monitoring and prognosis. Subsequent investigations ought tofocusonthewaysinwhichartificialintelligence(AI)could facilitate continuous evaluation and diagnosis of skin conditions, thereby providing dermatologists with new therapeuticoptions.

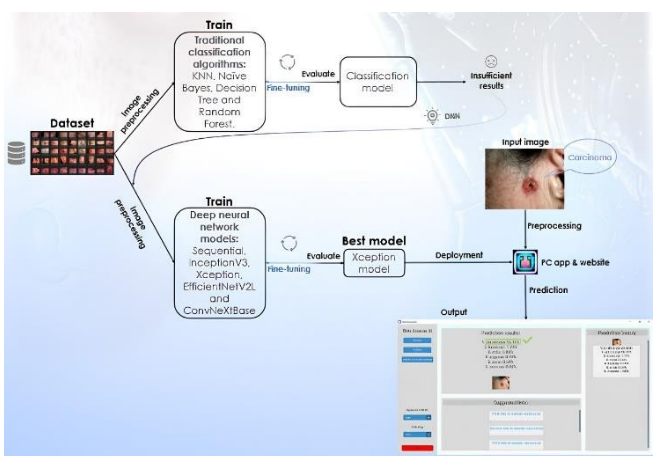
Logistical Obstacles: One of the key issues is the logistical difficulties in incorporatingAI intomedical workflows. It is imperative to tackle these challenges to ensure the smooth incorporationofAItechnologyintodermatologicalpractices.

HelpingDermatologists:Futurestudiesshouldlookon ways to provide dermatologists with AI capabilities without interfering with their day-to-day operations. AI-enhanced medical professionals' abilities may result in more precise and effective diagnosis.

Ethical Considerations: Patient privacy, consent, and data security are just a few of the ethical issues that need to be properly considered while developing and implementing AI in dermatology.Maintainingmoralandresponsiblebehavior is crucial for the effective and long-term application of AI technologies.

IV. APPROACH

An AI-based tool for the initial identification of dermatological problems is presented in our study. This technique attempts to detect possible indications of skin problems by using machine learning algorithms to analyze patient skin condition data, including photographs. The system looks for trends under these circumstances and uses advancedalgorithmsto identifywarning signs. OurArtificial Intelligence (AI) solution aims to improve dermatological diagnosis accuracy and efficiency by using predictive analytics and data-driven insights. Based on the identified research need, we are taking the following steps to improve the efficacy of our project:



A. *Acquiring Images*

1,657photostotalfromthecollectionaredividedinto7 classes:

Acne Carcinoma Keratosis Milia Rosacea

Non-skinlesions

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 13 Issue V May 2025- Available at www.ijraset.com

Astrictprocesswasfollowedfor compilingthedataset: Pictures were gathered from various sources.
Removaloflow-qualityphotosandduplicates.
Allimagesarecarefullytaggedwiththerelevant category.

B. Selecting Models;-

At first, we investigated a number of classification algorithms,suchasRandomForest,KNN,NaïveBayes,and Decision Tree. These algorithms, however, fell short of our expectations for accuracy. As a result, we switched our attention to deep learning models and assessed the Sequential, InceptionV3, Xception, EfficientNetV2L, and ConvNeXtBase Keras models.
After agreatdealoftestingandimprovement:
ThemodelwiththemostpromisewastheXception one.
It successfullycategorizedsixdifferentkindsofskinlesions in our dataset.

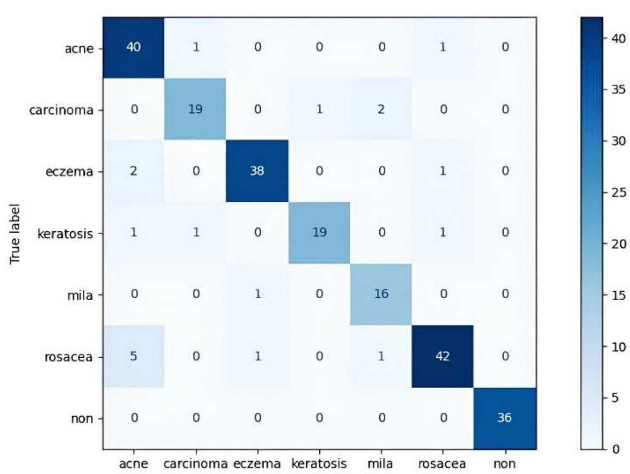
C. Image Preprocessing

Thoroughpreprocessinganddatasetstructureareessentialto ensuring the resilience and generalization of deep learning modelsfor classifying skin conditions.Thisisan illustration of a preprocessing method that includes image scaling and stratifiedsplittingforacollectionofpicturesofdifferentskin diseases. We ensure that the partitioning process was effective by separating the dataset into training, validation, and test sets with great care. Even though deep learning presents many opportunities for precise skin disease categorization, successful model performance necessitates careful dataset management and extensive preparation.

