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Pawnder: An Online Platform for Canine Adoption

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Abstract: ***This paper presents a new online tool, Pawnder, a dog adoption website which allows users to access and navigate through the database of dogs, in need of care and support, which constitutes a significant proportion of the canine's population in India with the subsequent aim of adoption, thus helping to reduce cases of human-animal interference along with their high mortality rates. Using the concepts of Machine learning and Web development using React.js, Pawnder is designed to run on any browser on any device creating easy accessibility for its users thus allowing a greater reach which consequently would help in providing all the resources needed for these innocent animals. The objective behind its development is to utilise the network base so created to eventually facilitate in their adoption and helping them find their forever homes.***
Keywords: Website, Adoption, Machine learning, Web development, React.js

I. INTRODUCTION

Web development and machine learning are widely used in projects. Computation tools are much faster and impactful than the previous methods to do a certain task as everyone wants to make things happen with the touch of their fingers or some clicks. This would influence more such responsible tasks, saving time and resources. This project bridges the gap between problem solving and creativity which leads to the possibility of a better future for these species.

II. METHODOLOGY

The website has been developed in React.js using Bootstrap 5. While the body of the website, that is the Frontend is developed in React.js, the core of the website, that is its Backend is developed in python with the use of Machine learning. MongoDB has been selected for building the database of the dogs. FLASK has been used to connect the Front end and the Backend of this website.

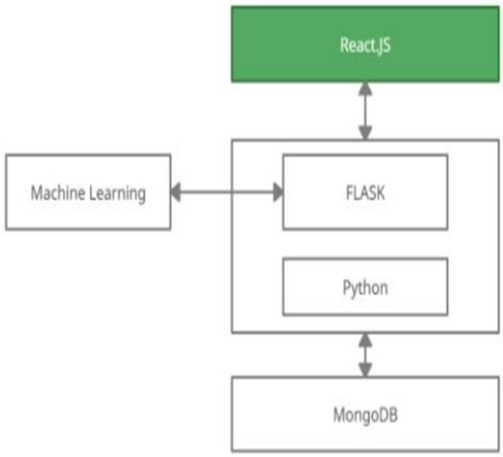


Fig. 1 Systematic Flowchart of Dependencies of the main project

There are many tasks that cannot be performed by our computers as they are not modelled that way. Examples include Autonomous Driving, Recognition tasks from unordered data (Face Recognition/Handwriting Recognition), Natural language Processing, computer Vision etc

Machine learning has a similar use in our website. Through Machine Learning, we would be providing better usability to our users as they would not require to add all the details about their pet. Machine learning/ImageNet will recognize the dog through a JPEG/PNG picture and important attributes like its breed, colour and fur.

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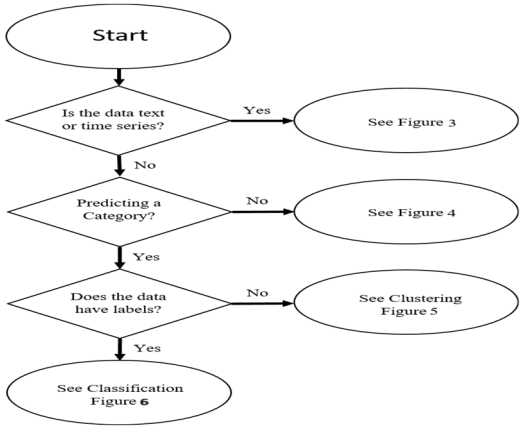


Fig 2. Algorithm Flow Chart [9]

Machine Learning would reduce the effort of the user who is listing that dog for adoption making his/her efforts minimal. Machine Learning would provide a shortcut to entering every detail of the dog like breed and colour.

1) The Process For The Lister

a) Login/Sign Up with Email or Phone.
b) Post your dog by uploading photographs
- ImageNet will recognize the Breed, Fur and the color of the Dog by itself.

c) Entering Age
d) Checking the box: Is Vaccinated | Not Vaccinated | Not known by the lister
e) Selecting Location
f) Reviewing the post with all the details in one frame
g) Post

2) The Process For The Person Who Is Willing To Adopt

a) Login/Sign Up with Email or Phone.
b) Adopting Party-Must have requirements
- Is above 18 years of age
- Does their house/apartment authorities allow pets
- Is willing to go through a training class if that is required for adoption

c) Browse and choose the pet according to your lifestyle
d) Call or book an appointment via email with the lister.
e) Take your little friend home.

