iJRASET
International Journal For Research in Applied Science and Engineering Technology

# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

**Volume:** 9 **Issue:** XI **Month of publication:** November 2021

**DOI:** https://doi.org/10.22214/ijraset.2021.38829

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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 XI Nov 2021- Available at www.ijraset.com*

# API Development Teaching- Learning Platform

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***Abstract*: *API (Application Programming Interface) is a sequence of commands, rules, or regulations that enables a software or app to leverage attributes from another application, system, or gadget to improve its own services. In a nutshell, it's a feature that allows apps to connect with one another. The IT industry has a high demand for REST API Development, hence this article provides an interactive teaching and learning platform for REST API Development. Using the LBD (Learning By Doing) concept, the suggested platform seeks to assist users in learning REST API Development. This tool would assist users in learning to design their own APIs by requiring them to practise (either through coding or MCQs). The platform would be based on self-evaluation and reflection models of self-regulated learning, allowing users to learn more effectively. The platform would also try to provide some scaffolding for users that fail test cases, such as assistance in debugging and why they might be failing the test cases.***

***Keywords: REST-API, Teaching Learning Platform, Self-Regulated Learning(SRL), Human Computer Interaction(HCI), Dashboard, Learning by doing(LBD)***

## I. INTRODUCTION

The early 2000s brought about a lot of advancements and paradigm shifts in the technological domain. The development of architectures based on Representational State Transfer (REST) and Service- oriented Architecture (SOA) led to the interconnection of various services and this set the path towards microservices. The architectural style and methodology of Representational State Transfer (REST) is widely utilised in the development of web- based applications and services.REST APIs offer a lot of flexibility and better modular architecture, not to mention the ease with which they may be integrated with a diverse set of third-party apps and services. Furthermore, REST APIs are stateless, allowing clients to make calls to different resources independently. Each call contains all of the necessary information for its execution. REST APIs are increasingly being used by businesses to swiftly acquire desired functionality through custom integrations. API development services is a quick and efficient way to enhance the functionality of a web/mobile app with minimal code changes. Besides, it accelerates the software development lifecycle while giving user access to required features by outsourcing third-party applications or services. REST API's provide perfect synchronization between different app elements (including third-party integrations) to deliver seamless user experiences across devices. There are a plethora of REST API Tutorials accessible today for studying REST API Development, but the majority of these courses focus on teaching students through videos or blogs. However, there is no platform for teaching REST API Development that focuses on LBD (Learning By Doing), Increased Human Computer Interaction, and Aspects of Self-Regulated Learning. Most language-learning platforms include some scaffolding to assist the user in identifying his or her error; however, no such assistance is visible for platforms teaching complicated topics like frameworks or REST API Development. The solution suggested in this research seeks to provide debugging assistance to the user in order to help him/her quickly locate his issue. The platform proposed in this paper also aims to follow the principles of self-regulated learning, so debugging assistance won't completely locate the error for the user.

## II. RELATED WORK

In this paper, we have reviewed a plethora of various teaching learning platforms and systems which will be illustrated below.We have also stated the key points and features included in each paper in an easy and compact manner.

In the research paper “An Intelligent Interface for Learning Content: Combining an Open Learner Model and Social Comparison to Support SRL [1]” they have created a platform which uses mastery grid system to provide better user experience via easy navigation through grid, so that students focus more on self regulated learning instead of navigating between pages. Their platform follows a combination of Open Learner Model(OLM) with Social Comparison ,also called Open Social Student Modeling. On their platform they have tried to enhance the engagement power of Open Learner Model(OLM) by using ideas of social comparison allowing students to view each other’s models, thus triggering social comparison effects. Their system aimed at enhancing self regulated learning via an Intelligent Interface, and they provided learning materials as well as practice content on their system.

In the research paper "Dashboards for Computer- Supported Collaborative Learning [2]" they have explained about different dashboards and ways to combine various indications into one or more visuals. This not only helps the instructors to view and estimate the student's progress properly, but it also helps the students to view their own progress rate and work on their strong or weak points.

