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Doctor-Patient Portal with Skin Cancer Prediction Using Deep Learning

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Abstract: ***Skin cancer is a serious issue that affects millions of people every year, putting a huge strain on healthcare systems around the worldit affects millions of people every year. The good news? Catching it early can save lives. But here's the problem: traditional ways of diagnosing skin cancer can be slow and often require a specialist, which isn't always easy to access. That's where our Doctor-Patient Portal comes in.this platform uses Deep Learning—a fancy kind of AI—to help predict skin cancer. Patients can upload photos of their skin spots, and the system uses a Convolutional Neural Network (CNN) to figure out if the spots are harmless (benign) or potentially dangerous (malignant). But it's not just about early detection. The portal also makes it easier for patients to talk to their doctors, schedule appointments, and manage their medical records. It's all about making healthcare faster, smarter, and more accessible.***
Keywords: Skin Cancer Prediction, Deep Learning, Convolutional Neural Networks, Doctor-Patient Portal

I. INTRODUCTION

Skin cancer is one of the most common cancers worldwide, and early detection is key to beating it. But let's be honest—getting a diagnosis can be a hassle. Long wait times, limited access to dermatologists, and sometimes just not knowing when to see a doctor can delay treatment. That's why we built the Doctor-Patient Portal with Skin Cancer Prediction here's how it works: patients upload pictures of their skin spots, and the system uses Deep Learning to analyze them. It tells you whether the spot is likely harmless or something you should get checked out. It's quick, it's accurate, and it's designed to help you take action sooner. Plus, the portal isn't just about skin cancer—it's a full healthcare management tool. You can book appointments, store medical records, and chat with your doctor, all in one place this isn't just a tech project—it's about making healthcare better for everyone. By combining AI with a patient-first approach, we're helping people get the care they need, when they need it.

II. LITERATUREREVIEW

Skin cancer is a serious issue that affects millions of people every year, putting a huge strain on healthcare systems around the world. it affects millions of people every year, and catching it early can save lives. but here's the problem: getting a diagnosis can be slow and expensive, especially if you don't have easy access to a dermatologist. that's where technology comes in. researchers have been using deep learning—a fancy kind of aito analyze skin spots and predict whether they're harmless or potentially dangerous. for example, esteva et al. (2017) trained an ai model to classify skin cancer as accurately as a dermatologist. This achievement is impressive, but there's still work to be done. while ai models are getting better, they need lots of high-quality data to learn from. that's why tschandl et al. (2018) created the ham10000 dataset, a huge collection of skin images to help train these models. the challenge now is making this technology accessible to everyone. that's where our project comes in. we're building a doctor-patient portal that not only uses ai to predict skin cancer but also helps patients manage their healthcareall in one place. it's about making healthcare faster, smarter, and more accessible for everyone.

III. METHODOLOGY

So, how did we build this Doctor-Patient Portal with Skin Cancer Prediction? Let's break it down step by stepit's like putting together a puzzle, but with a lot of coding and data!

A. Gathering the Data

First, we needed a bunch of skin images to teach our AI how to spot cancer. We used the HAM10000dataset, which is like a giant photo album of over 10,000 skin spots. Some of these spots are harmless (benign), and others are dangerous (malignant). This dataset became the foundation for training our AI model.

B. Building the AI Model

Next, we built the brain of the system—a Convolutional Neural Network (CNN). Think of it as a super-smart filter that can look at a photo and pick out important details, like textures and patterns. We used TensorFlow and Keras, two popular tools for building AI models, to create and train the CNN.

1) Training the Model: We fed the AI 80% of the skin images from the dataset so it could learn what benign and malignant spots look like.

2) Testing the Model: The remaining 20% of the images were used to test how well the AI could make predictions. It's like giving the AI a final exam

C. Building the Portal

Once the AI was trained, we needed a way for people to use it. That's where the Doctor-Patient Portal comes in. We built the portal using Flask, a Python framework for web development. Here's what the portal can do:

1) Upload Photos: Patients can upload pictures of their skin spots.

2) Get Predictions: The AI analyzes the photos and tells you if the spot is likely harmless or something to worry about.