A. ImageNet

ImageNet is a large visual database designed for use in visual object recognition software research. More than 14 million images have been hand-annoted by the project to indicate what objects are pictured and in at least one million of the images, bounding boxes are also provided. ImageNet contains more than 20,000 categories with a typical category, consisting of several hundred images. The database of annotations of third-party image URLs is freely available directly from ImageNet, though the actual Images are not owned by ImageNet. [5]



Fig. 3 ImageNet, Source: medium.com

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The ImageNet Large Scale Visual Recognition Challenge (ILSVRC) is an annual computer vision competition. Each year, teams compete on two tasks. The first is to detect objects within an image coming from 200 classes, which is called object localization. The second is to classify images, each labelled with one of 1000 categories, which is called image classification. VGG 16 was proposed by Karen Simonyan and Andrew Zisserman of the Visual Geometry Group Lab of Oxford University in 2014 in the paper "VERY DEEP CONVOLUTIONAL NETWORKS FOR LARGE SCALE IMAGE RECOGNITION". This model won the 1st and 2nd place on the above categories in 2014 ILSVRC challenge

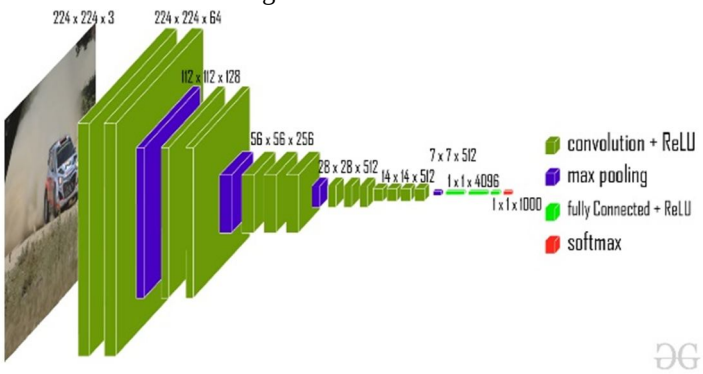


Fig. 4 CNN Model [4]

This model achieves 92.7% top-5 test accuracy on ImageNet dataset which contains 14 million images belonging to 1000 classes. [4]

B. Tensorflow

An open-source software library which is end to end encrypted for Machine Learning to build and deploy ML Models. Object detection in Tensorflow: Given an image or a video stream, an object detection model can identify which of a known set of objects might be present and provide information about their positions within the image. [6] For example, this screenshot of example application shows how two objects have been recognized and their positions annoted. An object detection model is trained to detect the presence and location of multiple classes of objects. For example, a model might be trained with images that contain various pieces of fruit, along with a label that specifies the class of fruit they represent (e.g.an apple, a banana, or a strawberry), and data specifying where each object appears in the image.

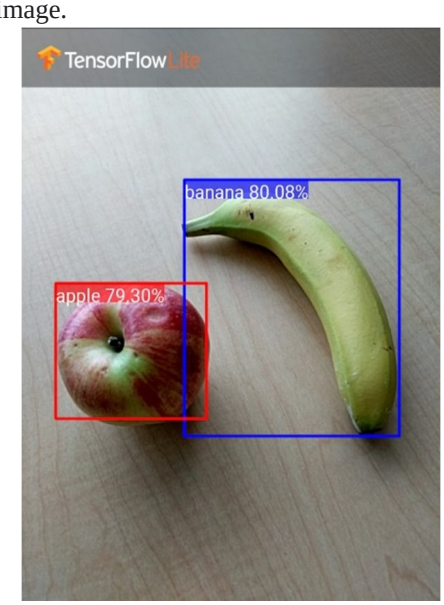


Fig. 5 Object Detection in Tensorflow [6]

When an image is subsequently provided to the model, it will output a list of the objects it detects, the location of a bounding box that contains each object, and a score that indicates the confidence that detection was correct.[6]

