iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** VII **Month of publication:** July 2021

DOI: https://doi.org/10.22214/ijraset.2021.36473

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue VII July 2021- Available at www.ijraset.com

Implementation of Canteen Automation System with Payment Gateway using MERN Stack

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Abstract: ***At present in our education system, students tend to study in different cities or states according to their choices or situations. Thus a lot of students tend to have meals at college canteens due to one or the other reason. The breaks for such meals are very short and the students rush for the canteens of their colleges. Due to sudden increase of footfall in the canteen only a few of the students get their orders served in time while the rest are busy waiting throughout their break. Being unaware of the food (menu) orders, canteen staff are helpless at that time of footfall. To overcome this issue due to manual ways of handling orders, canteen automation system is the key solution. Payment gateway is one added feature to make the process cashless and easy.***

Keywords: MERN, Payment gateway, Cashless, Canteen, E-menu.

I. INTRODUCTION

The aim is to satisfy maximum footfall and to increase canteen service keeping the time constraints in mind. To achieve this, modern computer technology plays a major role in replacing the conventional ways. The canteen automation system allows the users to view the available e-menu and place the orders for a specific time. This makes way for the canteen staff to know the orders priorly so that they can be served in time. The web app is built using MongoDB, Express, ReactJS and NodeJS. The reason to build a web app is to make it easily accessible to anyone with the internet. Crud operations to manage, e-menu, users, upgrade user accounts from students to professor, categories of meals and orders is available for admin. The users who are professors can order the food to their cabins while the stundents have the options for take away only. The users can cancel the orders within the time limits and the refund will be processed and initiated by the admin. Initially the user has to signup with valid email and password to access further features. After successful authentication, users can add the prefered meals to cart with needed quantity and confirm the order. The admin gets the details of user confirmed orders and he can accept or decline based on his situations and user dashboard is updated with the status. If the confirmed, the user is allowed to pay for the same. After payment, they will get an email alert of payment status and order confirmation.

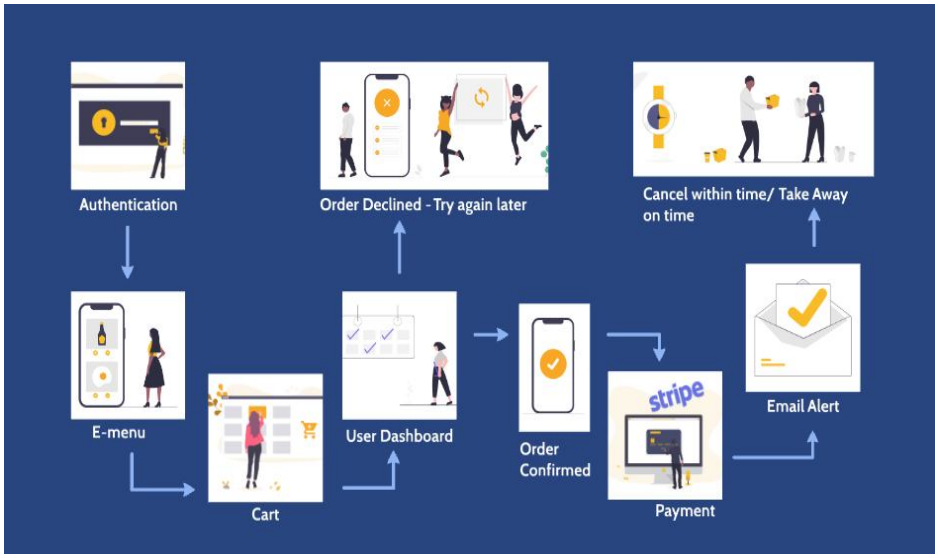


Fig. 1 The user flow process.

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II. BACKGROUND AND RESEARCH

A. Background

The conventional system involves -

1) Queues to order the food,
2) Handling bulk orders in short intervals/breaks,
3) Tracking of payment and order in manual,
4) Documentation of transactions is manual,
5) 75% of time being wasted in ordering and waiting.

Other systems - IOT based Automatic Identification, Data Capture and management, Android application and digital token based management, RFID with user account recharge-based management, Android application with xampp and sql technology, A high end security and portable management, Full-fledged and dynamic database management didn't solve some issues like service management for the cancellation of the order that might happen from the user, involves wallet and refilling the same whenever the user wants to order the food items, the creation of the user account involves pre-paid money, cancellation of order from the canteen admin.

