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AI Skill Path for Intelligent Career Development System Using Generative AI and ATS Analytics

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Abstract: ***The world's employment situation has been significantly impacted by the rapid advancement of automation and artificial intelligence (AI). Even though digital hiring systems are very popular these days, many students and young professionals just starting out in their careers struggle to find a suitable way to match their skills with industry demands. To solve this dilemma, the current paper has introduced AI Skill Path which is a smart career development system that assists in planning skills based on data. The system scans resumes, assesses their alignment with Applicant Tracking Systems (ATS), and creates customized career maps with the help of the integration of generative artificial intelligence and analyticsbased guidance. The implementation of AI Skill Path is done with the help of Django as a backend service and React.js as a user interface and the Google Gemini API to generate learning recommendations. ATS resume documents are analyzed to determine technical and soft skills, which are further matched to target job descriptions to determine ATS fit and the competency gap. The system generates a unique learning roadmap based on the determined gaps and involves applicable resources, project ideas, and time-specific guidance. This has been experimentally assessed with 100 anonymized resumes in the domain of software development and data science with a tenfold evaluation speed, average job-skill comparable accuracy of 85 and a user satisfaction rate of 92. The paper will address the system architecture, methodology, experimental findings, and possible future improvements and the contribution the AI Skill Path can make to the progress of transparent and adaptive career guidance systems.***

Index Terms—Artificial Intelligence (AI), Career Guidance System, Applicant Tracking System (ATS), Resume Parsing, Natural Language Processing (NLP), Skill Gap Analysis, Generative AI, Personalized Learning Roadmap, Google Gemini API, Django, React.js, Employability Enhancement

I. INTRODUCTION

Students and young professionals often struggle in today's digitalized job market because they are unable to match their skills to the real needs of the industry.

There is an increasing preference for degrees and grades no longer adequate[2], with recruiters placing more trust in Applicant Tracking Systems (ATS) and skills-based recruiting; most candidates still write resumes and plan their careers on a trial-and-error approach [3-4]. Such difference between classroom knowledge and on-the-job demands of a job leads to employment denial, wasted time, and slow career growth.

Meanwhile, the emergence of Artificial Intelligence (AI), Natural Language Processing (NLP), and generative models has created chances for data-driven and individualized career advice [5]. AI systems can now read resumes, grasp job descriptions, spot missing skills, and suggest targeted training, rather than relying on general advice [1]. While several AI-driven applications already aid in simple resume optimization or course recommendations, most work in isolation, lack transparency, or are not linked to skill gaps in relation to practical, step-by-step upskilling roadmaps [6].

AI Skill Path is advised based on a comprehensive and entire platform to help one to solve these issues. The system creates resume, compares it to target job descriptions, and then scores an interpretable ATS to create a personalized learning roadmap with the help of generative AI. The AI Skill Path system will help solve three practical issues that learners usually have to contend with, such as knowing where their skills are at present, what they need to know to occupy a particular job position, and what tangible steps they can make to enhance their skills. In order to sustain these goals, the platform takes full-stack architecture based on Django and React.js, with pipelines of natural language processing, as well as intertwined with the Gemini API of Google. Such a design enables the system to be scalable to an institutional deployment and at the same time to be usable and easy to use by individual users.

The following paper provides the design, implementation and evaluation of AI Skill Path as an AI-based career guidance framework.

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It details the system design, approach to be applied, and operational process with the main components of the system, including resume parsing, ATS-scoring, skill gap identification, and customized roadmap creation. Moreover, the paper presents experimental results and outcomes, accompanied by an anonymized resume dataset, an evaluation of the system's strengths and weaknesses, and a description of future enhancements, including integration with live job portals, interview preparation software, and augmented collaboration with academic institutions [4].

Recent studies show that artificial intelligence is being used more and more in competency modelling and automated resume screening. Machine-learning based competence models have been shown to be a decent indicator of candidate strengths and weaknesses and to offer a more consistent and objective evaluation than conventional manual approaches [23]. In the interim, developments in automated resume screening have demonstrated that NLPbased approaches may be used to retrieve structured candidate profiles, compare these profiles to job specifications and rank candidates depending on multidimensional skill relevance rather than total keyword frequency [24]. These advancements highlight the need of intelligent, explainable systems connecting resume evaluation with practical career advice.