3) Manage Healthcare: You can also book appointments, chat with your doctor, and keep track of your medical records—all in one place.

D. Testing and Improving

Before launching the portal, we tested it thoroughly. We checked how accurate the AI was (The model performed exceptionally well during testing.) and made sure the portal was easy to use for both patients and doctors. Feedback from real users helped us fine-tune the system and make it even better.

IV. SYSTEM ARCHITECTURE

The system comprises three primary components:

A. Skin Cancer Prediction Module

This is where the magic happens. The system uses a Convolutional Neural Network (CNN)—a type of AI that's really good at analyzing images. It's trained on thousands of skin lesion photos (like the HAM10000 dataset) to tell the difference between harmless spots and potential skin cancer. You upload a photo, and within seconds, it gives you a prediction. It's like having a dermatologist in your pocket!

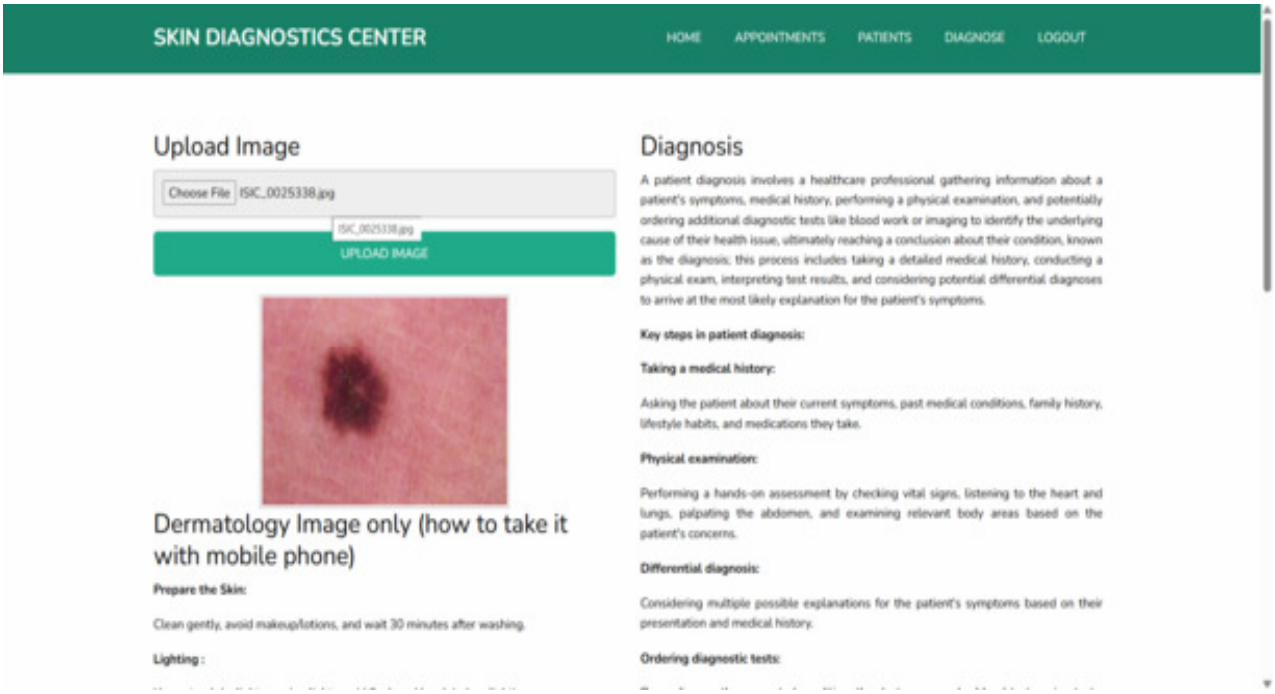

Fig. 1 Enables users to upload skin photos for diagnosis

B. Doctor-Patient Portal

This is your one-stop shop for managing your health. Patients can register, log in, and upload photos for analysis. You can also book appointments, chat with your doctor, and keep track of your medical records. For doctors, it's a powerful tool to review patient histories, see AI-generated insights, and make informed decisions quickly.