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C. Confidence Score

To interpret these results, we can look at the score and the location for each detected object. The score is a number between 0 and 1 that indicates confidence that the object was genuinely detected. The closer the number is to 1, the more confident the model is. Depending on your application, you can decide a cut-off threshold below which you will discard detection results. For the current example, a sensible cut-off is a score of 0.5 (meaning a 50% probability that the detection is valid). In that case, the last two objects in the array would be ignored because those confidence scores are below 0.5:

Class	Score	Location
Apple	0.92	[18, 21, 57, 63]
Banana	0.88	[100, 30, 180, 150]
Strawberry	0.87	[7, 82, 89, 163]
~~Banana~~	~~0.23~~	~~[42, 66, 57, 83]~~
~~Apple~~	~~0.11~~	~~[6, 42, 31, 58]~~

Fig. 6 Confidence Score Table [6]

The cut-off you use should be based on whether you are more comfortable with false positives (objects that are wrongly identified, or areas of the image that are erroneously identified as objects when they are not), or false negatives (genuine objects that are missed because their confidence was low). For example, in the following image, a pear (which is not an object that the model was trained to detect) was misidentified as a "person". This is an example of a false positive that could be ignored by selecting an appropriate cut-off. In this case, a cut-off of 0.6 (or 60%) would comfortably exclude the false positive. [6]

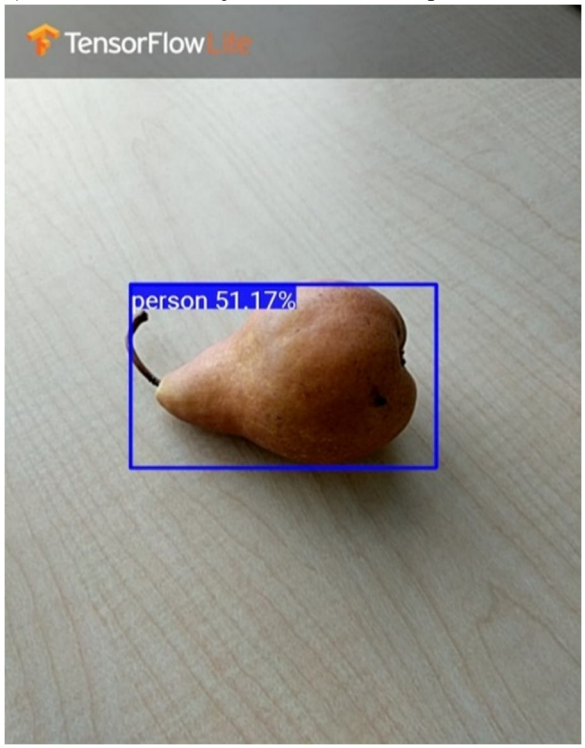


Fig. 7 False Negative [6]

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D. Dog Breed Classifier using React-ML App

The Dog Breed Classifier is a React App which is a privacy-first Machine Learning application that runs in the browser The Database chosen for Dogs Image is Stanford Dogs Dataset, which contains 137 different breeds of dogs with about 150 images per breed. This React App contains only the Frontend and has no Backend. As it runs in the browser, it doesn't need a server that runs the model and you preserve your user privacy This technology is to be integrated in our website (Pawnder) for better usability by the user and an easier process for the user to upload the details of the Dog.