In the research paper "Meta-Tutor [3]" learning activities were implemented in the system which had a high level of interactivity. Questionnaires based on cognitive task analyses of the course structure were done, to identify knowledge types and cognitive skills required to fulfil the objectives. Goal Setting and assessment system was implemented to keep the user's experience interactive and gradually increase user's progress the closer he gets to his goal.

The "LCM: A Model for Planning, Designing and Conducting Learner-Centric MOOCs[4]" paper describes about the four major structural components.

Out of the four, majorly we have incorporated Learning by Doing(LbD) approach. The platform mainly focuses on how to make the learner practice in order that he/she develops relevant skills by solving questions. The level of practice questions increases in ascending order and the subsequent level gets unlocked. More over, the debugging section also follows the LbD approach which helps the learner debug error by looking at the feedback given by the chatbot.

The paper "LADA: A learning analytics dashboard for academic advising [5]" focuses on data-driven decision making. Here, visual analytics and data-driven diagrams helps the learner to decide on to the selection of concepts and practice questions. This will help the learner to choose an appropriate level of practice question which will in turn reduce the time of learning a particular concept/skill.

In the research paper "Adoption and impact of a learning analytics dashboard supporting the advisor [6]", major focus is given on the visual aspect of data. The presentation of data is as equally important as the analysis. A vast scale case study is given in the paper which shows the adoption of Learning. Analytics Dashboards (LADs) for academics. LISSA, LADA, OAU, ESPOL are different type of dashboards on which the case study was performed. The dashboards target to make help student make a study plan and advise upcoming study strategy.

The paper "Self-Regulated Learning and Online Learning: A Systematic Review"[7] gives us the definition of SRL as a method of academically effective learning in which students must set goals and make plans before beginning to learn. Learners must monitor and regulate their cognition, motivation, and behaviour, as well as reflect on their learning process, as a continuous process. As a cyclic process, these processes will be repeated. The learning settings have altered as a result of developing technologies. Learners are taught via technology via the internet. Information regarding education and learners do not share the same physical space in online learning. Learners should be able to master necessary tasks through online learning. SRL methods can be used by online students.

The paper "An intelligent SQL tutor on the web" [8] presents SQLT-Web which is a SQL database language intelligent tutoring system with a Web interface. Students' actions are monitored by the system, which adapts to their knowledge and learning skills. The server handles all tutoring functions, and it also illustrates how SQLT-Web handles many students.Thus we can see that the Web has ushered in a new era of sophisticated education tools that are broadly accessible.Hence,the capacity to employ sophisticated tools for knowledge-intensive components of systems and design interfaces in platform-independent ways is a key feature of Web- based tutors.

The paper "Development of the Learning Analytics Dashboard to Support Students'[9] Learning Performance" explains that in a virtual learning environment, the Learning Analytics Dashboard (LAD) is a tool that displays students' online behaviour trends. This helpful application tracks students' log files, mines enormous volumes of data for significance, and visualises the results so they can be understood quickly. As a result, we can conclude that imagery enhances human cognition and changes the abstract and complex into the concrete and simple.