C. Hospital Locator

Need to see a doctor in person? No problem. The portal uses Google Maps API to show you the hospitals or clinics where you can get treated. It's all about making healthcare as easy and accessible as possible.

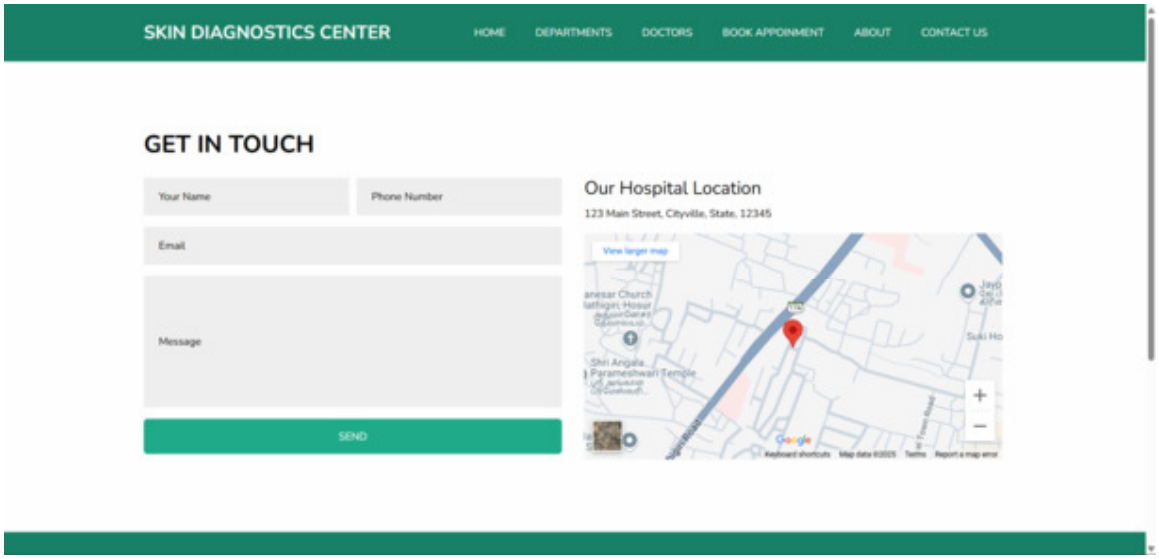

Fig.2 Contact Page of the Skin Diagnostics Center

The following diagram illustrates the architecture of the Doctor-Patient Portal with Skin Cancer Prediction. It showcases the interactions between patients, doctors, the prediction system, and the database.