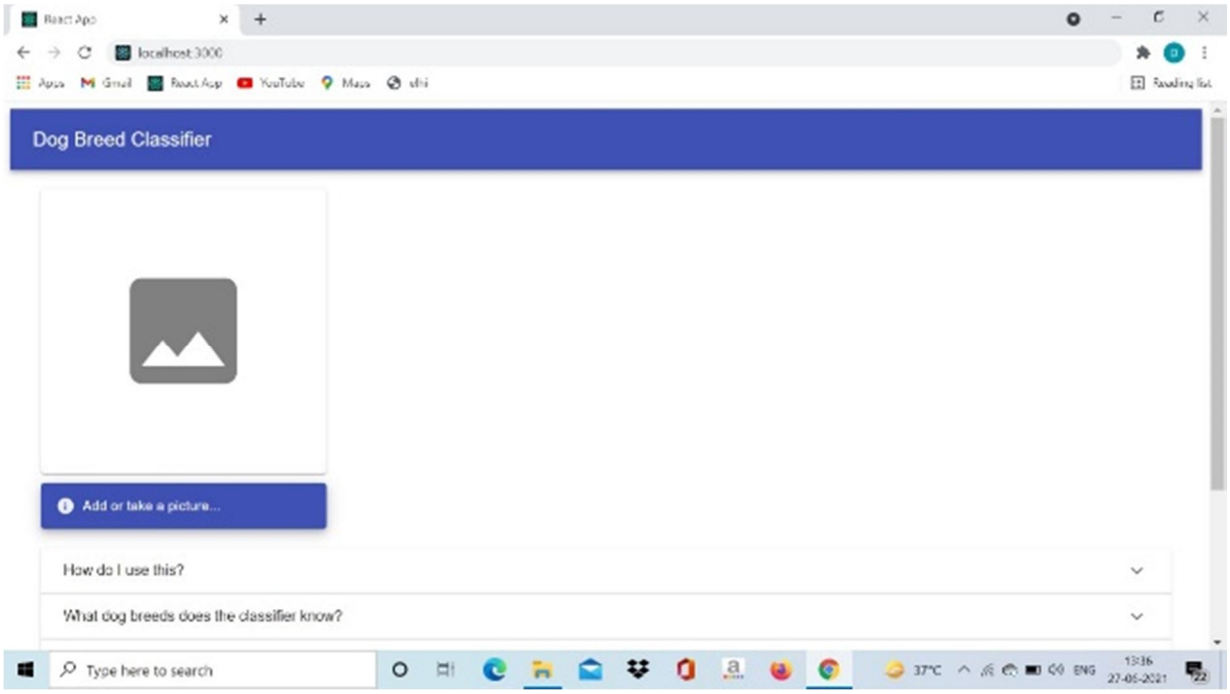


Fig. 8 Screenshot 1 - Dog Breed Classifier using React ML App [7]