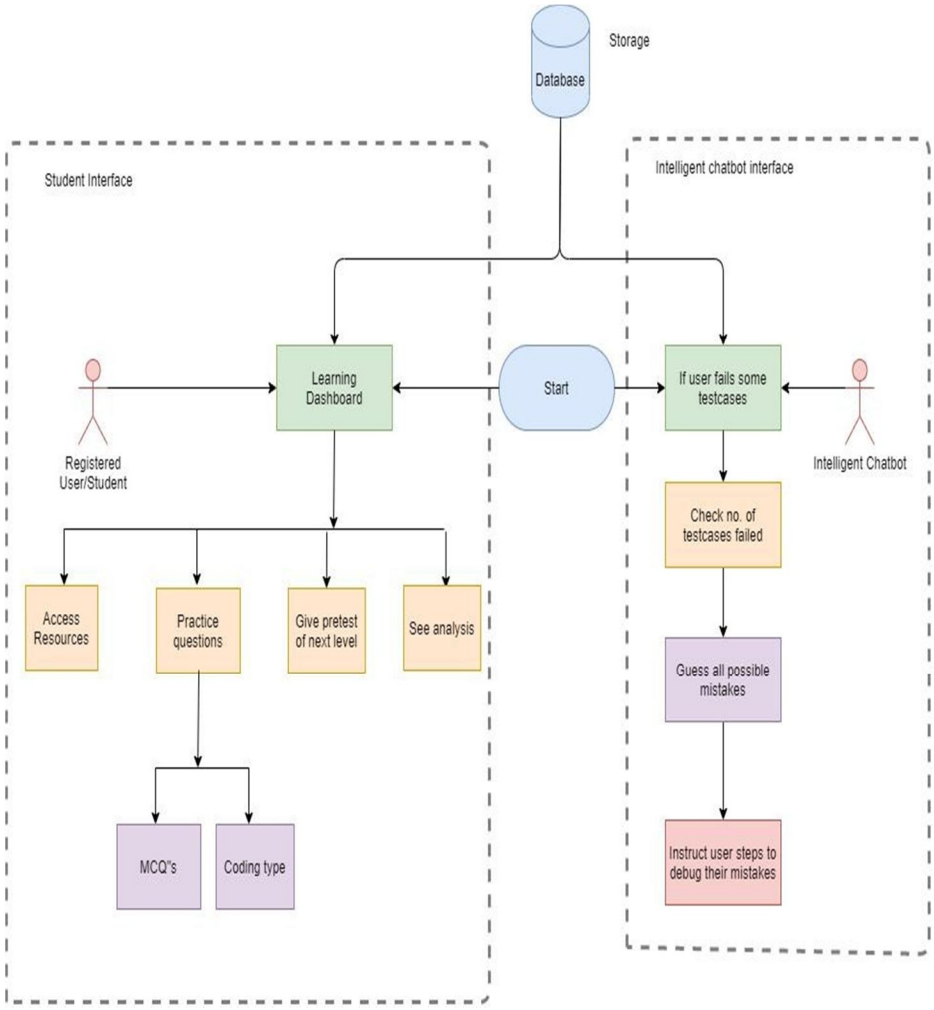
## III. PROPOSED METHODOLOGY/SYSTEM

When the learner visits the system for the first time, the learner has to give a pretest to determine the current level of expertise in the subject. The pretest will consist of MCQ's and coding questions. On the consensus of the scores in the pretest, one of the beginners, intermediate or advanced categories is allotted to the user.

In the situation of the beginner-level learners, the resources and problems in the beginner section will get unlocked one by one. The learner will start from basic concepts and then Have look at simple solved examples(may or may not be present) and execute a set of simple tasks. The steps will be repeated as per the learner's requirement. In the due course, the learner will learn by executing the task.

In the situation of the intermediate-level learners, the learner will have access to beginner-level problems and resources also whereas the resources and problems in the intermediate section will get unlocked one by one. The learner will learn advanced concepts and then have to look at solved examples(may or may not be present) and execute a set of simple tasks. The steps will be repeated as per the learner's requirement. In the due course, the learner will learn and upskill by executing the task.

In the situation of advanced-level learners, the learner will have access to beginner and intermediate level problems and resources also whereas the problems in the advanced section will get unlocked one by one. The learner will execute the given tasks and in the due course upskill in the topics.