The implemented canteen automation system -

a) Accelerates customer's order,
b) Time required is very less compared to the manual system,
c) User-friendly GUI,
d) Accessible & Effective,
e) Cost-effective,
f) Organized process and documentation of the transaction,
g) Easy maintenance,
h) Easy updating of menu,
i) Social distancing (need of the hour),
j) Cancellation of orders from both user and admin,
k) Handles payment and refund.

B. Research

The different tech stacks used by similar automation systems are LAMP stack, XAMPP, LEMP, WAMP, IOT, RFID, and Android with xampp. All the automation using LAMP, XAMPP, LEMP and WAMP involve HTML, CSS for frontend and their relative backend languages to handle the necessary features. The main disadvantage is that these technologies replace the whole DOM tree at the browser for every change in the state. This decreases the download speed of the data and features at the user and admin end.

The automation using IOT or RFID expects the users to carry along a Radio Frequency ID tags which has to be activated using prepaid money – this can be a burden at peak hours while keeping a check on the balance and recharge of the tags.

The automation is real-time and expects android apps coded by a professional and to be connected to real-time database. It sometimes involves complex codes which can drain the mobile batteries, compatibility issues may also arise with the change in models.

III. IMPLEMENTATION DETAILS

The implementation of the project has two main parts frontend and backend. Frontend is built using ReactJS and Bootstrap, backend is built using NodeJS and Express is used to connect both the ends while data is stored and managed in MongoDB.

A. The User Interface

The user interface has the following steps:

1) Login/SignUp by giving the valid credentials redirects the users to home page.
2) E-menu is avilable in the home page.
3) The users can add or remove the meals to or from the cart and choose to change the quantity in their cart.
4) Once they confirm the order – they are redirected to order status page in their dashboard.
5) The status is initially "Processing" and when the admin accepts the order the status changes to "Confirmed" and users will get a button to pay for their order.

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6) If the status is “Declined”, it means the order is declined by the admin.

7) The users can pay using the payment gateway for which they will get the confirmation mail about its status.