AI-based recommendation systems are developing to link employers, job applicants, and academic institutions by examining skill trends and producing customized upskilling recommendations that assist consumers in understanding not only their current fit but also what courses or credentials might increase their employability [25]. These results support the need of creating a comprehensive, open, and action-oriented career counselling platform like AI Skill Path even more.

II. LITERATURE REVIEW

A. Traditional and Computerized Career Guidance

Most students used to ask their teachers, counselors, or relatives for career advice. Popular were methods including aptitude testing and career counseling meetings; while they offered some support, they are sluggish, challenging to grow, and significantly dependent on the counselor. Older systems frequently lagged as careers changed and new jobs developed.

As an alternative to totally manual counseling techniques, computer-based career guidance systems were created to streamline the career choice process. Usually, these tools take user input through questionnaires and compare the responses to the potential job postings kept in pre-defined databases. While these systems are effective at offering fast and trustworthy advice to a large number of users, they are limited by predetermined instructions and a set of tasks, so lowering their long-term applicability. As a result, they often struggle to keep up with rapid changes in their respective fields, such as information technology and data analytics, and can hardly offer practical recommendations tailored to specific resumes[7].

The previous career support systems were heavily reliant on human resources and were therefore time-consuming and could not be scaled accordingly. The shift to the computerized systems made it more efficient by providing career matching that was automatized by structured assessments and job repositories that were managed by hand. Nevertheless, as much as these solutions have these benefits, most of them are not responsive enough to the changing labour market conditions. Recent studies in the area of higher education indicate a trend towards the increased demand of active digital career ecosystems, which continuously modify in response to the needs of the industry. Research also suggests that the more universities are turning to AI-based solutions which provide students with clear feedback and decision support options, which is mostly lacking in the traditional computer-based guidance systems.[15][17].

B.AI and Recruitment

Applicant tracking systems (ATS) have become a standard tool for handling large numbers of job applications as a result of organizations' increasing use of artificial intelligence in the hiring process. The initial applicant tracking systems (ATS) were primarily designed to search resumes using pre-programmed keywords or skills and rank the candidates for human review. Recent systems expand on this approach by applying Natural Language Processing (NLP) to gather contextual data and comprehend employment experiences outside of simple keyword matching [8].

In spite of such developments, even the well-constructed systems might fail to give due consideration to good candidates or inadvertently favour the applicants who are keen on formatting their resumes in such a way that they can bypass the keyword-based filters.

In order to reduce these restrictions, researchers have developed more complex matching algorithms that can use large datasets, and sophisticated text analysis to enhance the correspondence between resumes and job descriptions [7]. Nevertheless, the current generation of commercially implemented recruitment systems remains largely opaque black-box systems, providing no detail about how the score of candidates is generated, or how applicants can optimize their profiles [9].

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Explainability is now a key issue as AIbased screening is becoming the initial phase of recruiting. Recent literature underlines the importance of recruitmentoriented AI systems that are able to give clear explanations of why they make certain decisions to mitigate bias, establish trust, and assist in developing the candidates by indicating a clear absence of skills or experience gaps [14] [17] [18].

C. AI in Career Guidance

As artificial intelligence rapidly develops, a number of platforms have been created that assist students and professionals to plan long-term careers, as opposed to concentrating on job placement. Such systems usually pool data like content of resumes, educational accomplishments, and finished courses along with other background variables in order to prescribe appropriate career opportunities or educational pathways. E.g. according to previous studies, AI-based models can evaluate whether a technology student will fit a role like data analytics or web development more by using analyzing their previous knowledge and experience [7].

In spite of these, most of the existing solutions offer only general recommendations, like proposing a general area of careers, and do not tell how to refine a particular resume or how to deal with role-specific shortcomings in skills [9] [10].

Besides that, the rationale supporting these recommendations is not fully explained in most cases making their practical value to the user who would want to take action based on them to be limited [16]. Consequently, although AI-based career guidance has grown beyond job matching and can now offer more sophisticated information, there is still a necessity in systems that can bridge the gap between high-level information and specific, actionable and transparent professional development guidance.