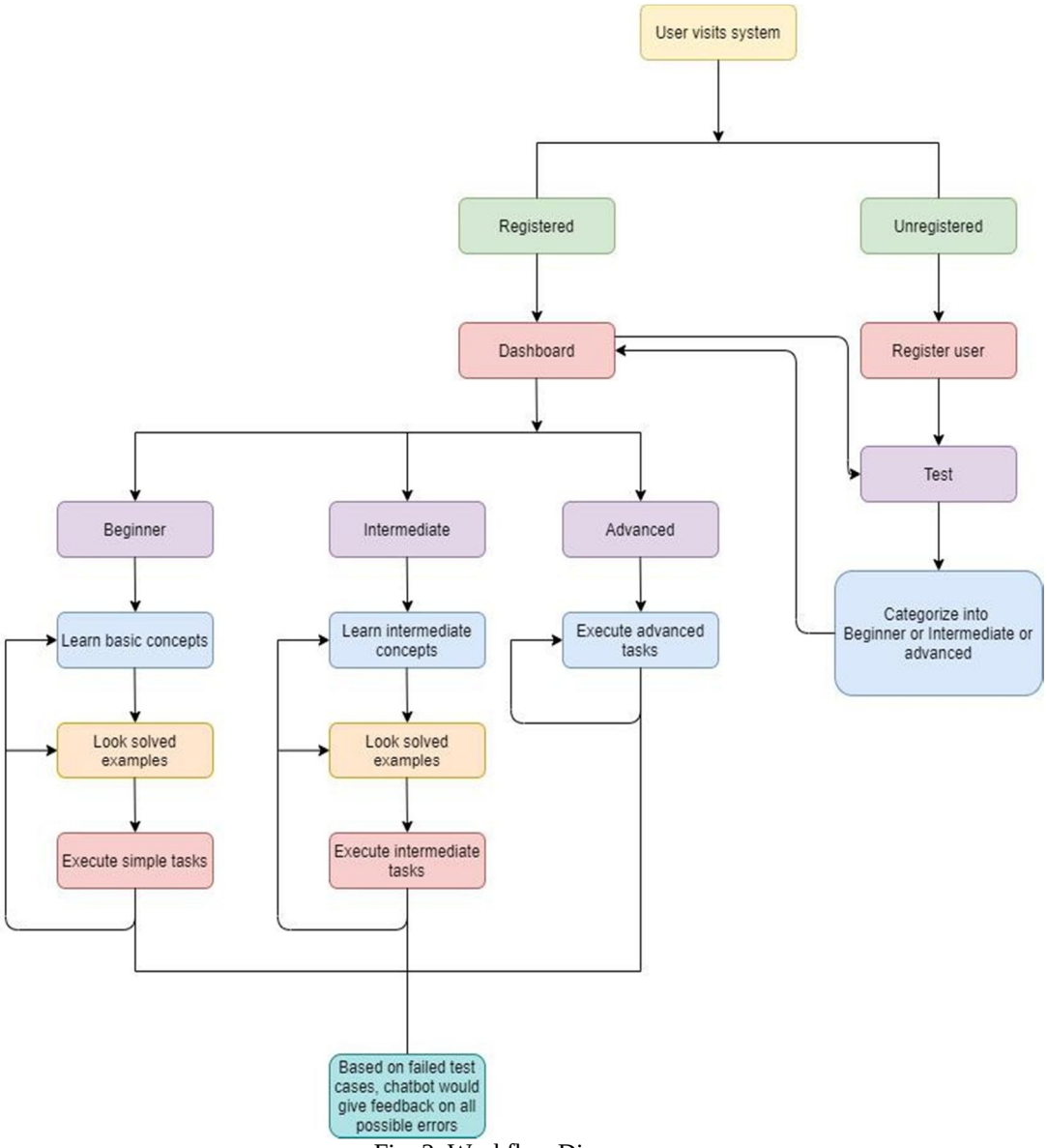

Fig, 1. System Architecture

When the learner logs out and re-visits the system, the learner will resume from the last solved problem/concept/resource and unlock the subsequent problems or resources. If a learner completes the beginner or intermediate section, he needs to give another test to unlock the subsequent section. If a user does not complete the beginner or intermediate section but is confident that he is prepared for the next section, then he can give the test to unlock that section.

The tasks that the user must do will test their knowledge and assist them in learning through practise. These tasks would either be Multiple Choice Questions or Coding Questions. On our platform, a test case will be a request to the server with a specific task, and the server will have to respond to this request appropriately in accordance with the question; if the response is correct, the user will pass the test case; if the response is incorrect, the user will fail the test case. In coding questions, the user is given a comprehensive problem statement, and he or she must write the code on an online IDE or on a local computer, and then run it.

They'll then pass the url of their output and hit run to run all of the test cases. To pass the code questions, the user would have to pass all of the test cases.