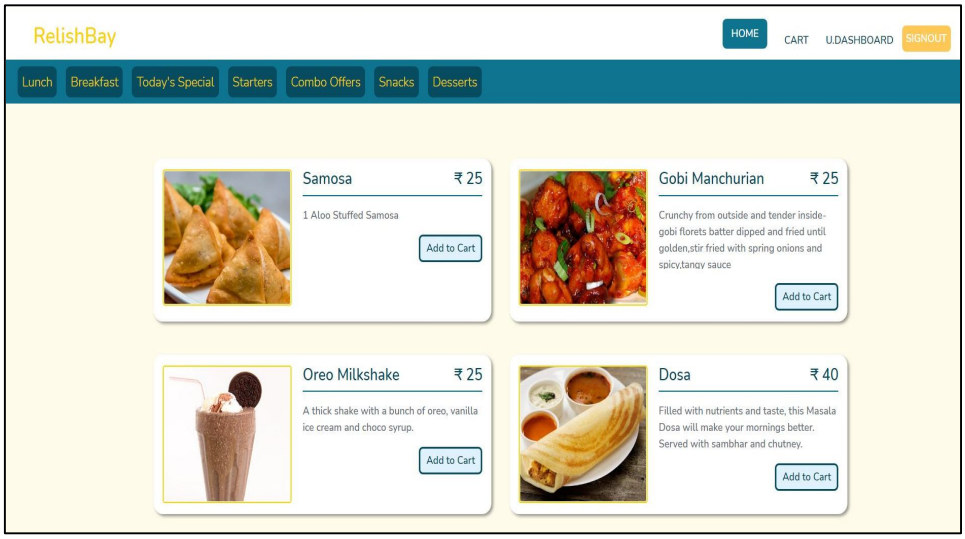


Fig. 2 Home Page – E - Menu

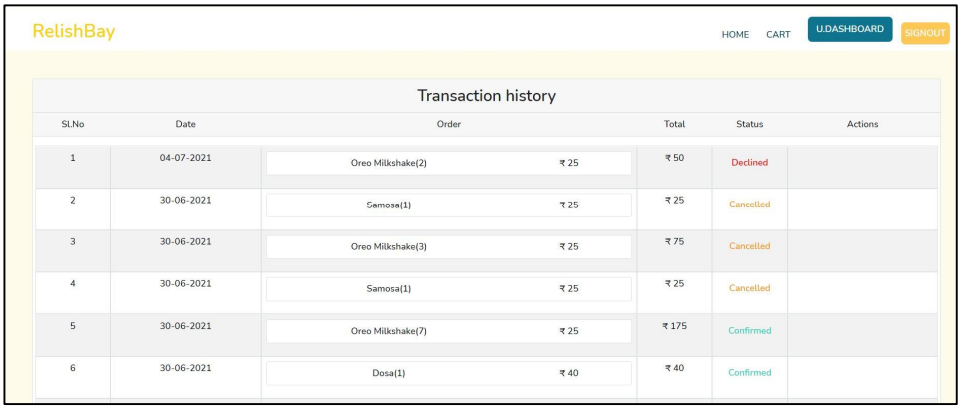


Fig. 3 User Dashboard

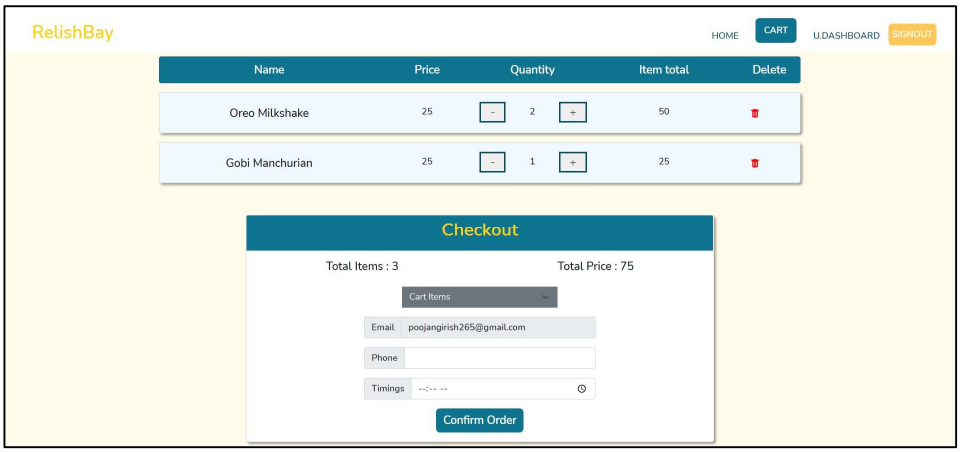


Fig. 4 Cart and Checkout

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B. The Admin Interface

The admin interface the following steps:

1) Login/SignUp by giving the valid credentials will redirect the admin to Admin Dashboard.

2) The Admin Dashboard gives options for admin to create new users, categories, dishes, manage existing users, categories, dishes, view and take actions on orders – accept or decline, initiate refunds when necessary.

