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Office Productivity Enhancement using an Online Appointment Manager App

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Abstract: ***Booking appointments and meetings online is quite common nowadays. However, it can be a time-consuming & tedious process, especially if the appointment system is poorly developed. The paper explains how we established a seamless experience for accepting appointments and scheduling meetings using our app. The Appointment Manager App is an android application built in Flutter to view, schedule, manage and track appointments. It uses Google Firebase for the authentication of users. Users can schedule appointments with the higher authorities of the organisation by selecting a suitable date and time, title and description of the meeting and the designation of the attendee. The appointment data is stored in the Firebase Firestore NoSQL database. These meetings can be effortlessly approved, rescheduled and tracked.***

Keywords: Appointment Manager, Appointment Scheduling, Appointment Booking, Android Application, Flutter, Google Firebase, Firebase Firestore

I. INTRODUCTION

Mobile applications are used for several purposes in today's world. Most of our daily activities now involve a few online interactions, from online shopping to online education. COVID-19 has opened our eyes to a world of new possibilities online, and an online appointment booking system is one of them. Appointment scheduling is usually done by hand, by physically entering meeting information and keeping track of attendees. It is a time-consuming and challenging process and can result in human blunders. Through our mobile application, "Appointment Manager", we present an online system for facilitating the task of scheduling meetings in the offices of educational institutions, mainly with the higher authorities of the institution. Such a mobile application can make the scheduling process more manageable. Furthermore, given the hectic lifestyles that many of us lead nowadays, an online appointment management system in educational institutions can be excessively beneficial, as it can free up significant time for instructors, university staff, and students. Meetings can be scheduled smoothly by entering details like date, time, the reason for the appointment, the number of attendees. As required, the appointment can be accepted, cancelled, or extended. The Admin can also take notes in the mobile app during the meeting, and easily share these meeting notes with the concerned people via email.

II. LITERATURE REVIEW

Since online appointment management systems exist in multiple ways, we discovered some relevant works and articles aimed at making appointment scheduling easier. We mostly used Google Scholar, ResearchGate, and ScienceDirect to find scholarly publications for these connected works. We looked at these publications and highlighted their flaws so that we might make appropriate changes to our project.

1) In "A Proposed Algorithm and Architecture for Automated Meeting Scheduling and Document Management" [1], the authors aim to eliminate the conflict of time arising among the attendees of the meeting, by making an online Automated Meeting Scheduling and Document Management system. The document data is to be stored safely using encoding and decoding mechanisms using Base64. Here, meeting durations are fixed at one-hour slots, and cannot be changed or rescheduled.

2) Alaa Qaffas and Trevor Barker in "Online Appointment Management System" [2], develop and evaluate an online lecturer appointment system for students' projects, where all processes of appointments are verified. Appointment management, such as reservations, confirmations and cancellations, are controlled automatically and it facilitates the task of booking an appointment with lecturers. However, the facility to reschedule appointments is not available within the online system.

3) In "Appointment Scheduling System" [3], an online appointment scheduling web application is built for every student to schedule an appointment by themselves whenever and wherever they are. This system helps to lessen the burden of waiting at the advisor's assistant's desk or to conserve time and use it efficiently to bring the appointment scheduling process online. This system is specific to the particular organisation (GSU) and requires access to the internal databases.