Modern systems consolidate data from academic records, certifications, resumes, and prior learning to generate personalized guidance.

Recent research reveals that including artificial intelligence into Decision Support Systems (DSS) can greatly improve the dependability of advice when decisions are accompanied by explanations. By explaining why a particular career path is suggested instead of leaving consumers to guess the rationale, accountable DSS raises learner confidence and promotes self-reflection [17, 18]. Furthermore, in higher education settings, artificial intelligence-based mentoring has been demonstrated to enhance student independence and facilitate more informed career decisions [15][19].

D. Generative AI and Personalized Learning

Driven by huge language models, the most recent artificial intelligence systems can operate nearly as intelligent mentors. They enable users to define their objectives, recommend what to study next, and even explain the underlying reasons [11]. AI systems have aided custom learning programs, interview preparation, and felt personal feedback in certain studies [12].

However, most of these are still early-stage or pilot projects. Very few combine ATS-style analysis (where you stand right now in the job market) with direct, step-by-step up skilling plans [13].

The major difference of AI Skill Path approach is that it does not just propose appropriate job titles. Rather, it clearly outlines skills that are lacking in a desirable position and offers a systematic learning package to close the shortfalls [10]. Such an ability is in line with modern trends in generative artificial intelligence that have brought increased personalization of career development systems. Compared to previous AI-based systems that used either fixed or one-time recommendations, generative models have the ability to generate adaptive learning programs, ongoing feedback systems, and mentorship-like messages which improve over time. Empirical research shows that the engagement of the learner becomes much more effective in case the generative AI systems can provide the personal study plans and the feedback based on the individual goals and levels of performance [19][20]. Studies in personalized learning also indicate that students are more likely to gain advantages of AI models able to determine students individual strengths, weaknesses and preferences in learning than generalized suggestions [14][18]. Moreover, generative AI has shown a beneficial effect on assessment assistance, interview preparation, and skill development in terms of an iterative natural-language dialogue and prompt self-reflection [20]. According to the recent literature, it is also worth mentioning that AI-enabled personalized learning has started to be regarded more as a lifelong support mechanism than as a tool used in acquisition of academic skills. The AI systems have the capability of dynamically changing the pathways of learning according to the user progress, motivation and long-term career goals and providing continuous upskilling at various stages of career development [21]. Moreover, the increased attention to AI-based career pathway modelling indicates that the integration of the personal profiles with the labour market trends and future skills demand can result in more transparent and data-driven career trajectory suggestions [22]. Taken together, these results indicate a transition towards stable career guidance models towards learner-centered and constantly evolving career development models. To conclude, there are numerous tools and research studies that underline career guidance and hiring, however, the vast majority of them aim at individual operations or lack clear and actionable feedback. Really needed is the combination of resume evaluation, clear skill assessment and flexible learning programs.

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Directly connecting what is on your resume to what is needed for your desired employment, describing discrepancies in plain terms, and employing generative AI to present the processes helps AI Skill Path fill this gap. It seeks to provide students and professionals not only guidance but also a clear plan of action for boosting their employability by making everything open and understandable.

E. Comparative Analysis of Existing Systems

TABLE I: DESCRIPTIONOF TABLE

System/Model	Technology Used	Key Features	Limitations
Jobscan (2025)	Keyword-based ATS	Resume matching, job keyword identification	No personalization or AI-based analysis
Kashif et al. (2024)	NLP-based Resume Parser	Structured data extraction	Struggles with unstructured formats
Abbas et al. (2024)	Deep Learning for Skill Fitment	High accuracy in pattern recognition	Requires large datasets
Surya et al. (2025)	Generative AIassisted ATS	Contextual interpretation of resumes	Isolated from learning guidance
LinkedIn Learning	ML-based Recommendation	Suggests relevant courses	Lacks resumebased evaluation
AI Skill Path (Proposed)	NLP + Generative AI (Gemini)	Integrated ATS scoring + Personalized learning roadmap	Under development; dependent on API response latency

III. OBJECTIVE

The creation and deployment of an AI-powered career counselling system is the primary goal of this study. AI Skill Path analyses resumes, evaluates ATS compatibility, and generates personalized learning roadmaps to reduce the gap between academic skills and industry requirements.