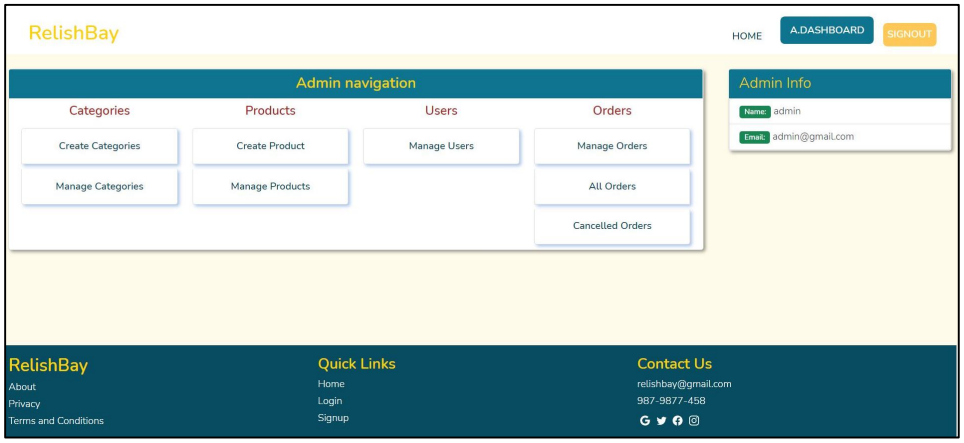


Fig. 5 Admin Dashboard

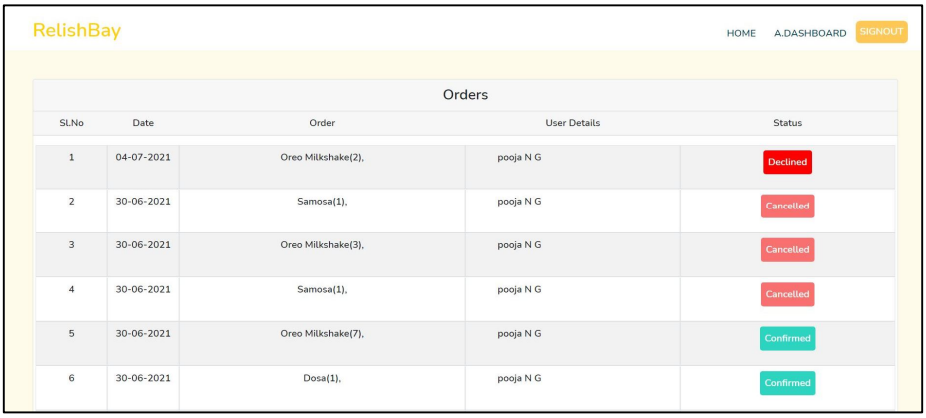


Fig. 6 All Orders

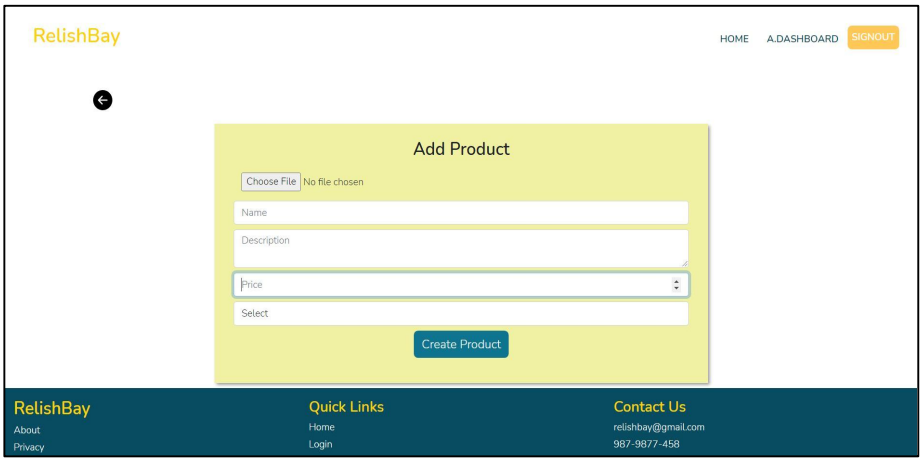


Fig. 7 Creating a new product

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C. The Professor's Interface

This is similar to user interface but with an added feature to order to the food to the desired address inside the campus.

D. Technologies Used

1) *Frontend:* ReactJS framework is used to build reuseable component based UI. It is an open source, declarative code which is predictable and easy to debug. The react hooks help in DOM manipulation. A react application can have multiple or nested components each responsible for rendering a samll reuseable piece of HTML. Bootstrap provides prebuilt open source, responsive css classes which can be used upon importing the css cdn link. CSS gives the complete control as in layout, fonts, colors so on, and other style factors of any webpage to the programmer to make it presentable. EmailJS is a npm package which is parameterized template based email service customizable via javascript. It provides inbuilt js methods which allow to integrate with different programming languages and email services.
2) *Backend:* NodeJS which is one among the advanced runtime environments is open source and executes javascript code on cross-platforms. It handles non-blocking events and all API services needed for the website. Express is framework for NodeJS and it handles JWT and validation when the users login. It gives options for the programmer to specify the request type and template to be loaded for the response. Mongoose provides functionalities for creating and working with schemas which are mapped to mongodb documents. It is also known as object document mapper. It also provides pre-built crud, validation and type casting methods for the interaction with documents. MongoDB is a NoSQL database where the data is stored in the form of key-value pairs which inturn increases performance and scalability. It handles huge data traffic by providing excellent processing of queries.
3) *Hosting and Payment:* Heroku which is a PaaS supports wide variety of programming languages. This service provides easy to use procedures that prevent the hastle of maintaining large severs and allows the programmers to focus on the core factors of website. Developers can easily bring their apps to the markets using their fully manageable dev toolkit. Netlify specializes in cutting edge web hosting platform which can be linked to the git repositories and thus relieves the burden of updating the already hosted website by using recent commits. It takes care of building an optimized file with just one command. Stripe is payment processor which allows the user to process transactions using cards. The the integration is easy because of their industry-leading developer tools. It also allows customizable and international transactions.