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4) In “Online Lecturer Appointment System for Project Students” [4], M. Alqahtani aims to develop an online lecturer appointment system for students in terms of usability, efficiency and reducing the time spent to schedule the appointments. OpenID is used as an authentication technique. The programme leader has to schedule appointments for each student with specific examiners, taking into consideration time, date and location. There are 2 modules: lecturer as administrator and student. The authorization process, notifications, e-mail system can be improved in this system.
5) In "Smart Appointment Reservation System" [5], patients can schedule appointments with their doctors using a web-based platform. The Doctor or Admin can reschedule or cancel these appointments and can notify patients with an SMS and Email. The appointments, however, cannot be extended, causing a delay in all future schedules.
6) "Appointment Scheduling System" [6] is designed for universities so that students can schedule appointments with their university’s faculty and staff regarding academic, employment, immigration, or personal issues. Here, the appointment durations are fixed and cannot be changed. This will result in a wastage of time for the faculty or staff.
7) "Design and Implementation of a Patient Appointment and Scheduling System" [7] focuses on developing a system to improve upon the efficiency and quality of delivering a web-based appointment system to reduce waiting time. In this paper, a patient appointment and scheduling system is designed using AngularJS for the frontend, Ajax framework for handling a client-server request and Sqlite3 and MYSQL for the backend. This paper does not show about rescheduling an appointment. Due to this, either the appointment has to be cancelled or attended by disrupting the personal schedule.
8) In "Online Academic Appointment Scheduling System" [8], a web-based centralized system for appointment booking is developed for scheduling appointments for students and staff. It has two modules: the appointment requester and the confirmer, and it aims to help in scheduling and maintaining the priority of requests using Google Calendar API. However, this system does not have a robust method of sending automatic notifications. Also, appointment slot durations cannot be extended.
9) "Bookazor" [9] is an appointment booking and scheduling web-based application which is used for booking appointments in the streams of parlours, hospitals and architects within a defined geographic area. The user selects the time and duration of the appointment in this app. Whereas the Admin should have the right to allot the time, based on the service requested. This will ensure that the service is given in stipulated time and no time can be wasted. Also, this app lacks the feature to extend or reschedule the appointment.
10) "E-Appointment Scheduling (EAS)" [10] has been developed to schedule appointments with lecturers and doctors at the student medical centre. The scheduled appointments will be sent to the respective authority for approval where they can accept or change the time as per the requirement. The UI of the system is not appealing. The Appointments are scheduled over a PHP, which makes it difficult for the Admin to get appointment details instantaneously as it is not handy.

III. TECHNOLOGIES USED

A. *Front-End*

1) *Dart:* Dart is a programming language designed for client development, such as for the web and mobile apps. It is developed by Google and can also be used to build server and desktop applications. [11]
2) *Flutter:* Flutter is an open-source UI software development kit created by Google. It is used to develop cross-platform applications for Android, iOS, Linux, Mac, Windows, Google Fuchsia, Web platform, and the web from a single codebase.[12]

B. *Back-End*

1) *Firebase Authentication:* Firebase Authentication provides backend services, easy-to-use SDKs, and ready-made UI libraries to authenticate users to your app. It supports authentication using passwords, phone numbers, popular federated identity providers like Google, Facebook and Twitter, and more. [13]
2) *Firebase Firestore:* Cloud Firestore is a flexible, scalable database for mobile, web, and server development from Firebase and Google Cloud. Like Firebase Realtime Database, it keeps your data in sync across client apps through real time listeners and offers offline support for mobile and web so you can build responsive apps that work regardless of network latency or Internet connectivity. [14]
3) *OneSignal Mobile Push:* OneSignal is the fastest and most reliable service to send push notifications, in-app messages, SMS, and emails. [15]
4) *EmailJS:* EmailJS helps to send emails using client-side technologies only. No server is required – just connect EmailJS to one of the supported email services, create an email template, and use our Javascript library to trigger an email. [16]

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IV. SYSTEM FLOW

This system has two main modules: The User and the Admin sides.

A user can use the User side to create a new appointment. A user must pick an available day, time, meeting title, and agenda for booking an appointment. The admin can then use the Admin Side of the application to approve or reject this appointment request. The admin can also start and end meetings, cancel, reschedule or extend appointments using the Admin side.

1) Staff members, students, parents and other people can apply for appointments with various higher authorities in the institution such as the principals and deans of institutes.

2) To make an appointment, users must sign in to the app using their phone number. Then they can navigate to the 'Schedule Appointment' section and check the availability of time slots.

3) Users must select the date, time, designation (staff, government organizations, student, parent, others), subject of meeting (meeting regarding fees, academics, miscellaneous etc.) and the number of attendees.

4) After selecting a suitable slot, a notification will be sent to the respective authority's assistant or admin. Appointments will be sorted according to the priority assigned based on the designation. Appointments with the highest priority will be displayed first. This appointment will be reviewed and approved, disapproved or rescheduled by the PA.

5) Upon approval or rescheduling, a mobile notification informing regarding the meeting will be sent to the user who applied for the appointment.

6) The PA and authority can view all the upcoming appointments through the Admin section of the app. These appointments can be easily rescheduled as required.