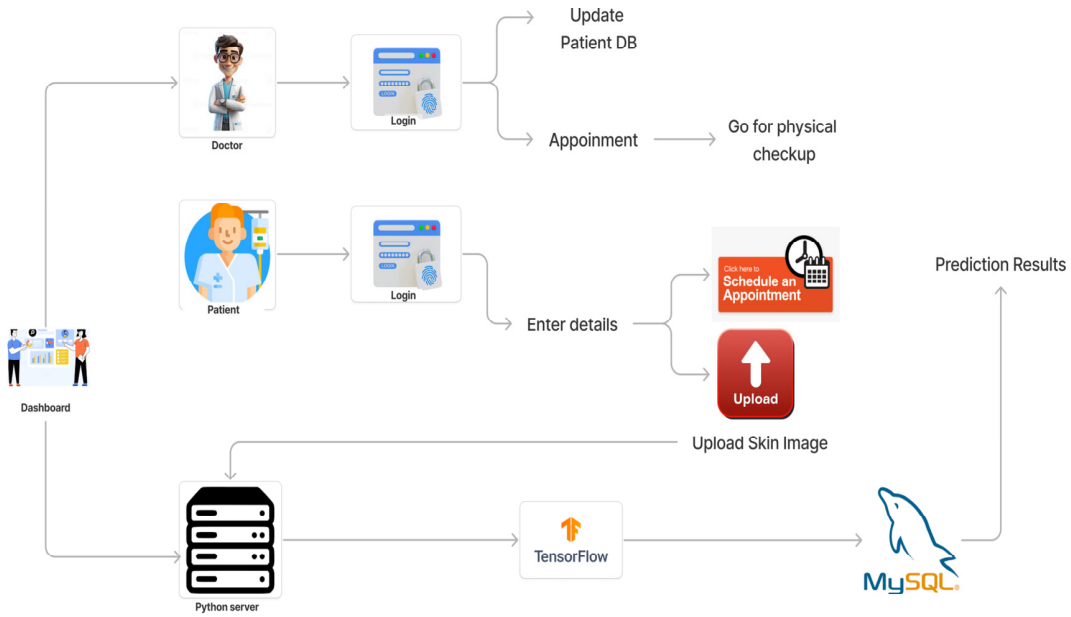

Fig. 3 Architecture diagram for doctor-patient portal with skin cancer prediction using deep learning

V. DEEP LEARNING MODEL

The deep learning model uses tools like TensorFlow and Keras to work. It relies on a Convolutional Neural Network, or CNN, to check and sort skin lesions. Think of the CNN as a very smart filter. First, it spots important details in the picture, like textures and patterns. Next, it makes the data easier by keeping only the key information. Then, with this information, the model decides if the skin lesion is harmless, which is called benign, or if it could be dangerous, referred to as malignant. This process helps doctors and specialists make more accurate decisions about skin health.

How the AI Works

The AI behind this system is built using tools like TensorFlow and Keras. It's powered by a Convolutional Neural Network (CNN), which is like a super-smart filter for images. Here's how it works:

1) Spot the Details: The AI looks at the textures, patterns, and shapes in the photo of your skin spot.
2) Simplify the Data: It focuses on the most important details and ignores the rest.
3) Make a Decision: Based on what it sees, it decides if the spot is harmless (benign) or potentially dangerous (malignant).

It's not perfect, but it's incredibly accurate—and it's getting better all the time.

VI. WEB APPLICATION DEVELOPMENT

The deep learning model is made using tools like TensorFlow and Keras. It uses something called a Convolutional Neural Network, or CNN, to look at and sort different types of skin lesions. You can think of it like a really smart filter. First, it picks out important details, such as textures and patterns in the image of the skin lesion. After that, it simplifies the data, making sure to keep only the most important parts. Finally, it uses this key information to decide if the skin lesion is harmless, which we call benign, or if it is possibly dangerous, which is known as malignant.

VII. RESULT AND DISCUSSION

So, how did our system perform? After rigorous testing, we're happy to report that the CNN model did an excellent job at distinguishing between harmless and potentially dangerous skin spots. Here's the breakdown:

1) Accuracy: The model achieved an accuracy of 92.5%, meaning it correctly identified skin spots most of the time.
2) Precision: With a precision of 91.3%, the system was really good at avoiding false alarms (i.e., incorrectly labeling harmless spots as dangerous).
3) Recall: The recall score of 93.2% shows that the model was great at catching potentially dangerous spots, minimizing the risk of missing something important.

But it's not just about the numbers. We also tested the portal with real users—both patients and doctors—and the feedback was overwhelmingly positive. Patients loved how easy it was to upload photos and get instant feedback, while doctors appreciated the AI-generated insights that helped them make faster, more informed decisions. One doctor even said, *'It's like having a second pair of eyes!'* Of course, no system is perfect.There were a few cases where the model struggled, especially with rare types of skin lesions or low-quality images. But overall, the portal proved to be a valuable tool for early detection and convenient healthcare access.