IV. CONCLUSIONS

The fully automated system eliminates queue and the hustle of maintaining manual records. This addresses the large-scale institution canteens which experience sudden time specific footfall and thus suggests a working solution to the same. The easy and understandable UI makes it easy for the users and doesn't require any mere training to use the web app. As it is responsive the user doesn't have the constraints for any screen size. Admin has the complete control of the contents that are shown on the web app. This app can also have an extended feature to help hostelites with the help of pre credited wallets.

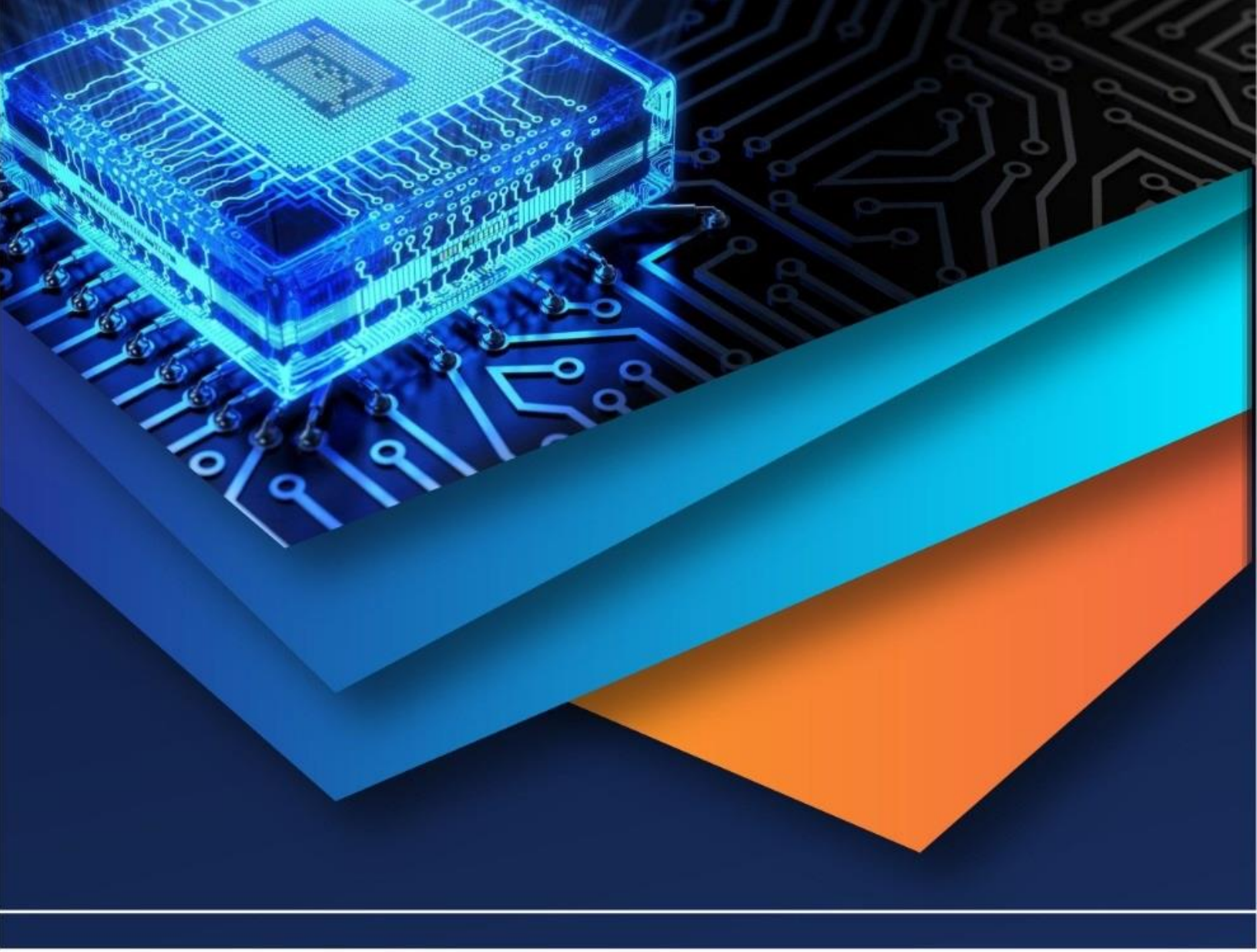
V. ACKNOWLEDGMENT

The authors express gratitude towards the assistance provided by our mentors and faculty members who guided us throughout the research and helped us in achieving desired results. We offer our sincere thanks as it would not have been possible without the guidance, assistance and suggestions of many individuals.

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