Specifically, the system aims to:

1) Accurately extract and regularise practical and soft skills from semi-structured resumes using NLP-based parsing.
2) Compute transparent ATS scores and identify role-specific skill gaps by connecting resume skills with scratch job descriptions.
3) Leverage generative AI (Gemini API) to produce adaptive, resource-linked information plans related with user goals.
4) Validate the system's effectiveness in terms of accuracy, speed, personalization, and user satisfaction through quantitative metrics and comparative evaluation security to current tools.

Outside the instant technical objectives, AI Skill Path is planned as a practical and scalable framework that can be accepted by colleges, training institutions, and single learners to care on-going, skills-based career development. Rather than functioning as a one-time assessment tool, the system is envisioned as a continuous support mechanism that allows users to periodically review their profiles, monitor skill improvements, and update their learning plans in response to changing job roles and emerging technologies. By this long-term viewpoint, students can proactively familiarize to shifting industry demands and preserve their relevance in their works over time.

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IV. METHODOLOGY

A. *Overview of Methodology*

AI's Skill Path The modular design approach used in Skill Path helps to enable scaling and improve the clarity of analysis as well as allow for a credible evaluation of the results of career development. It combines natural language processing (NLP) of resume text, algorithm-based ATS to find role fit, and generative AI systems to make personalized learning plans.

Regarding implementation, the backend will be developed in Django, user interface will be developed in React.js and structured data will be stored in PostgreSQL. The general methodology is divided into four layers to ensure a clear and extensible workflow with each of them dealing with a particular stage of processing and analysis.

- Data Ingestion and Pre-processing
- ATS Scoring and Skill Gap Analysis
- AI-driven Roadmap Generation
- User Interaction and Visualization

Each layer is responsible for a well-defined set of operations, while secure REST-based APIs enable seamless communication and coordination across the entire workflow.

B. *System Workflow*

When a user uploads a resume (in PDF or DOCX format) and a target job description (optional), the AI Skill Path process begins. The uploaded document is analysed using applications like PyMuPDF and docx2txt in order to retrieve text related to the document which is analysed with NLP methods to determine some important factors such as skills, education background, work experience, certification and project. The learned skills are then standardized and mapped onto standardized skill taxonomy to ensure that differences and synonyms, like "JS" and "JavaScript" are treated equally. After this pre-processing step, the ATS evaluation module will compare the resume based skills and those of the target job description.

The compatibility scores are determined through weighted variables in the form of skill overlap, keyword relevance, level of experience and academic qualification. Missing and underrepresented skills are indicated to enhance targeted upskilling. The generative AI module developed on Gemini creates a personalized learning roadmap with recommended courses, project ideas, timetables, and useful career guidance based on the gaps found. This roadmap changes as the user does. An interactive React.js dashboard that shows ATS scores, skill gaps, roadmap summaries, and progress indicators is used to illustrate the findings. Customers have the ability to keep updating their skills profile or re-adding new resumes so that they get updated assessments and can monitor their progress over time.

C. System Architecture Layers

1) Ingestion Layer and Data Parsing.

Libraries such as PyMuPDF and docx2txt are used in the ingestion and parsing data layer to convert resume files into machine-readable text, and SpaCy and NLTK are used for named-entity recognition, tokenization, and part-of-speech tagging.This process is used to obtain important data such as the name of candidates, their contact information, education, work experience and skill sets among others and store them in a well organized format that can be analyzed further.

2) ATS Scoring and Skills Gap Analysis Layer.

ATS score is calculated as a ratio of have matches between job- required skills and resume skills:

$$\text{ATS Score} = Sm/Sj \times 100$$

Assuming that Sm = Number of matched skills, Sj = Total number of skills required in job discription. Besides the basic matching of skills, the scoring system has weighted significance on issues like the relevant experience, educational credentials and weighted regency of the acquired skills. The module outputs various reports such as a general percentage of skills match, list of skills that are missing or weak and practical suggestions on how to align the resume with the job position being applied.