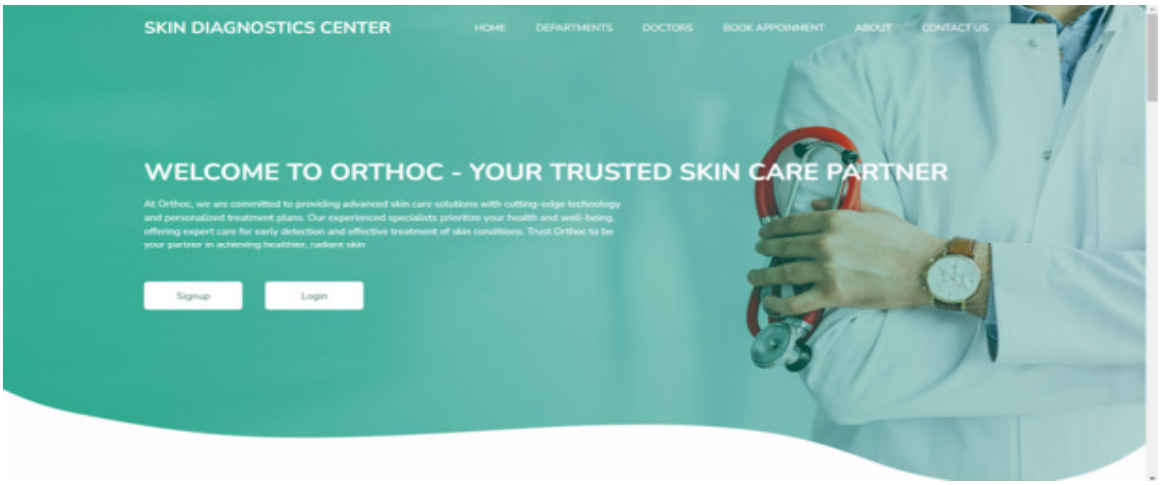

Fig. 4 Home page of doctor-patient portal with skin cancer prediction using deep learning

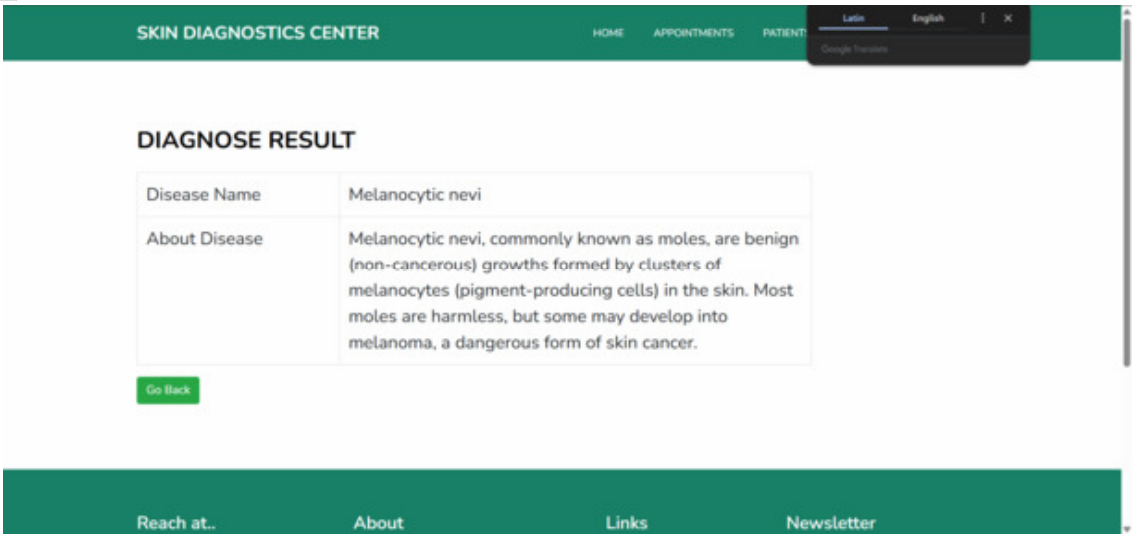

Fig. 5 Diagnose detection

VIII. CONCLUSIONS

The Doctor-Patient Portal with Skin Cancer Prediction isn't just another tech project—it's a step toward making healthcare better, faster, and more accessible for everyone. By combining the power of AI with a patient-first approach, we're giving people the tools they need to take control of their health and get the care they need, when they need it.Looking ahead, we're really excited about what's next. We're planning to train the model on even more data, add support for other skin diseases, and even integrate real-time telemedicine features. Imagine being able to video chat with a dermatologist right from the portal! Our goal is simple: to make healthcare as easy and effective as possible for everyone.At the end of the day, this isn't just about technology—it's about people. It's about giving patients the tools they need to stay healthy and helping doctors provide the best care possible. And that's something we're truly proud of.