7) In case an appointment has to be rescheduled or delayed, the PA can make required changes to the appointment timings in the app. The timings of further appointments on that day will be updated automatically. A notification regarding the updated timings will be sent to the respective people.

8) The user can view the list of upcoming appointments scheduled by him in the My Appointments section of the app. Users can also edit or update their app account details in the Profile section.

9) The respective authority or their assistant can be assigned as the admin or administrator of the app. The admin can access the Admin section of the app. In this section, he or she can view the list of that day's appointments, all appointments and pending approvals.

10) The admin can extend the meeting duration before approval, or extend the meeting duration while the meeting is in process, as needed. In case of extension of a meeting, the timings of further scheduled meetings will be updated and notifications informing of the same will be sent to the concerned personnel.

11) Meetings can also be rescheduled to a different time slot by the admin.

12) Both the users and admins can easily cancel any meetings if required, and the notification for cancellation will be sent.

13) The admin can take notes in the notes section of the respective meeting in the app. These meeting notes along with meeting details can be shared with the concerned people via email so that they can take further action as discussed in the particular meeting.

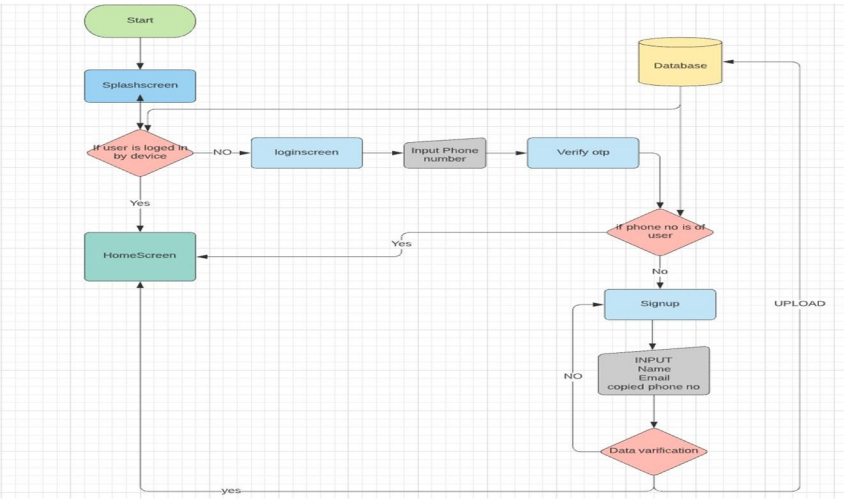


Fig. 1 Flow Diagram of Login System

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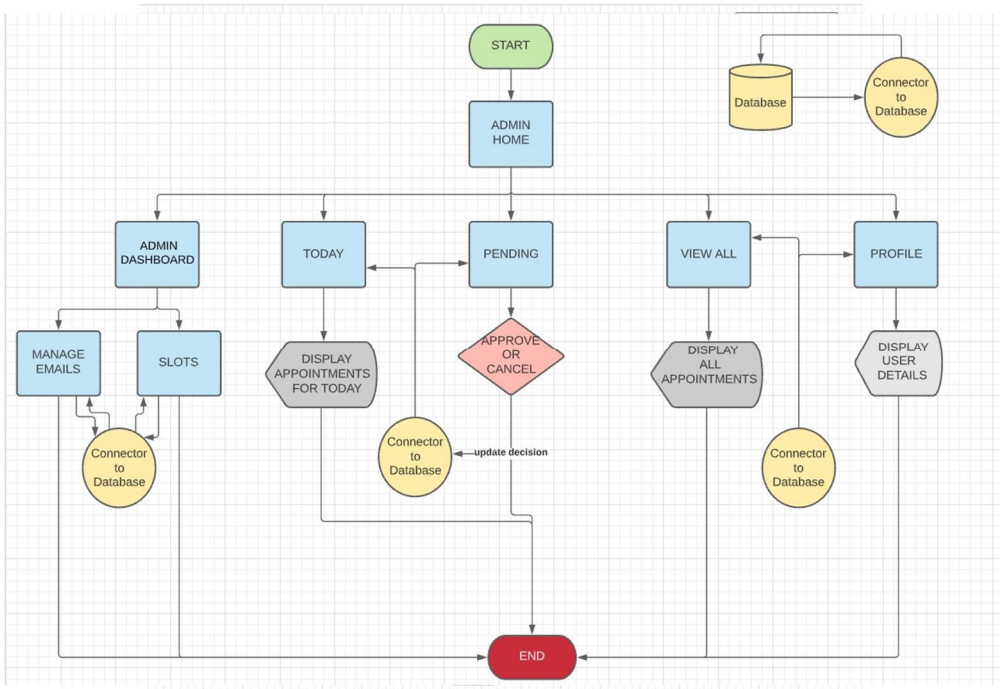