3) Roadmap Generation Layer

At the center of this layer is the Gemini API which converts skill shortage and user-job profiles to individual learning pathways. They consist of the sets of recommendations of courses, practical projects to carry out, scheduled plans, and interview preparation tips, and are dynamically updated when a user acquires new competencies or when the job market needs alter.

4) Visualization Layer and User Interaction

React.js helps developers build interactive and dynamic user interfaces. It gives consumers a fluid and engaging experience by making web applications seem real time and responsive. In the scoring logic of the ATS and database management, the Django REST Framework handles the backend services used to interact with the API. MySQL database holds the user data and security is provided via JWT-based authentication and safe HTTP communication.

Using the dashboard, users are able to see detailed ATS score breakouts, see what skills they are lacking, see individualized roadmap plans, see progress visually, and get actionable feedback to continue enhancing their results

5) Tools and Technologies Used

Component	Technology / Tool	Purpose
Frontend	React.js	Dashboard and user interface
Backend	Django REST Framework	API handling and data processing
Database	PostgreSQL	User data and resume storage
API	Gemini API (Google)	Generative AI for roadmap generation

Libraries	spaCy, NLTK, PyMuPDF, docx2txt	NLP and text extraction
Authentication	JWT	User login and session management
Version Control	Git & GitHub	Code maintenance and collaboration
Hosting	Vercel	Cloud deployment and API hosting

V. CONCLUSION AND FUTURE OUTCOMES

The AI Skill Path project was launched with the aim of bridging the always-present gap between the academic learning and industry expectations of students and early career professionals. Using ATS based evaluation and personalised road map generation, together with artificial intelligence on resume analysis, the system offers users a clear picture of their current skill position and actionable advice on how the same can be improved. Instead of focusing on resume screening, AI Skill Path converts resumes and job descriptions into a structured format of skills, unveils gaps, and suggests time-based learning plans that directly contribute to the development of employability.

The proposed approach can be judged as being effective in practice as experimental assessment of 100 anonymized resumes, all of software and data-centric roles, reveals. The fact that an ATS is as accurate as possible in the mid-80% range indicates that the human assessment is remarkably consistent and replicated by the system and has the capability of meaning the same thing. The process of parsing and evaluations of resumes takes a matter of seconds, which means that the overall processing time is about ten times slower than reading resumes manually. These features render the platform appropriate when implementing it in academic settings like college placement units, and in large-scale Internet career guidance systems.

Although it has the strengths, there are some weaknesses.

The quality of resume parsing is also impacted by document formatting; sometimes a very ornate or complicated layout might result in extraction mistakes. Furthermore, the current skill ontology and evaluation dataset is mostly pertinent to technical disciplines, making it less useful when applied in a non-technical field like healthcare or finance. Depending on third-party AI also runs the danger of latency and rate limits during periods of heavy usage. Furthermore, because it is not yet integrated with live job advertisements or any outside learning environment, the platform is unable to capture real-time labor market developments and monitor learner progress automatically. Furthermore, the support is now restricted to English, therefore reducing its usefulness in multilingual contexts.

Even with such constraints, AI Skill Path provides some of the most hopeful directions for future refinement. Including live job portals like LinkedIn, Indeed, or Naukri into the system would enable matching skill gaps with contemporary employment market data and fresh job criteria. By expanding the skill taxonomy and training data across other domains, it would improve generalizability and help in identifying cross-domain skill connections. To improve end-to-end career readiness, the generative AI component might also be used to help with interview preparation by generating mock interviews, job-related questions, and user-specific feedback.

Another excellent chance in the medium term is more integrated engagement with professional and educational training ecosystems. Educational institutions and skilling programs can integrate AI Skill Path into their curriculum design and placement processes to examine a huge volume of resumes, identify widespread skill gaps, and develop targeted training programs. By identifying patterns like average ATS, administrative dashboards can also enable data-driven decision-making. Connecting to other sources like Coursera, Udemy, or GitHub would let the system automatically track courses and projects done, therefore continuously updating the user profile and recommendation system as they progress.