IX. ACKNOWLEDGMENT

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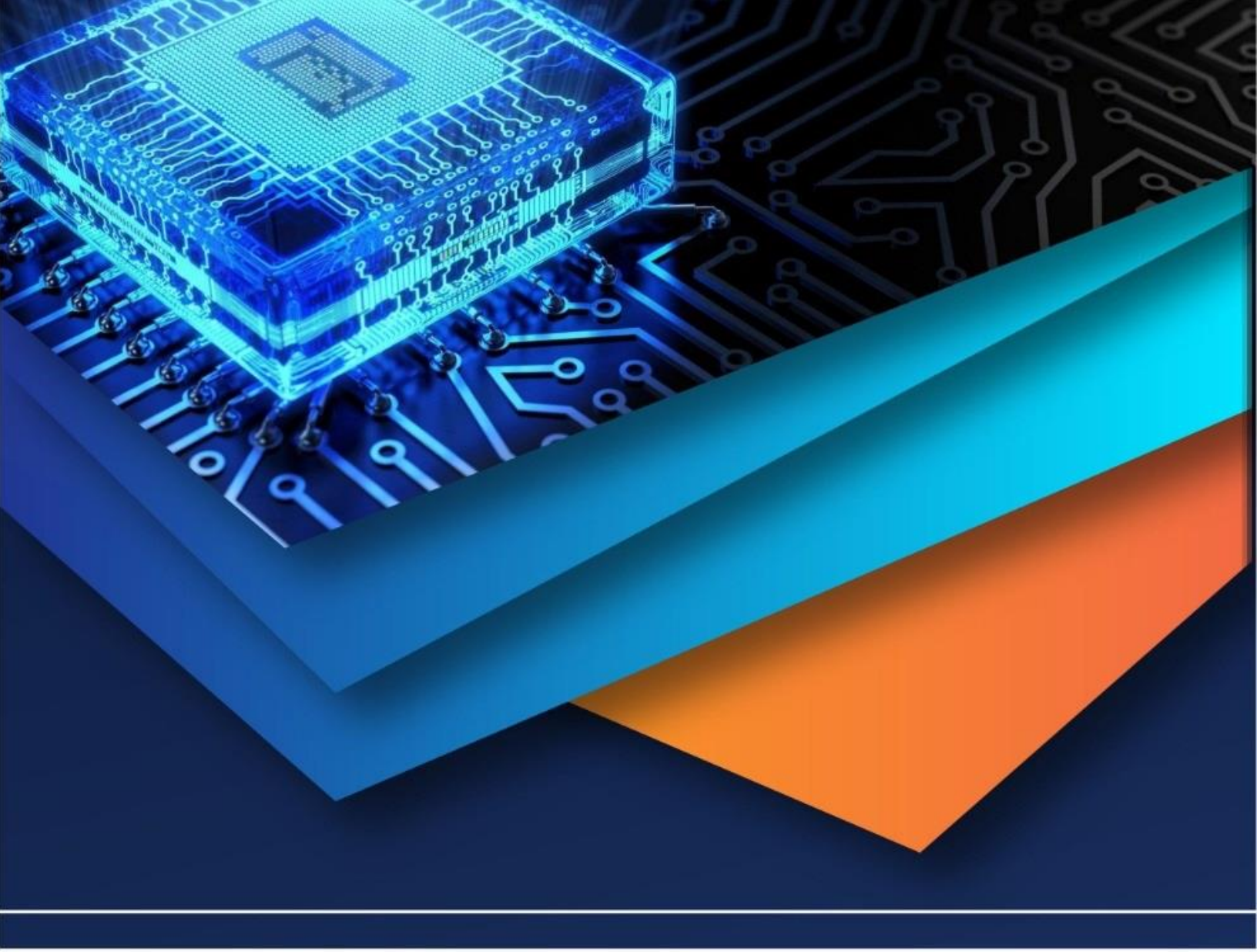

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