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Intelligent Personalized Career Path and Resume-Job Fit System

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Abstract: ***In this project, we present a system that unifies personalized career guidance and resume-Job fit analysis using artificial intelligence. This system gathers user preferences and experience and offers an understandable career roadmap and analyzes the resume of the user with regards to its eligibility according to applicant tracking systems and identifies any skill gaps. Transformer-based resume-Job fit score calculation and suggest edits that can help increase the chances of getting selected for an interview. This project delivers this system in form of an accessible and equitable web app.***
Keywords: Career Path Recommendation, Resume-Job Fit Analysis, ATS validation, BERT, RoBERTa, Skill Gap Analysis, NLP, Gemini API, Firebase.

I. INTRODUCTION

In today's fast-paced world, choosing the right career path and designing a resume that stands out is among the major concerns that students and fresh graduates face. Many people find it difficult to choose career paths according to their skills and expertise or even to prepare a proper resume that can get them into an interview. Additionally, the era of digital transformation has brought a major change in the hiring process of companies. They tend to use Applicant Tracking Systems (ATS) to select suitable candidates for positions. Most people do not have enough knowledge about ATS and the skills required by companies in their field. Although many online services are available for career guidance and job searching including LinkedIn, Naukri, Indeed, they only provide career recommendations, resume templates, and job listings without any detailed analysis or personalized career guidance.
We will be creating an Intelligent Personalized Career Path and Resume-Job Fit System that provides end-to-end career path advising, resume creation, and job fitting through a web-based interface.

II. LITERATURE SURVEY

In recent years, there have been several publications regarding personalized career guidance and resume and job- candidate matching. Some major works, along with the core contributions of the papers, their weaknesses, and the gaps this project will fill, are presented in Table I and II.

TABLE I
Literature Survey – Part 1

Topic	Paper Reference	Summary	Weakness	Gaps
Personalized Career Path Recommendation	Siswipraptini et al., IEEE Access (2017)	Career path recommendation for Indonesian students of IT major using naive bayes classifier based on student academic and personality records.	Only focused on Indonesia IT students; Lack of labor market data	No real-time market integration; No resume-job fit analysis
Career Path Prediction from Resume	Decorte et al., arXiv (2023)	NEXT job prediction from anonymized resumes and career history of candidates using transformer-based CareerBERT.	Lack of time/seniority related features; No resume improvement tips/Less focus on career path	No career roadmap generation; ATS validation/resume improvement

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Resume Dataset for Career Modeling	Yamashita et al., OpenResume (2023)	Public anonymized and synthetic datasets containing resumes aligned with ESCO for	Designed mainly for data release purposes; Focused on resume anonymization	Not designed for full end-to-end system for career modeling and resume matching
		benchmarking and testing career domain prediction models.		
Intelligent Resume Matching	Sagar et al., IJRASET (2025)	Embedding-based resume- job match score and automatic candidate communication using BERT embeddings.	Only tested on limited dataset; No resume improvements and job suggestion	Not a complete solution; ATS validation/resume job fitting/career roadmap
Embedding-Based Job-Candidate Matching	Zhao et al., CareerBuilder (2023)	Embedding-based job candidate match scoring and large scale resume retrieval and reranking with contextual information using geolocation.	Dependent on job location context; Focuses on scoring and matching	No resume editing suggestions; Explainability of resume-job fit

TABLE II
Literature Survey – Part 2

Topic	Paper Reference	Summary	Weakness	Gaps
OpenResume: Anonymized & Synthetic Career Datasets	Yamashita et al., OpenResume (2024)	Publicly released anonymized resume dataset and synthetic career trajectories in English and Spanish languages for benchmarking purposes.	Only includes resumes in English; Limited recruiter feedback	More diverse languages required; Requires more recruitment feedback
Advancing Resume Matching (multiple approaches)	Multiple authors, ML/NLP venues (2018-2025)	Evaluation benchmarks for hybrid, deep learning, and NLP-based resume-job matching models; Discussion on evaluation metrics and feedbacks.	Heavily depends on proprietary data; No benchmark sharing; Less reproducibility and less fairness	Requires more open data sharing and better explainability and fairness in ATS
Personalized Recommendation Systems (Survey)	Raghavendra C K et al., IJMECS (2018)	Comprehensive survey on collaborative, content-based and hybrid filtering systems in personalized recommendations and discussions on learning in career/job domain.	Comparative study with less discussions on career/job learning	Requires more depth in learning career/job recommendations

It is clear from the literature survey that no one has created such a system yet that could combine resume-job semantic matching, personalized career recommendations, resume creation, ATS validation, and resume improvement in a single platform. Our project focuses on filling this gap.