Fig. 2 Flow Diagram of Admin Side

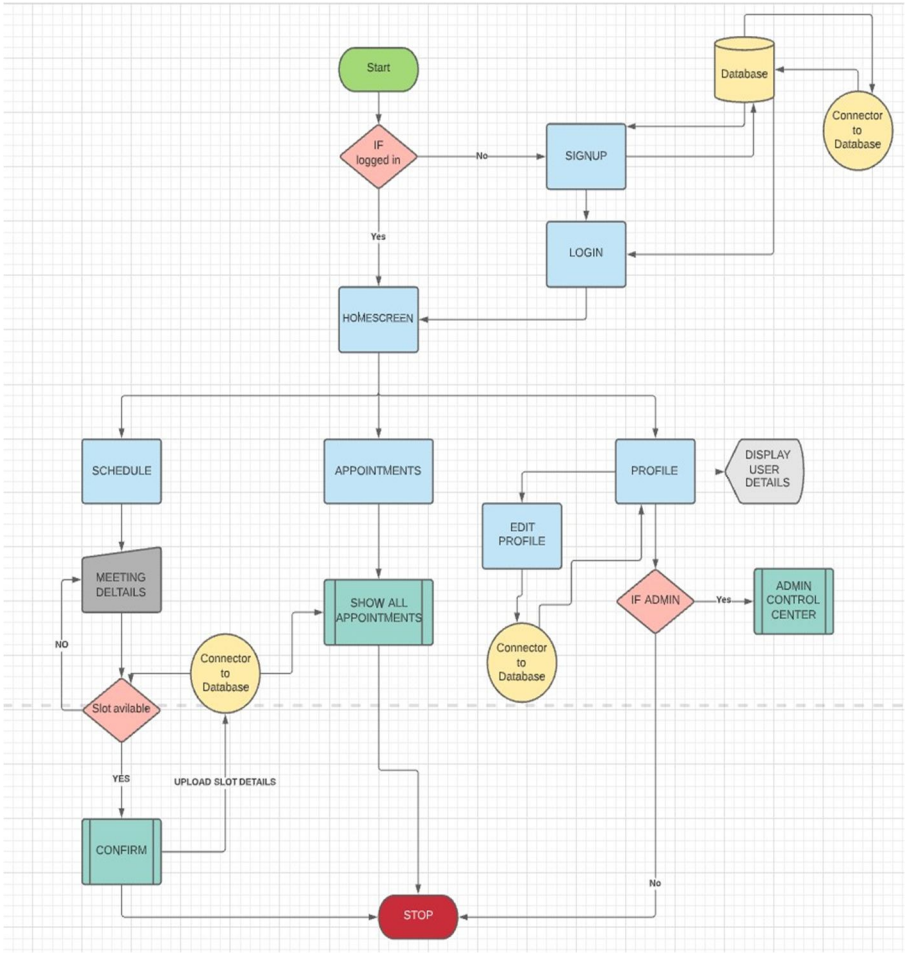


Fig. 3 Flow Diagram of User Side

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V. IMPLEMENTED SYSTEM

Appointments with higher authorities and officials of various organisations can be scheduled using the Appointment Manager App. The user has to sign in to the app to schedule an appointment. By selecting the authority, the user can choose a date and time from a list of available slots.

Once selected, the user has to provide the title of the meeting, the agenda/description of the meeting and the number of attendees. After submitting the data, a function with Firebase transaction will fetch the number of minutes available in the booked slot. If the available time is greater than or equal to 15 minutes (Default 10 minutes meeting + 5 minutes buffer time), then 15 minutes will be added to the slot timings and an appointment will be scheduled with the details from the user. Else, an error page will be displayed and the user will have to search for another slot. The default state of the appointment will be 'Pending' since it requires approval from the Admin.