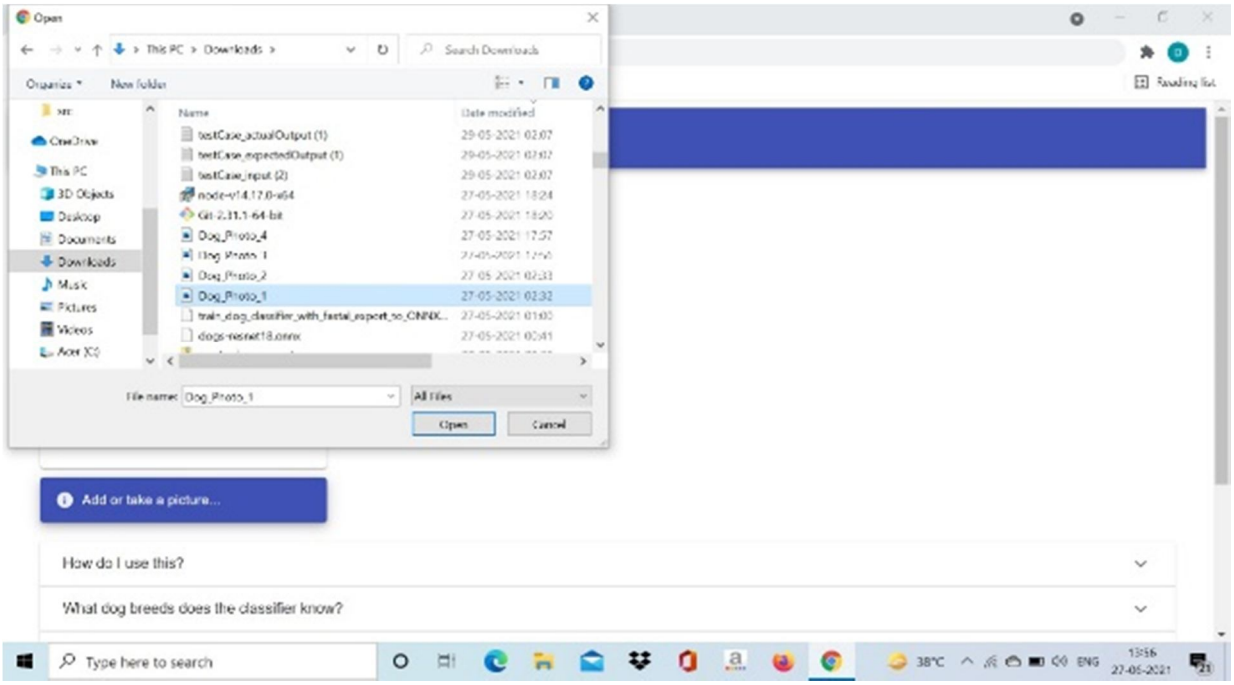


Fig. 9 Screenshot 2 - Uploading the Image of a dog [7]

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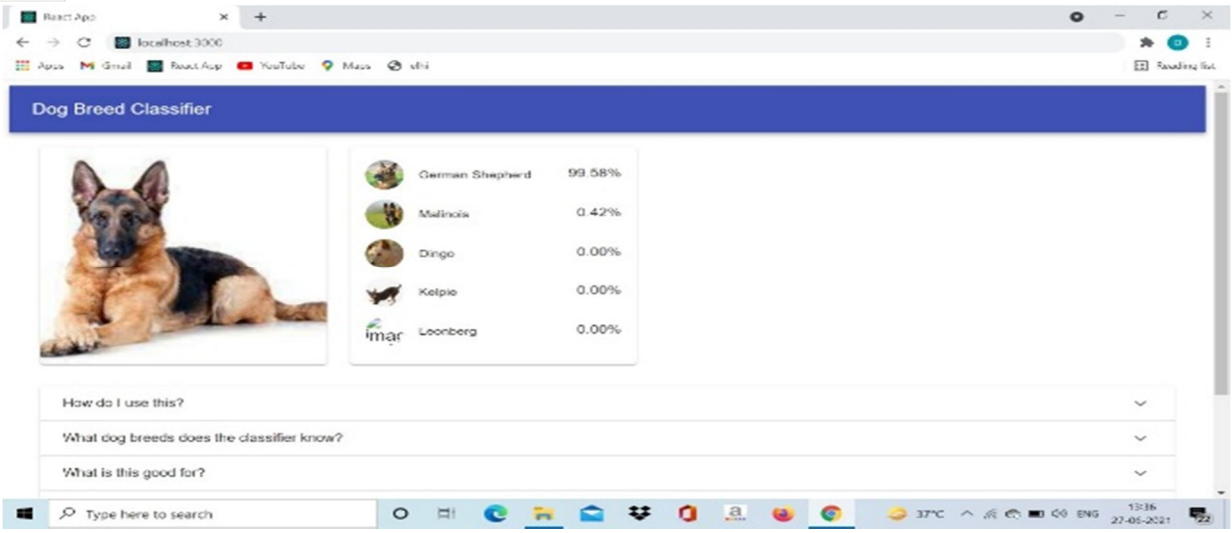


Fig. 10 Output [7]

To analyse whether there exists a need of such an adoption website, we conducted a survey. Survey was conducted via google forms and participants between the age group of 18 to 30 were asked about their preferences of getting a dog; whether they would prefer to adopt or shop one. We got multiple entries and based on that, below are the results in the form of pie chart:

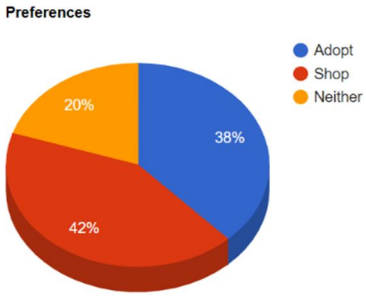


Fig. 11 Pictorial representation of survey data

III. CONCLUSION

This online tool will mainly solve the problem of over burdening of shelters and provide a happy life to all the road side as well as other dogs that are being pet but are not taken care of. A dog doesn't only require food. With sufficient nutrition, it requires a habitat in which it can adapt and grow and as well a caring owner. There has always been a rise in the health chart of the dogs when they are actually taken care of in a proper manner. Taken care of doesn't only limit to providing them their meals timely, but also to take care of their paws, their fur, looking out for ticks, cleaning them, taking care of their dental hygiene. This would also reduce the cruelty that these creatures have to face by some humans. According to stats, a large number of dogs get involved every year in road accidents. While some of them get injured, most of them die on the spot. Petting a dog is a task full of responsibilities. But if you are petting a dog, you would be saving them from a lot of disastrous factors. Don't Shop, Adopt