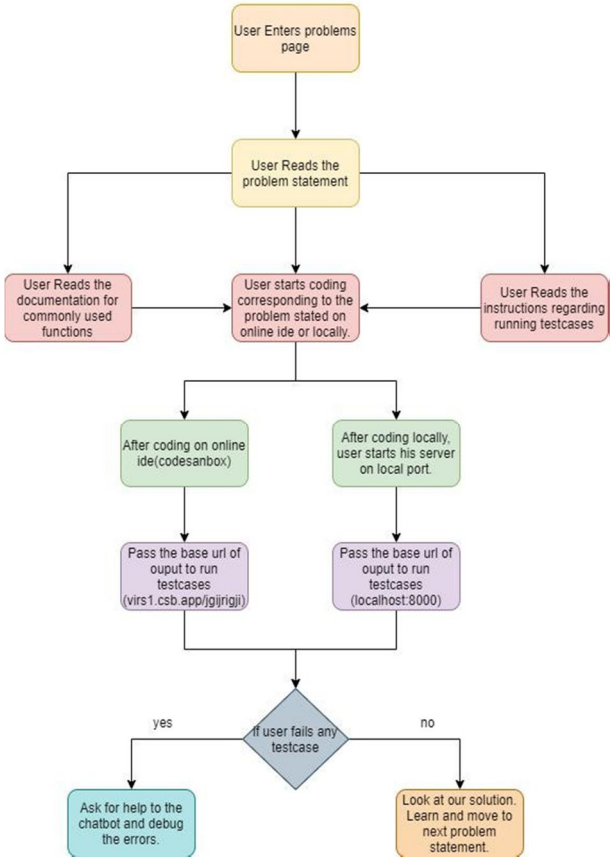
Scaffolding is a phrase used in education to represent a variety of teaching practises that help students get a better understanding.




Fig, 2. Workflow Diagram

Teachers provide various levels of temporary support that help pupils reach greater levels of comprehension and skill acquisition that they would not be able to achieve without aid, as the phrase suggests.

When the supportive strategies are no longer required, the teacher progressively withdraws them, and the student assumes more responsibility for the learning process. If a user fails a test case, it indicates that he or she has made an error. By using an intelligent chatbot, our platform seeks to provide support, i.e. scaffolding, to the user in such a circumstance. This chatbot will not notify the user the exact mistake that he or she made, but rather will analyse all of the conceivable errors that the user may make and then instruct the user to check each part of the code one by one in order to debug/locate the error. This will not only assist the user in learning how to troubleshoot REST API Development errors/mistakes, but it will also boost the user's general confidence in learning REST API Development because he or she will eventually learn everything on their own using the LBD (Learning By Doing) approach.



Fig, 3.User Interaction on Problems page

This gain in confidence would eventually lead to the user's desire to solve more tasks on their own, resulting in more and better learning.

By this method, the suggested platform attempts to facilitate self-regulated learning inside the user.

In terms of self-regulated learning, the user would be able to see his performance on a particular task, such as the accuracy with which he solved the problem (as determined by the number of attempts and the number of test cases passed in each attempt) and whether or not he used the chatbot for that task. There are a few more scaffolding supports on the problems page, where the user would execute coding questions. On that page, there would be a link to a discussion forum where people may communicate and discuss information about the task with other users.

There will also be a link to a documentation page where the user could find documentation of the frameworks' specific functions that would be required to complete the task. This will save users time searching for syntaxes and ways to use certain functionalities of the framework they'll be using (node js, expressjs).

## IV. CONCLUSION

In this paper, we looked at a variety of learning platforms and drew inspiration from them and have proposed a REST-API teaching learning platform. We went through a plethora of papers but none had developed a REST-API web-app which was as efficient as proposed by us and one which could effectively turn a layman into a REST- API expert. Thus, taking this into account we decided to propose a platform which could be used effectively by any person who has the willingness to learn the topic and become an expert in the topic. As a result, a web application will be developed to encourage students to acquire and enhance their REST- API skills by motivating them and providing them with effective study schedules and tactics. To inspire students, this system would employ various game- based learning tactics. Additionally, students will be able to visualise their test scores, and the system will recommend appropriate study schedules and tactics as a result. As a result, the system will be able to enhance the overall experience and assist students in becoming more motivated and focused on their studies.