III. SYSTEM ANALYSIS

A. *Existing System and Drawbacks*

As mentioned previously, all career advising platforms operate separately. Resumes are either screened manually by recruiters or through some simple keyword-based filter, but lack semantic understanding and are likely to miss out on suitable candidates. They also lack the facility to give customized recommendations according to the profile of an individual. They also lack resume improvement facilities for users and there is no way for them to know the gap between their resume and particular jobs.

B. *Proposed System*

We are proposing an Artificial Intelligence Based Career Advisor Web Application that would provide career development assistance to the users in an integrated manner. It will include User Profiling and Career Assessment, Upload Resume/Build Resume, AI-based Resume Analysis, Identification of Skills Gap, Educational and Career Pathway Recommendation, and Job Suggestions.

C. *Technical Specifications*

The technical specifications of our proposed system is given below in Table III.

TABLE III
Hardware and Software Requirements

HW Component	Specification	SW Category	Details
Processor	Intel i3 / Ryzen 3 or above	OS	Windows 10/11, Linux, macOS
RAM	Minimum 4GB (Preferred 8GB+)	Frontend	React.js, HTML5, CSS3, JavaScript
Storage	Minimum 10 GB free space	Backend / Auth	Node.js, Firebase Authentication, Firestore, Storage
Internet	Broadband internet connection	AI / NLP	Gemini API, BERT/RoBERTa, SpaCy, NLTK
User device	Desktop, Laptop, Smartphone (recommended)	Resume Parser	pdfjs-dist
Browser	Any latest browser	Deployment	Firebase Hosting / Vercel

IV. SYSTEM DESIGN

A. *System Architecture*

The system architecture, as depicted in Fig. 1, consists of six different modules working together. User interaction with this system occurs through a Progressive Web Application interface. Firebase Authentication and Firestore take care of all the data handling for our system. The Resume Parser uses NLP-based approach for extracting information from resume. Labor Market Data API provides real-time signals of job market. The Career Path Recommendation Engine provides structured recommendations, whereas the Job-Fit Prediction Engine calculates the compatibility score of user and gives suggestions accordingly. All the recommendations provided in the system come under the Explainability and Fairness module.

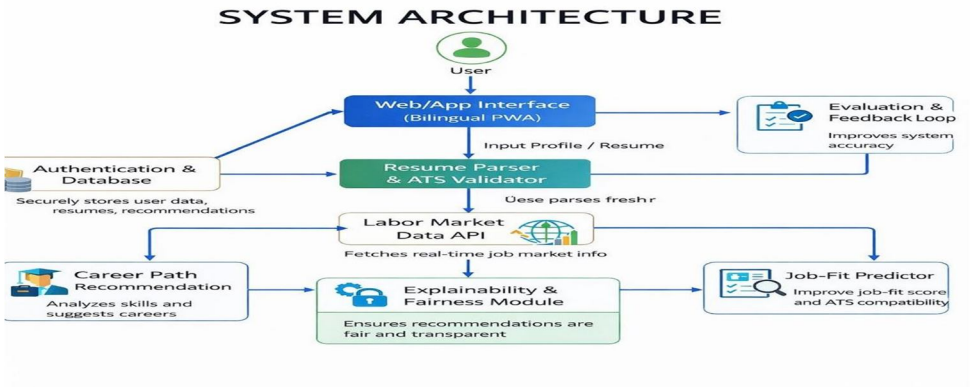

Fig. 1: System Architecture

B. Context Diagram (DFD Level 0)

Our Level 0 Data Flow Diagram, as shown in Fig. 2, depicts the system as a single process. Users' profile and resume form the input of the process. After processing this information, the system generates three main outputs - a career recommendation report, job fitness score with improvement suggestions, and ATS validity of the resume.