All the system functions are executed online, making it completely flexible, easy to use and data remains safe & backed up. The information about meeting confirmation, cancellation and rescheduling will be conveyed to the respective people via mobile notifications in real time using OneSignal Mobile Push.

A. Signing in to the App

The app uses Google Firebase Phone Authentication to sign in to the app. An OTP is sent to the phone number provided by the user. After signing in to the app, if the user's display name & email address exist in Firebase Authentication, he will be redirected to the home screen of the app. Else, the user will be redirected to the Edit Profile page. On the Edit Profile Page, it will ask for the user's name and display name and will store it in Firebase Authentication as well as in the database created in Google Firestore.

B. Booking Appointments

The user has to select the authority of whom the appointment has to be scheduled. The app will check for the current time after selecting the date. If the current time is equal to or greater than any of the slot timings, that slot will be disabled automatically. Else, the app will check for the slot date and timing in the Google Firestore Database. If the slot is present in the database, it will check for the booked/occupied time. If the time is less than 45 minutes, it will show the slot as 'Available' else it will be 'Disabled'. On selecting the available slot, the user will enter the meeting details such as the Title, Description/Agenda, Designation and Number of Attendees. Priority will be assigned based on the designation. For example, the Dean or Principal of the institute will have the highest priority. On clicking the 'Schedule Appointment', a Firebase Firestore Transaction will read the booked time and, if it is less than 45 minutes, it will add 15 minutes (10 minutes meeting time + 5 minutes buffer time) to it and upload the data. The appointment will be in a 'Pending' state initially, waiting for the Admin to take action on it.

C. Managing the Appointment by Admin

The Admin can see the scheduled appointments from the users on the 'Pending Appointments' Page. These appointments will be sorted according to the date and priority using the designation of the user and orderBy() clause of Firebase Firestore. The Admin can view the details of the appointment and based on that, can 'Approve', 'Cancel' or 'Reschedule' the appointment. Rescheduling the meeting is similar to scheduling an appointment, as it searches for open slots and adjusts the meeting time. These actions will trigger a Push Notification using OneSignal Mobile Push Notifications to the respective users.

D. Extending the meeting by Admin

The appointment can be extended if it is still in progress. The appointment can be extended for up to one hour by the administrator. To extend, the Admin must specify the amount of time to be added to the meeting. Following the meeting's extension, all subsequent appointments will be rescheduled and extended by the specified time to accommodate the extended time. A push notification will be sent to all users whose meeting has been rescheduled.

E. Meeting Notes and Updates

The Admin can take notes during or after the meeting. These notes will automatically be saved in the Firestore Database. After completion of the meeting, the Admin can share these meeting notes along with meeting details with the concerned people via email so that they can take further action as discussed in the particular meeting. The emails are sent using the Email-ID linked with the EmailJS Account to make API calls from the app easily. After completion of the appointment, the Admin can add the status of the appointment so that the user can track the progress.

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VI. RESULT ANALYSIS

"Appointment Manager" has been created taking into consideration the issues faced due to manual scheduling of meetings. As of now, most organizations that make use of appointment management systems continue to use a manual method of scheduling meetings and entering details, which can be laborious and error-prone. It can be seen that our app makes this process significantly easier. The process of scheduling, rescheduling and cancelling meetings is much faster and error-free as it is done automatically by the system, and the user has to simply enter the appropriate details in the mobile app. The provision of meeting notes also makes it efficient to send meeting details to the designated persons, and follow-up work can be tracked. Hence, using this system results in an efficient and well-organized method of scheduling meetings and appointments.

VII. FUTURE ENHANCEMENTS

A few more features that we can implement in the future include the integration of IoT (Internet of Things) in the system. A QR code scanner can be placed at the entrance of the office. It will scan the QR code that is generated on the user's appointment page to indicate the start and end of the meeting. After deployment of the app, the pattern of acceptance of the appointments can be monitored and an AI-based model can be implemented. This model will suggest the meetings to accept according to priority so that the meetings with higher priority can be scheduled first. An option could also be given to the users to automatically book the slot so that it will have a high probability of getting accepted.