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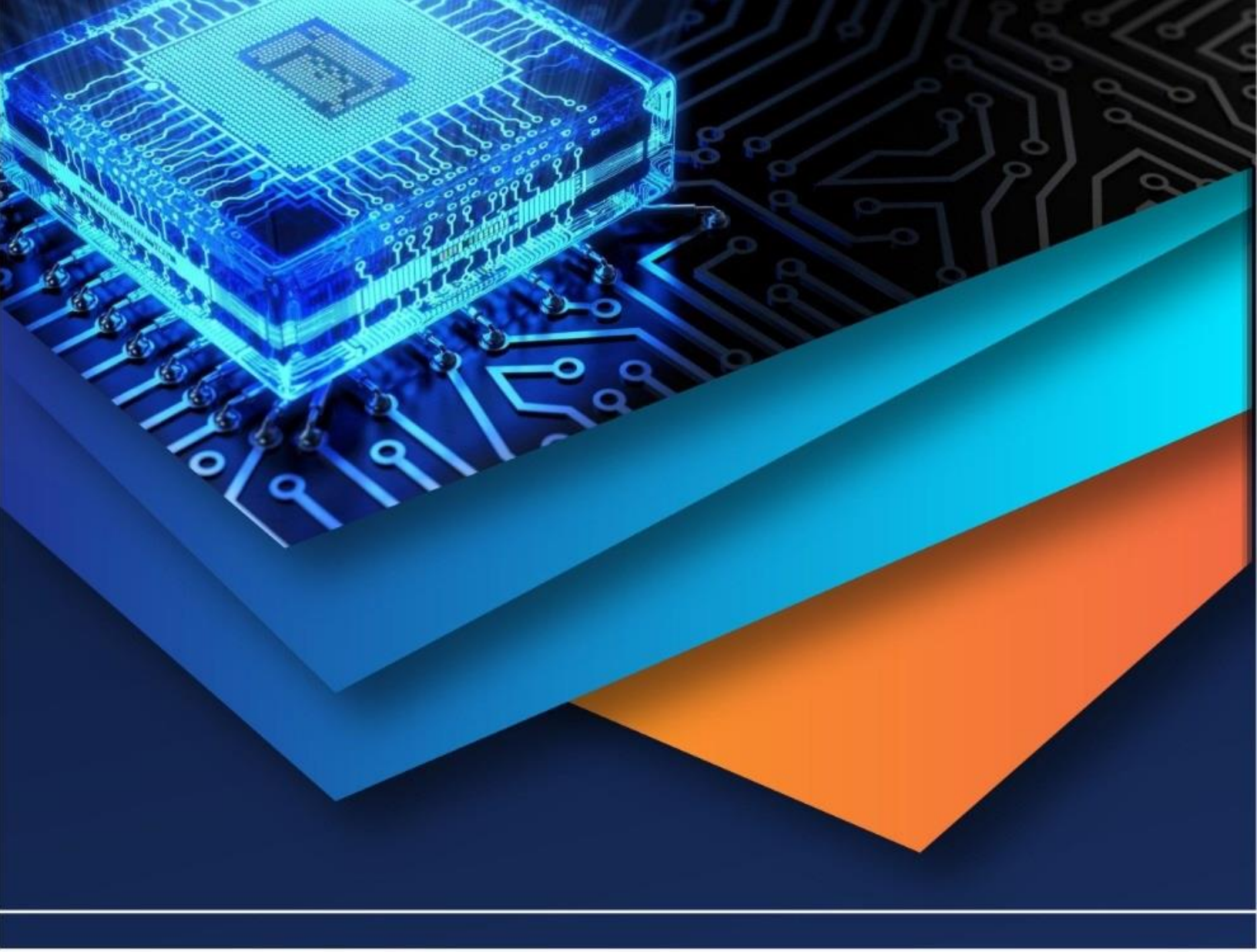

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