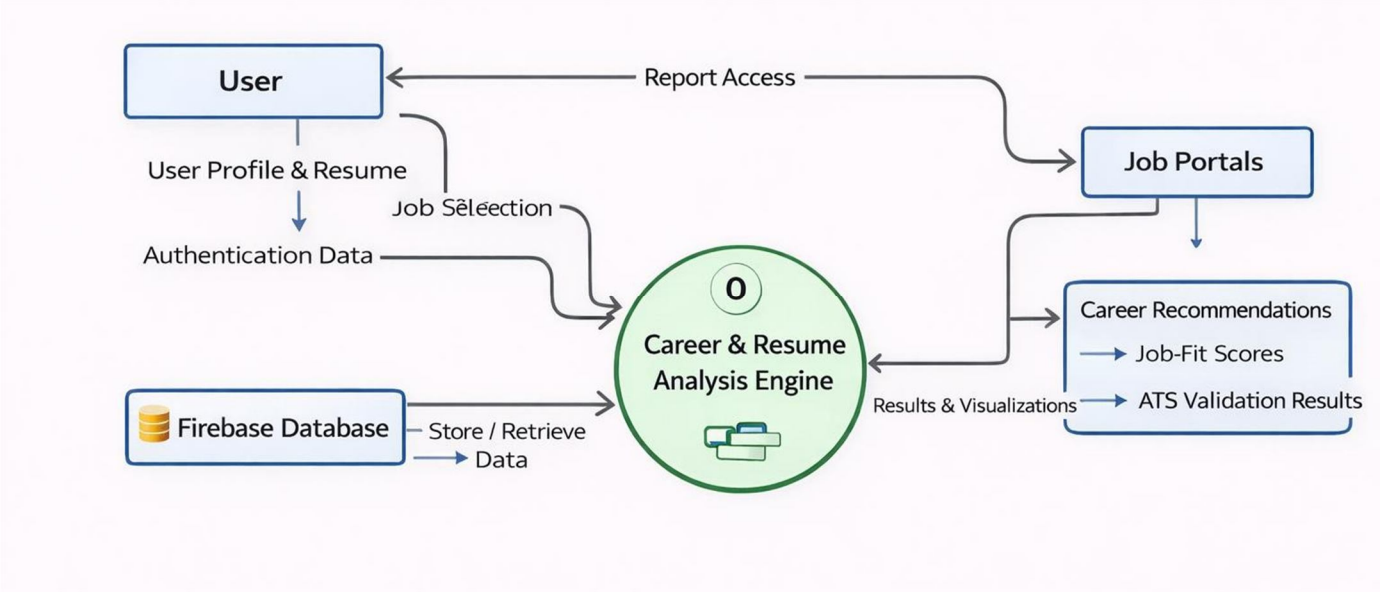

Fig. 2: Context Diagram (DFD Level 0)

C. Use Case Diagram

Fig. 3 demonstrates the Use Case Diagram, which depicts the interplay between the user and the system. The main actor in this scenario is the user, who can sign in, manage the profile, upload a resume, perform a career assessment and conduct a job search. In case a resume has been uploaded into the system, the process of resume analysis starts automatically and includes four sub-processes: skills extraction, ATS compatibility validation, career suitability evaluation, and career recommendation generation. As seen from the diagram, the system presents a single-platform approach where all career guidance features are accessible through one single entry point.

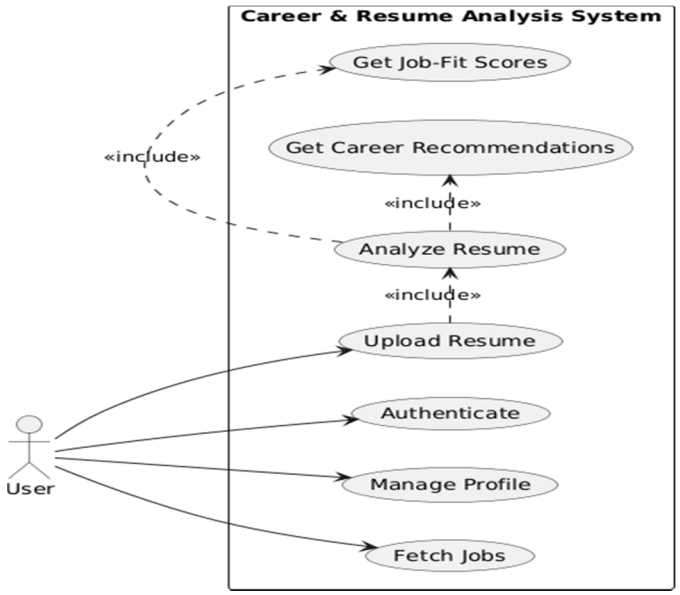

Fig. 3: Use Case Diagram

V. IMPLEMENTATION

A. Technology and System Design

The application was developed based on a web-based software stack. The frontend of the application was created with React.js and the react-router-dom library that supports the router implementation. Firebase was utilized for backend functionality, including Authentication, Firestore databases (collections of userProfiles, careerAssessments, resumes, resumeInsights, and jobHistory) and Firebase Storage for uploading resume files. The development of the application involved Node.js and npm as well.