IV. ACKNOWLEDGEMENT

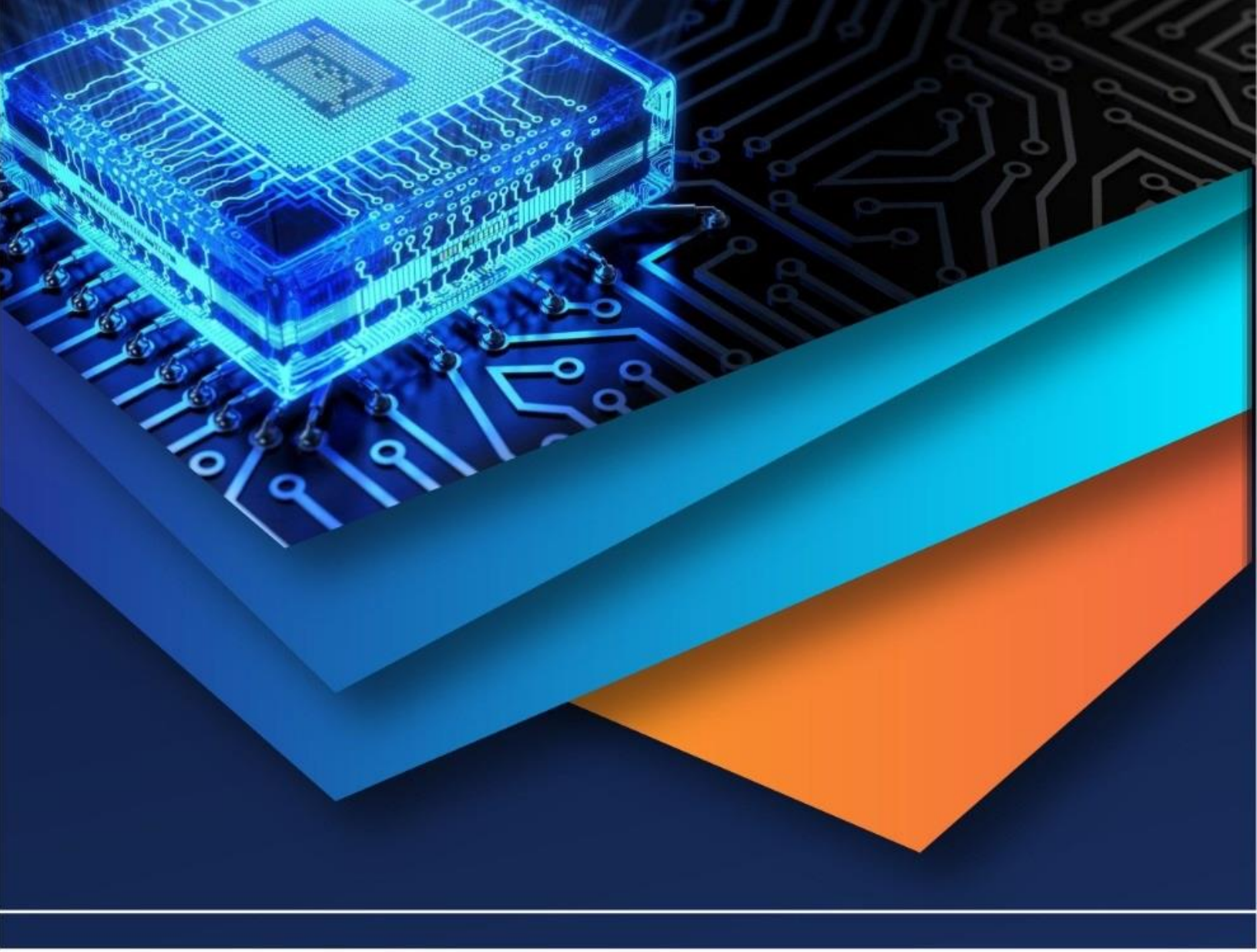
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