VIII. CONCLUSION

Our project strives to provide a seamless experience for applying and approval of appointments. As online appointment booking is a frequently used tool, a well-designed and user-friendly app like Appointment Manager will help aid the college authorities. We intend to make this process as less time-consuming and easy to use as possible by providing appropriate categories and sections in the app. Our app aims to facilitate the task of scheduling meetings, mainly with the higher authorities of the university, and providing updates post-meeting, making it truly helpful for them to streamline their appointment scheduling process.

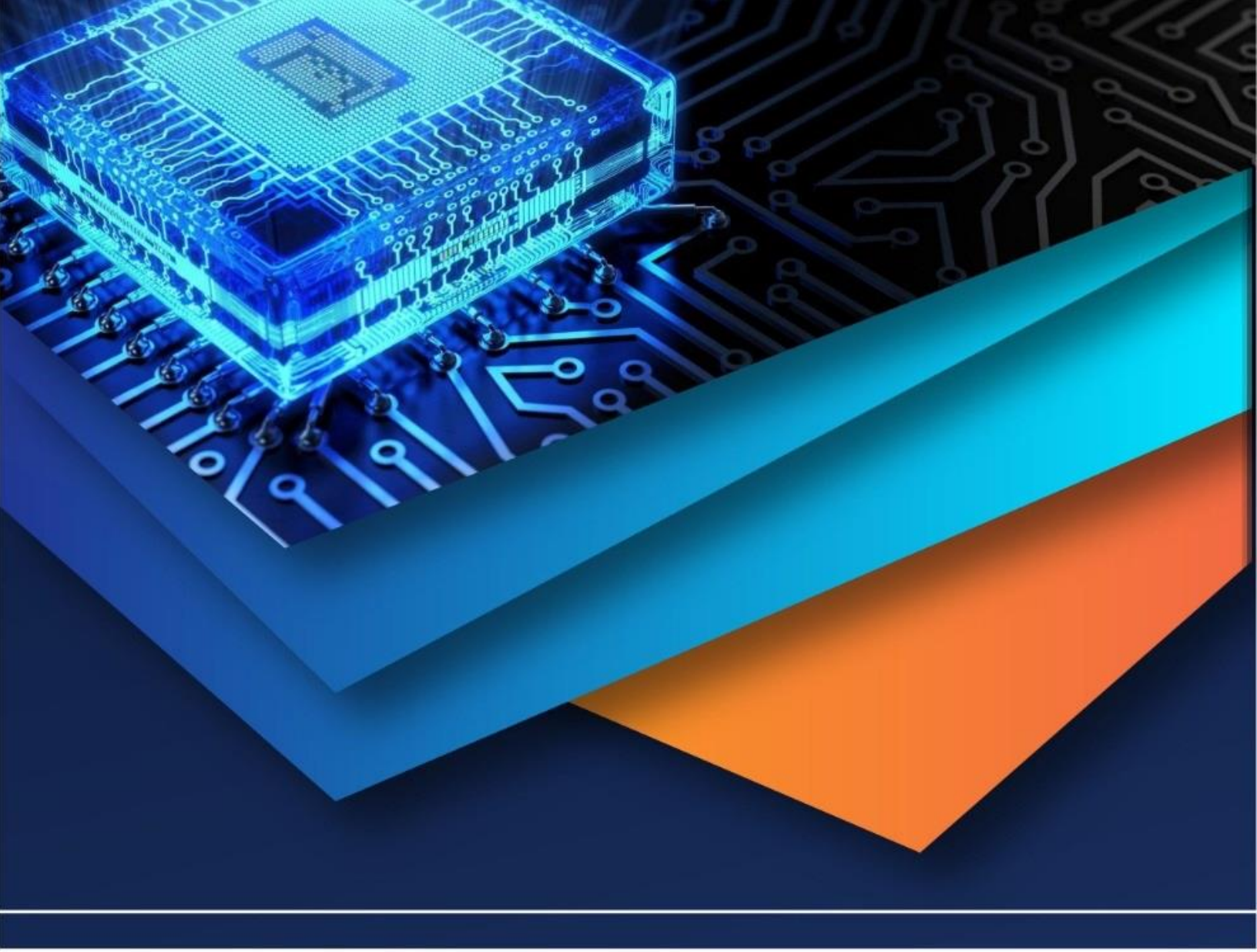
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