B. AI Integration and Resume Processing

The reusable service module for handling all interactions with the AI API was implemented. The module generates personalized career recommendations, career paths and learning roadmap based on personal traits of the user. Resume processing is performed using pdfjs-dist package for extracting the text from the uploaded file. Based on the extracted information and user profile data, structured prompts are sent to the Gemini API, which returns job role recommendations, ATS suggestions, personal strengths and weaknesses, as well as some recommendations for improvement. All these outputs are stored in Firestore and displayed in the dashboard.

C. Job Recommendation and Deployment

The job recommendation module integrates external APIs (JSearch) to pull real-time listings, which are filtered by location, personal skills, and position type. In case of API malfunctioning, the application uses mock job data for job recommendation. The deployment of the entire project has been completed using Firebase Hosting technology, which involves setting up all required environment variables and verifying all available features.

VI. TESTING

A. Testing Strategy

Testing was performed manually and included both functional testing of all modules and integration testing across the entire application. Windows 10/11 OS and Google Chrome/Microsoft Edge browsers with a stable internet connection have been used for testing purposes. Every module was tested in isolation and as part of the integrated application. Some error handling scenarios were tested separately.

B. Test Cases

The summary of all implemented test cases can be found in Table IV.

TABLE IV
Test Cases Summary

Module	Test Scenario	Input	Expected Output
Authentication	Valid login	Correct email and password	User redirected to dashboard
Authentication	Invalid login	Wrong or unregistered credentials	Error message shown; access denied
Profile	Save user profile	Skills, education, interests entered	Data saved in Firestore; shown on dashboard
Career Assessment	Complete questionnaire	All questions answered	Career suggestions generated and displayed
Resume Upload	Valid PDF upload	PDF file selected and submitted	File stored; text extracted for analysis
Resume Upload	Invalid file type	Non-PDF file submitted	Error message shown; upload rejected
Resume Analysis	AI analysis on resume	Resume text + user profile	Job-fit score, strengths, weaknesses, suggestions generated
Job Recommendation	Fetch listings	User skill profile submitted	Relevant job listings displayed with filters
Job Recommendation	API unavailable	Request during API failure	Fallback mock data shown; no crash
Error Handling	Missing required fields	Form submitted incomplete	Validation messages shown; submission blocked
Error Handling	Network interruption	Action during connection drop	Error message shown; session data preserved

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It was found out that all tested modules produce valid output data for valid input scenarios. For error scenarios, graceful degradation of the application performance and proper error messages have been detected. No system crashes or errors occurred while conducting integration tests with the React frontend, Firebase services, and Gemini API.

VII. RESULTS AND DISCUSSION

Each implemented feature was tested on real user data. Authentication module allowed only those users with authorized credentials to enter the dashboard and blocked unauthorized access. Career assessment generated relevant career advice based on answers to questionnaire questions. Resume analysis produced resume-specific information in terms of job-fit score, ATS suggestions, personal strengths and weaknesses, and improvement tips. Finally, the job recommendation module returned real-time job listings depending on the user's skill profile and fallback data in case external API was down.

Table V summarizes the comparison between the implemented system and other systems available in the market and research studies.

TABLE V
Comparison of Proposed System with Existing Approaches

Feature	LinkedIn / Naukri	Sagar et al. [5]	Decorte et al. [3]	Zhao et al.	Siswipraptini [1]	Proposed System
Personalized Career Roadmap	No	No	Partial	No	Partial	Yes
Semantic Resume-Job Matching	No	Yes	Yes	Yes	No	Yes
ATS Compliance Validation	No	Partial	No	No	No	Yes
Real-Time Labor Market Data	Yes	No	No	Yes	No	Yes
Skill Gap Analysis	No	No	Partial	No	No	Yes
Explainable AI / Transparency	No	No	No	No	No	Yes
Actionable Resume Improvement Tips	No	Partial	No	No	No	Yes
Accessible Web Interface (PWA)	Yes	No	No	No	No	Yes
End-to-End Single Platform	No	No	No	No	No	Yes

As can be seen from this table, none of the current solutions on the market or researched papers provide all these features simultaneously. Thus, the proposed system stands out from other solutions because it offers an accessible web application with all the above-mentioned features.