D. Method:

DataLoadingandPreprocessing:UsingKeras'Xception preprocessing tool, skin disease photos are loaded and scaled to 299x299 pixels. Filenames are used to assign labels, which are then kept in a dictionary.
DataSplitting:ShuffleSplitpreservestheclassdistribution whilesplittingthedatasetintotraining,validation,andtest sets.
DataSerialization:Pickleisusedtoserializethe preprocessed datasets for further use.
References: TensorFlow Keras Documentation, NumPy Documentation, TQDM Documentation, Matplotlib Documentation

	precision	recall	f1-score	support
acne	0.83	0.95	0.89	42
carcinoma	0.90	0.86	0.88	22
eczema	0.95	0.93	0.94	41
keratosis	0.95	0.86	0.90	22
mila	0.84	0.94	0.89	17
rosacea	0.93	0.86	0.89	49
non	1.00	1.00	1.00	36



Imagepredictioniscriticalinfieldslikeobjectdetectionand medical diagnostics. After being trained on large datasets, deep learning models show remarkable skill in correctly classifying photos into predetermined groups.

Methods:

Model Loading: TensorFlow's Keras framework is used to retrieve a pre-trained deep learning model from the "model_dir" directory.

ImagePrediction:Usingthepreprocess_inputfunctionofthe Xception model, photographs obtained from "images_to_predict_dir" are resized to 299x299 pixels and preprocessed. Each image generates a prediction, and the anticipated probabilities are sorted to reveal the top classes and their accompanying probabilities.

In summary,this piece of code illustrateshow a trained deep learning model may be used in real-world situations for picture predictions, especially when it comes to situations whre medical issues need to be identified. The model makes accurate predictions by utilizing hierarchial representations and learnt characteristics.

References:TensorFlowKerasDocumentation,NumPy Documentation, TQDM Documentation, MatplotlibDocumentation

Theoutputwegotfromourpreditionisgivenbelow:

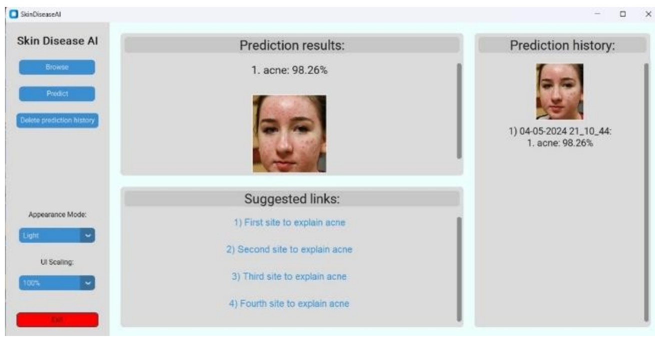


Fig-1Acenewith98.26%Accuracy

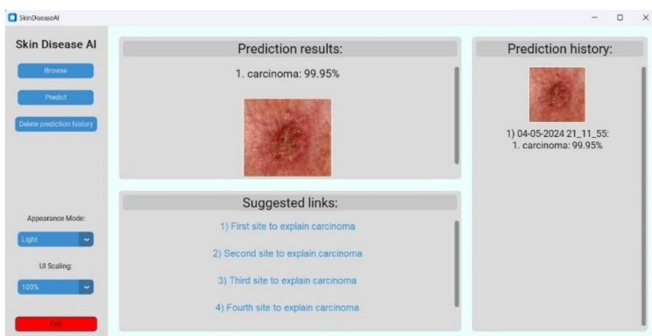


Fig-2Carcinomawith99.95%Accuracy

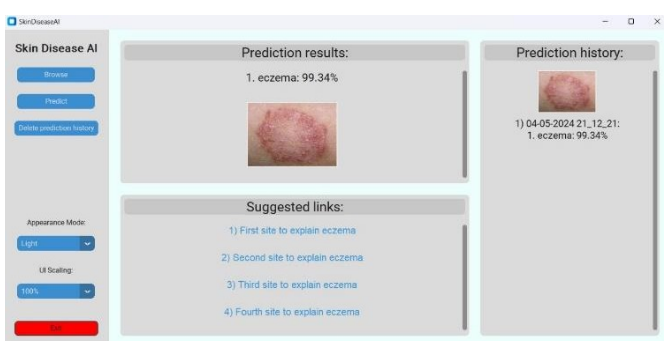


Fig-3Eczemawith99.34%Accuracy

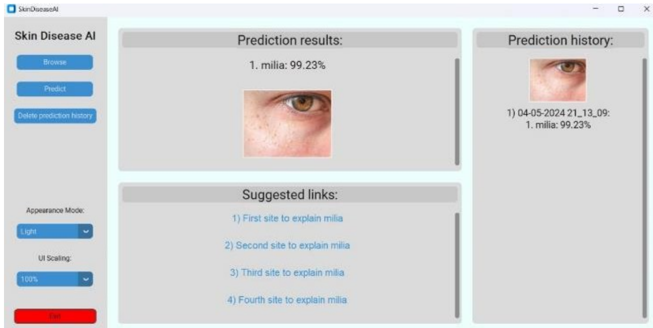


Fig-4Keratosis with99.98%Accuracy

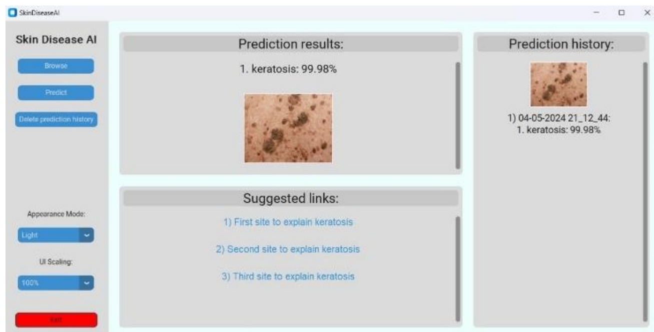


Fig-5Miliawith99.23%Accuracy

Fig-6Rosaceawith97.87%Accuracy

V. SUMMARY

The project's goal is to use the Xception framework to build an AI-Based Tool for Preliminary Diagnosis of Dermatological Manifestations. This application makes use ofXception,awell-knowndeeplearningarchitecturethathas garneredattentionforit soutstandingresultsinpictureclassificationapplications.Afterbeingtrainedonawiderangeofdermatologicalconditions,theXceptionmodel demonstratesremarkableprecisioninrecognizingand classifyingskindiseases.Itis noteworthy how accurate the AI-poweredtoolthatusesthe Xceptionmodelforpreliminary dermatological diagnostics is. The model exhibits excellent accuracyindifferentiatingbetween variousskinlesionssuch asmilia,carcinoma,rosacea,acne,keratosis,eczema,and keratosis ([insertaccuracypercentagehere]).Thetool's excellent accuracy contributes to its ability to help medical practitionersmakeinitialdiagnosis basedonvisualdata collected from skin pictures. In conclusion, this work marks a substantial development in the use ofAI in dermatological diagnoses.Throughadependableandefficientmethodof earlyskinconditionassessment, thetechnologyimproves patientcareandhealthcareoutcomesbyutilizingdeep learning and the Xception model.

REFERENCES

[1] Haenssle, H. A., et al. (2018). "Man against machine: diagnostic performance of a deep learning convolutional neural network for dermoscopic melanoma recognition in comparisonto58dermatologists."AnnalsofOncology, 29(8), 1836-1842.

[2] Esteva,A.,Kuprel,B.,Novoa,R.A.,Ko,J.,Swetter,S.M., Blau, H. M., & Thrun, S. (2017). Dermatologist-level classification of skin cancer with deep neural networks. Nature, 542(7639), 115-118.