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The research is still pertinent for more overall artificial intelligence-based career development directions going forward. Adding the concepts of explainable artificial intelligence might guarantee that the results of the ATS, learning courses, and predictive insights are backed by unambiguous and understandable explanations. Also improving interdisciplinary and new role knowledge are integrated forms of rule-based logic and semantic representations. AI Skill Path offers a realistic alternative for converting the present résumé-based review mechanism into the vibrant career development system changing the business environment.

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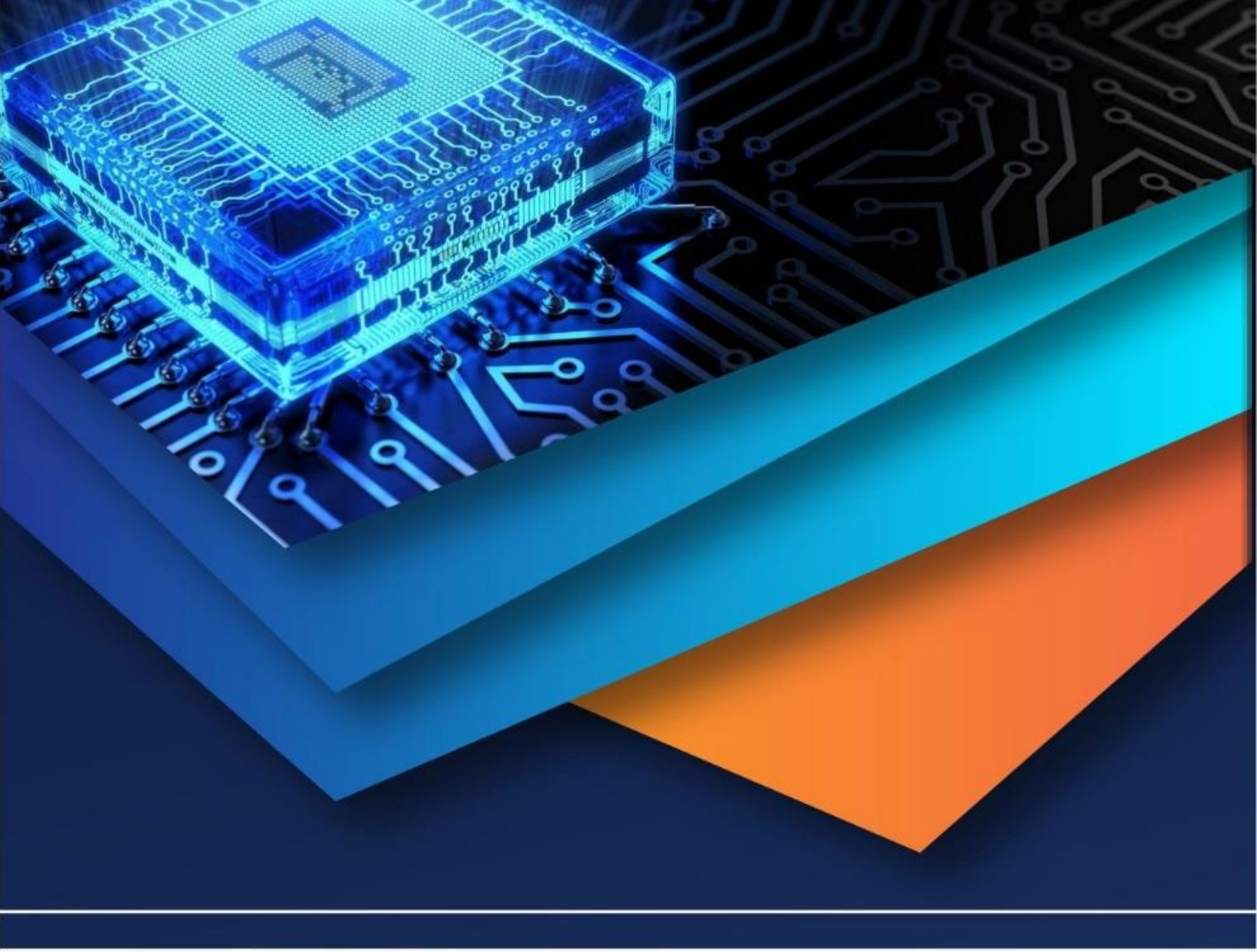

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