VIII. CONCLUSION

In this paper, the Intelligent Personalized Career Path and Resume-Job Fit System was designed and developed. The use of AI technologies allows integrating the resume parsing, semantic resume-job matching, job listing analysis, and resume improvement in a convenient way. The use of Firebase and web technologies makes the application easily scalable and accessible on both desktop and mobile devices. It allows connecting individual skills of people to job opportunities and helps with better decision-making about career development. The system can improve the employability of people and reduce unemployment in a more informed manner. Finally, the application is consistent with Sustainable Development Goals concerning quality education, decent work and economic growth, innovation, and reduction of inequalities.

IX. FUTURE WORK

The application can be further improved using deep learning models to enhance prediction results. The following new modules are supposed to be added in the near future: interviews preparation module, AI resume auto-generation module, and course suggestions based on skills of the user. Multilingual support for different languages will make the application usable worldwide. Feedback learning system for gradual improvement of recommendation quality is expected in the near future too.

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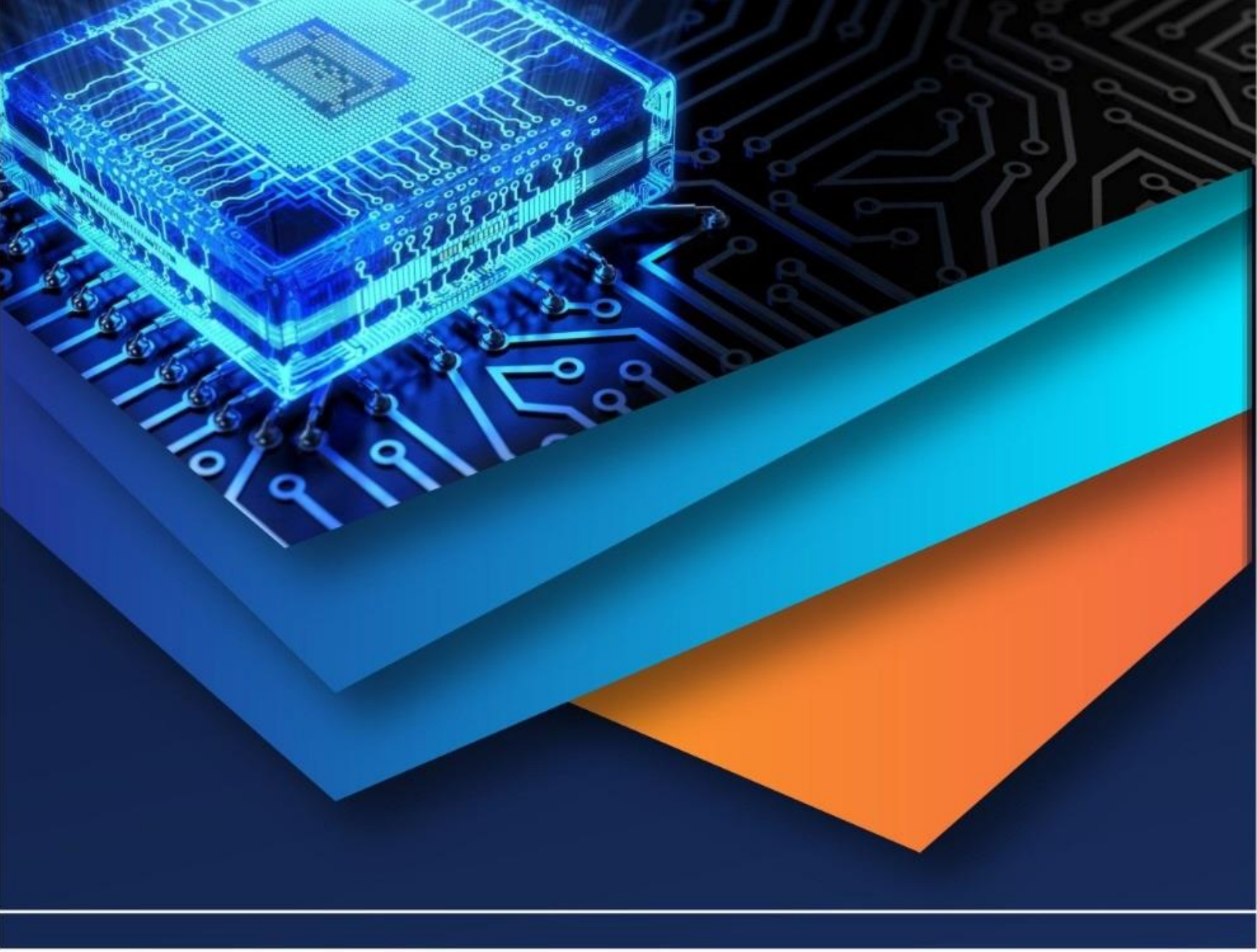

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