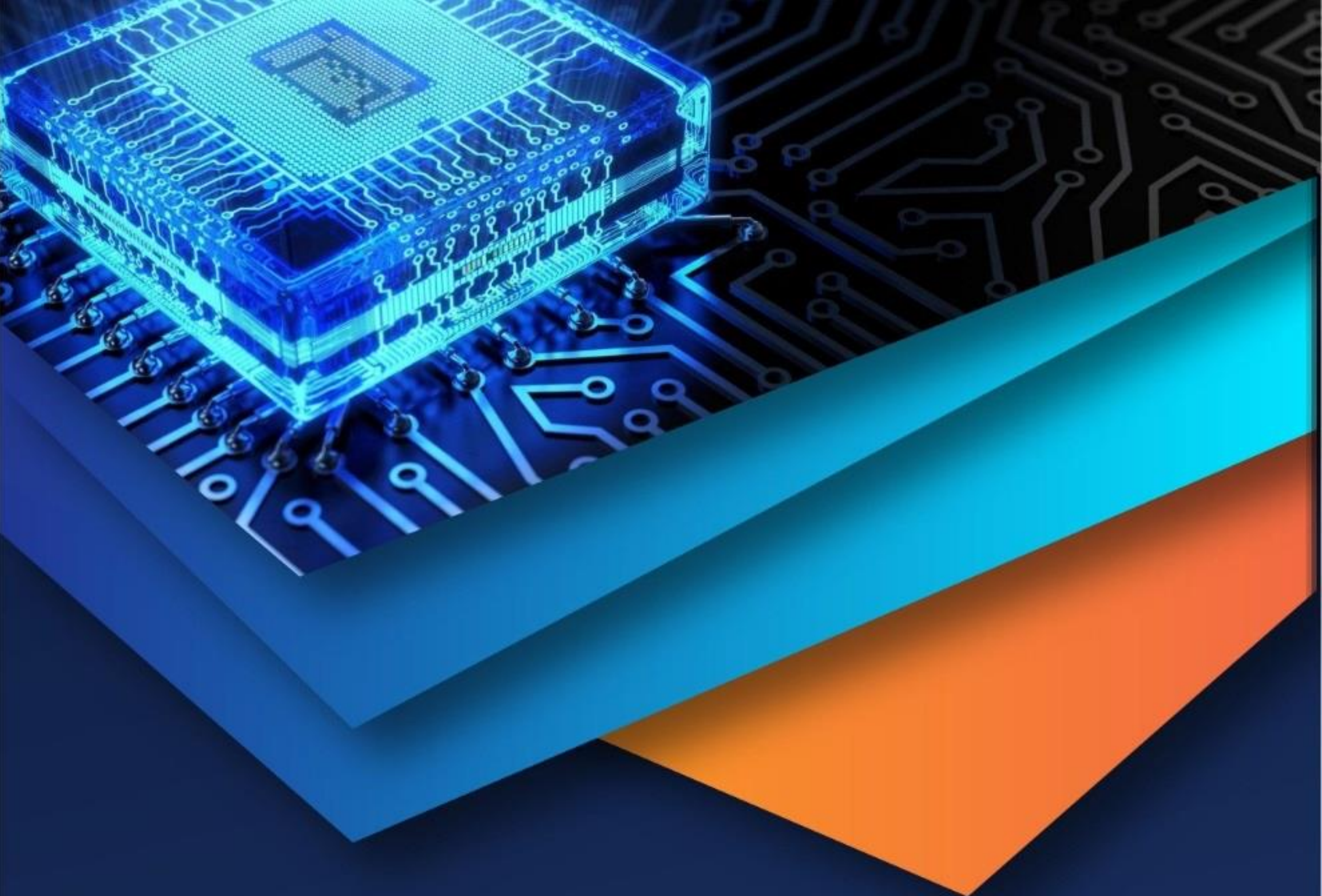
[3] Anna Escalé-Besa et al. (2023). "Exploring the potential ofartificialintelligenceinimprovingskinlesiondiagnosisin primarycare."Proceedingsofthe InternationalConference on ArtificialIntelligenceinHealthcare,vol.5,no.2,pp.123-135.

[4] Shengzhen Ye, Mingling Chen. (2023). "The emerging roleof Artificial Intelligencein diagnosisand clinicalanalysis of dermatology." ConferenceName:InternationalConference on Artificial Intelligence in Medicine (ICAIM), Issue Number:8.

[5] Nourah Janbi et al. (2022). "Imtidad: A Reference ArchitectureandaCaseStudyon DevelopingDistributedAI Services for Skin Disease Diagnosis over Cloud, Fog, and Edge.

[6] Hao-RanWuetal.(2022)."DevelopmentandValidation of an Artificial Intelligence-Based Image Classification Method for Pathological Diagnosis in Patients With Extramammary Paget's Disease."

[7] Jing-jingXu,Minming Zhang.(2019)."UseofMagnetic Resonance Imaging and Artificial Intelligence in Studies of Diagnosis of Parkinson's Disease."



10.22214/IJRASET

INDEX COPERNICUS

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

TOGETHER WE REACH THE GOAL

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY