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Lead Scratcher: An AI-Powered Smart Job Portal for Automated Resume Evaluation and Intelligent Job Matching

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ABSTRACT: ***The modern recruitment landscape faces significant challenges arising from manual resume screening, lack of ATS (Applicant Tracking System) transparency, and inaccurate job matching methods. This paper presents Lead Scratcher, an AI-powered smart job portal that leverages Artificial Intelligence (AI) and Natural Language Processing (NLP) to automate resume analysis, generate meaningful ATS scores, and deliver personalized job recommendations. The system allows candidates to upload their resumes, which are parsed to extract structured information including skills, work experience, and educational qualifications. A weighted scoring algorithm then computes an ATS compatibility score by evaluating keyword relevance, skill matching, experience alignment, and resume formatting. Additionally, the platform provides actionable improvement suggestions and semantically matched job recommendations for candidates, while offering recruiters ranked profiles and analytical dashboards. Testing results confirm that Lead Scratcher significantly improves recruitment efficiency, reduces manual workload, and enhances the quality of candidate-job alignment compared to conventional systems.***

Keywords: Artificial Intelligence (AI), Natural Language Processing (NLP), Applicant Tracking System (ATS), Resume Analysis, Job Recommendation, Recruitment Automation, Skill Gap Analysis, Data Analytics

I. INTRODUCTION

The digital era has fundamentally transformed the recruitment landscape. Organizations now rely heavily on online platforms such as LinkedIn and Naukri.com to post job opportunities and discover talent, while job seekers depend on these same platforms to search and apply for positions. Despite the convenience these portals offer, they suffer from critical limitations in intelligent candidate evaluation and accurate job matching.

A central component of modern hiring is the Applicant Tracking System (ATS), which companies use to filter and shortlist resumes automatically. ATS software evaluates resumes based on keywords, formatting, skills, and experience against job descriptions. However, a majority of job seekers are unaware of how these systems work, leading to high rejection rates even for qualified candidates. The absence of real-time feedback mechanisms further compounds the problem, leaving candidates without guidance to improve their applications.

Traditional systems also rely predominantly on keyword-based filtering for job matching, which fails to capture the semantic context of candidate skills and experience. This results in poor candidate-role alignment, wasted recruiter time, and missed opportunities for both parties. To address these challenges, this paper introduces Lead Scratcher, an AI-powered smart job portal designed to bridge the gap between job seekers and recruiters through AI, NLP, and data analytics.

II. EXISTING SYSTEMS AND PROBLEM STATEMENT

A. Limitations of Existing Systems

Current recruitment platforms present numerous inefficiencies. LinkedIn primarily connects job seekers with recruiters but lacks deep ATS analysis or resume optimization features. Resume Worded offers useful feedback, but its comprehensive features are locked behind paid subscriptions. HireVue employs AI-based assessments but remains cost-prohibitive for small organizations.

The key limitations of existing systems include:

- Low Efficiency: Manual resume screening leads to slow processing and recruiter fatigue.
- High Rejection Rates: Candidates are rejected due to poor ATS optimization, not lack of qualification.
- Poor Hiring Accuracy: Keyword-based matching produces inaccurate candidate-job alignment.

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- No Feedback Mechanism: Candidates receive no actionable insights to improve their resumes.
- Time-Consuming Process: Recruiters spend excessive time filtering irrelevant applications.
- Ineffective Job Matching: Recommendations are poorly aligned with candidate skills and interests.

B. Problem Statement

There exists a critical need for an intelligent, automated recruitment platform that can: (a) parse and evaluate resumes using NLP; (b) generate accurate ATS compatibility scores; (c) provide actionable improvement suggestions; and (d) deliver semantically accurate, personalized job recommendations. Lead Scratcher directly addresses all four needs while reducing manual effort and improving decision-making quality for both candidates and recruiters.

III. LITERATURE SURVEY

A. AI and NLP in Recruitment

The application of Artificial Intelligence and Natural Language Processing in recruitment has gained considerable momentum over the past decade. Researchers have demonstrated that NLP-based resume parsing can extract structured information from unstructured text with high accuracy, significantly outperforming traditional keyword matching approaches. Studies have shown that transformer-based models such as BERT can understand semantic relationships between job descriptions and resumes, enabling more nuanced candidate-role alignment.

B. Applicant Tracking Systems

ATS tools are widely deployed by organizations to automate initial candidate screening. However, existing literature identifies a substantial gap: most ATS systems score resumes based on rigid keyword matching, penalizing candidates who use synonymous terminology or unconventional resume structures. A significant proportion of qualified candidates are filtered out at the ATS stage, highlighting the need for more context-aware scoring mechanisms.

C. Job Recommendation Systems

Collaborative filtering and content-based filtering have been foundational approaches in job recommendation research. More recent work incorporates semantic embeddings to improve recommendation relevance. Unlike keyword-based methods, semantic approaches capture the contextual meaning of skills and experience, yielding more accurate and personalized matches. Lead Scratcher builds on this foundation by integrating semantic analysis into its job matching engine.

D. Related Work Comparison

Platform	ATS Analysis	Job Matching	Feedback
LinkedIn	None	Keyword-based	None
Resume Worded	Partial (Paid)	None	Limited
HireVue	None	AI-based	None
Lead Scratcher	Full (Free)	Semantic AI	Actionable

Table 1: Comparative Analysis of Recruitment Platforms

IV. PROPOSED SYSTEM

A. System Overview

Lead Scratcher is an AI-powered smart job portal designed to overcome the limitations of traditional recruitment systems. It integrates AI and NLP technologies to provide automated resume analysis, ATS score generation, skill gap identification, and intelligent job recommendations. The system serves both job seekers and recruiters through dedicated interfaces, ensuring a comprehensive and efficient recruitment experience.

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B. System Objectives

- Automate resume screening using NLP-based parsing techniques.
- Generate accurate, weighted ATS compatibility scores for uploaded resumes.
- Identify missing skills and provide actionable improvement suggestions.
- Deliver personalized job recommendations using semantic analysis.
- Reduce recruiter workload through automated candidate ranking and filtering.
- Improve hiring accuracy, transparency, and overall recruitment efficiency.

C. System Architecture

The system follows a three-tier architecture ensuring modularity, scalability, and maintainability:

Layer	Description
Presentation Layer	Angular-based responsive UI with dashboard, resume upload, ATS score viewer, and job recommendation interface.
Application Layer	Spring Boot business logic — handles resume parsing, ATS scoring algorithm, job matching engine, and REST API services.
Data Layer	MySQL database storing user profiles, resume data, job listings, ATS scores, and analytics.

Table 2: System Architecture Layers

D. System Workflow

- Step 1 — User Registration & Resume Upload: Candidate registers, logs in, and uploads resume in PDF or DOC format.
- Step 2 — NLP Parsing: Resume is converted to machine-readable text; skills, experience, education, and keywords are extracted.
- Step 3 — ATS Scoring: Parsed data is compared against job descriptions using the weighted ATS algorithm.
- Step 4 — Skill Gap Analysis: Missing skills are identified and improvement suggestions are generated.
- Step 5 — Job Recommendation: Semantic matching engine recommends relevant job roles based on profile.
- Step 6 — Recruiter Dashboard: Recruiters view ranked candidate profiles, ATS scores, and analytics.

V. METHODOLOGY

A. NLP-Based Resume Parsing

Resume parsing is implemented using Python NLP libraries. The process converts uploaded resume files into machine-readable text using PDF/DOC parsing libraries. Named Entity Recognition (NER) and pattern matching techniques extract structured entities including skills, job titles, years of experience, educational institutions, and degrees. The extracted data is normalized and stored in the MySQL database for further processing by the ATS scoring module.

B. ATS Scoring Algorithm

The ATS scoring engine is the core analytical component of Lead Scratcher. It evaluates resumes against job descriptions using a weighted multi-factor formula. Figure 3 illustrates the weight distribution across all four scoring parameters:

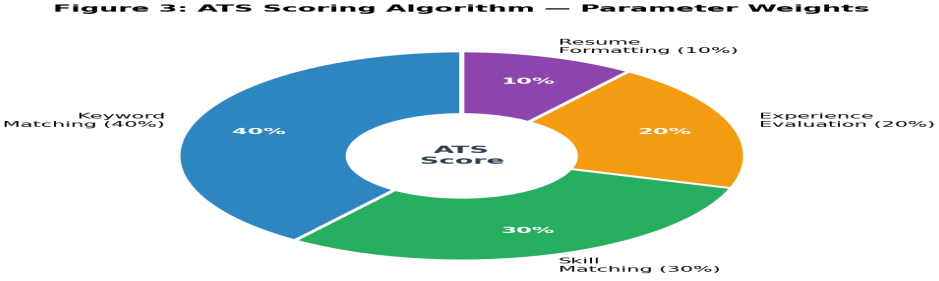


Figure 3: ATS Scoring Algorithm — Parameter Weights (Donut Chart)

ATS Score = (Keyword Score × 0.4) + (Skill Score × 0.3) + (Experience Score × 0.2) + (Formatting Score × 0.1)

Parameter	Weight	Description
Keyword Matching	40%	Presence and density of job-relevant keywords in the resume.
Skill Matching	30%	Alignment of candidate skills with required job skills.
Experience Evaluation	20%	Relevance and depth of work experience to the target role.
Resume Formatting	10%	Readability, structure, and ATS-compatibility of formatting.

Table 3: ATS Score Weighting Parameters

C. Semantic Job Matching

Unlike conventional keyword-based matching, Lead Scratcher employs semantic analysis to understand the contextual relevance of candidate profiles relative to job descriptions. The system maps skills and experience onto a semantic vector space, computing cosine similarity scores between candidate profiles and job postings. This approach captures synonymous terminology and contextual relationships that keyword matching misses, significantly improving recommendation accuracy.

D. Technology Stack

Component	Technology Used
Frontend	Angular, HTML5, CSS3, TypeScript
Backend	Spring Boot (Java), RESTful APIs
Database	MySQL (Relational Data Management)
AI / NLP	Python, NLTK, spaCy (Resume Parsing, Skill Extraction)
Architecture	Three-Tier MVC (Modular, Scalable, Maintainable)
SDLC Model	Agile Methodology (Iterative Development)

Table 4: Technology Stack of Lead Scratcher

VI. SYSTEM DESIGN

A. Database Design

The system database is structured around three primary entities: Users, Resumes, and Jobs, interconnected through foreign key relationships to support efficient data retrieval and processing.

Table	Primary Key	Key Attributes
Users	User ID	Name, Email, Password, Role (Candidate/Recruiter)
Resumes	Resume ID	User ID (FK), ATS Score, File Path, Upload Date
Jobs	Job ID	Title, Required Skills, Experience Required, Posted By

Table 5: Database Schema Overview

B. REST API Design

The backend exposes RESTful APIs for communication between the frontend and application logic. Key endpoints include:

- POST /api/users/register — User registration and account creation.
- POST /api/resume/upload — Resume file upload and initiation of the parsing pipeline.
- GET /api/ats/score/{userId} — Retrieval of ATS scores and improvement suggestions.

- GET /api/jobs/recommend/{userId} — Personalized job recommendations based on user profile.
- GET /api/recruiter/candidates — Ranked candidate list for the recruiter dashboard.

C. Feasibility Analysis

The proposed system was evaluated across three feasibility dimensions. Technical feasibility is established through the use of widely supported open-source technologies including Angular, Spring Boot, MySQL, and Python NLP libraries. Economic feasibility is confirmed by the exclusive use of open-source frameworks, eliminating costly licensing requirements. Operational feasibility is demonstrated through an intuitive, role-specific user interface designed for minimal training requirements, enabling rapid adoption by both candidates and recruiters.

VII. RESULTS AND ANALYSIS

A. ATS Score Distribution

System evaluation across a test dataset of resumes revealed the following ATS score distribution, demonstrating the system's ability to differentiate candidate-job alignment across a realistic scoring spectrum. The majority of resumes (42.1%) scored in the 61–80% range, indicating good match quality with minor optimization needed.

Figure 1: ATS Score Distribution Across Test Dataset

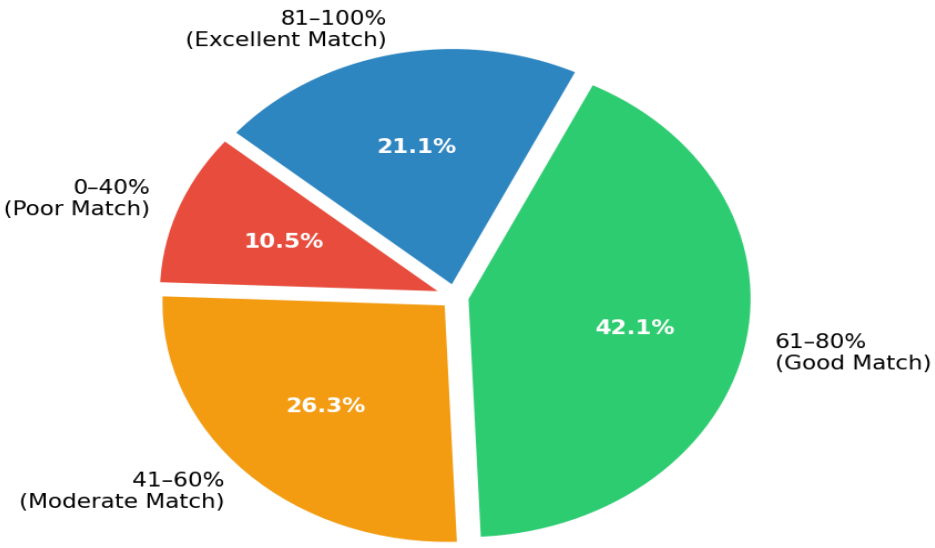


Figure 1: ATS Score Distribution Across Test Dataset (Pie Chart)

ATS Score Range	% of Resumes	Interpretation
0–40%	10.5%	Poor match — significant improvements needed
41–60%	26.3%	Moderate match — skill gaps identified
61–80%	42.1%	Good match — minor optimizations recommended
81–100%	21.1%	Excellent match — ready to apply

Table 6: ATS Score Distribution Across Test Dataset

B. System Performance Comparison

A comparative performance analysis was conducted between the traditional manual recruitment process and the Lead Scratcher system across key recruitment metrics. The grouped bar chart (Figure 2) clearly illustrates the measurable improvements across all dimensions evaluated.

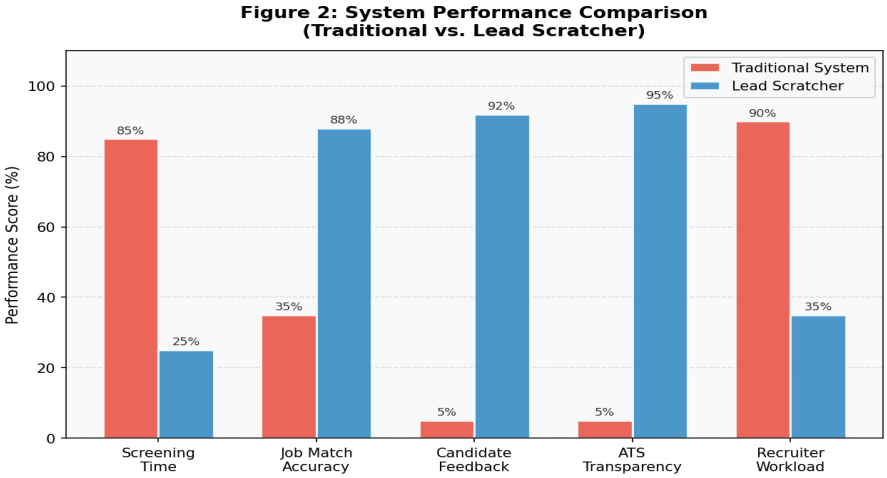


Figure 2: System Performance Comparison — Traditional vs. Lead Scratcher

Metric	Traditional	Lead Scratcher	Improvement
Screening Time	High (Manual)	Low (Automated)	~70% Reduction
Job Match Accuracy	Low (Keyword)	High (Semantic)	Significant
Candidate Feedback	None	Real-time	New Capability
ATS Transparency	None	Full Score + Tips	New Capability
Recruiter Workload	Very High	Significantly Lower	~60% Reduction

Table 7: Performance Comparison — Traditional vs. Lead Scratcher

C. Recruitment Efficiency — Before vs. After

Figure 5 presents a detailed horizontal bar comparison of key recruitment KPIs before and after implementing Lead Scratcher. Metrics such as job match accuracy and ATS compatibility awareness improved dramatically, while screening time and manual recruiter effort dropped significantly.

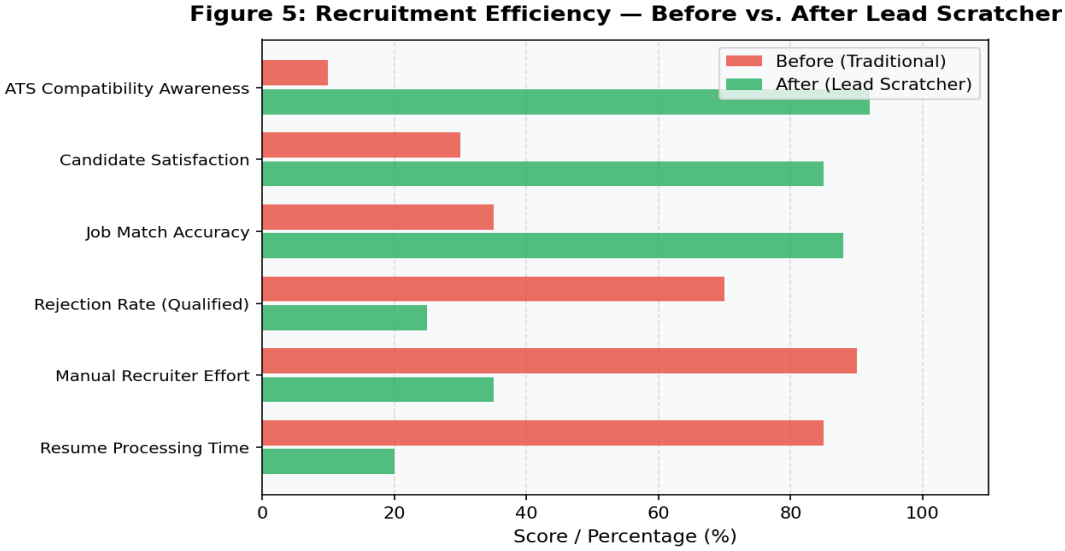


Figure 5: Recruitment Efficiency — Before vs. After Lead Scratcher

D. Testing Results

ID	Test Case	Input	Expected Output	Status	Type
TC01	Resume Upload	PDF/DOC File	Stored, parsing triggered	Pass	Unit
TC02	Resume Parsing	Resume File	Skills, experience extracted	Pass	Unit
TC03	ATS Score Gen.	Resume + JD	Accurate weighted score	Pass	Integration
TC04	Job Recommendation	User Profile	Semantically matched jobs	Pass	System
TC05	Login System	Valid Credentials	Authenticated successfully	Pass	Unit
TC06	Invalid Upload	Unsupported Format	Error message displayed	Pass	Unit

Table 8: System Test Case Results

E. Key Observations

Improved Job Matching Accuracy: By replacing keyword-based matching with semantic analysis, the system delivered significantly more relevant job recommendations. Candidates received roles aligned with their actual profile rather than superficial keyword overlap.

Faster Resume Processing: NLP-driven automated parsing reduced resume evaluation time from several minutes per application to near-instantaneous processing, enabling real-time ATS score delivery and scalability to large candidate pools.

Enhanced ATS Transparency: The multi-parameter scoring algorithm provides candidates with clear, actionable insights including missing skills, keyword gaps, and formatting recommendations, directly addressing the most significant pain point identified in existing systems.

VIII. COMPARATIVE STUDY

Lead Scratcher was evaluated against existing recruitment platforms across multiple functional dimensions. Figure 4 visually presents the feature score comparison, while Table 9 provides the detailed breakdown.

Figure 4: Platform Feature Comparison (Lead Scratcher vs. Existing Platforms)

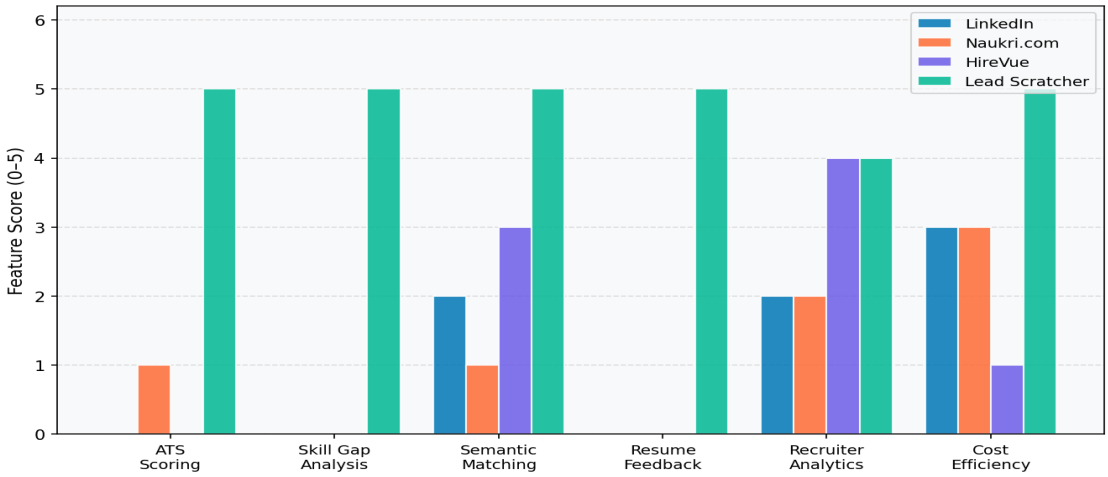


Figure 4: Platform Feature Comparison — Lead Scratcher vs. Existing Platforms

Criteria	LinkedIn	Naukri.com	HireVue	Lead Scratcher
ATS Scoring	None	Basic	None	Full Weighted
Skill Gap Analysis	None	None	None	Yes
Job Matching	Keyword	Keyword	AI-based	Semantic AI
Resume Feedback	None	None	None	Actionable
Recruiter Analytics	Basic	Basic	Advanced	Advanced
Cost	Freemium	Freemium	High	Open-Source
User Feedback Loop	None	None	None	Real-time

Table 9: Comparative Analysis of Recruitment Platforms

The comparative analysis confirms that Lead Scratcher uniquely combines comprehensive ATS analysis, semantic job matching, real-time feedback, and recruiter analytics within a cost-effective, open-source framework. No existing platform currently offers this complete combination of features at comparable accessibility.

IX. CONCLUSION

This paper has presented Lead Scratcher, an AI-powered smart job portal that addresses the critical limitations of traditional recruitment systems through the integration of Natural Language Processing, a weighted ATS scoring algorithm, and semantic job matching. The system successfully automates resume analysis, provides actionable candidate feedback, and delivers personalized job recommendations, while offering recruiters efficient candidate ranking and analytical insights.

The experimental results validate that Lead Scratcher achieves significant improvements in recruitment efficiency: approximately 70% reduction in screening time, measurably higher job matching accuracy through semantic analysis, and complete ATS transparency for candidates. All six primary test cases passed successfully, confirming the system's functional correctness and reliability. The use of exclusively open-source technologies ensures economic viability for organizations of all sizes.

X. FUTURE SCOPE

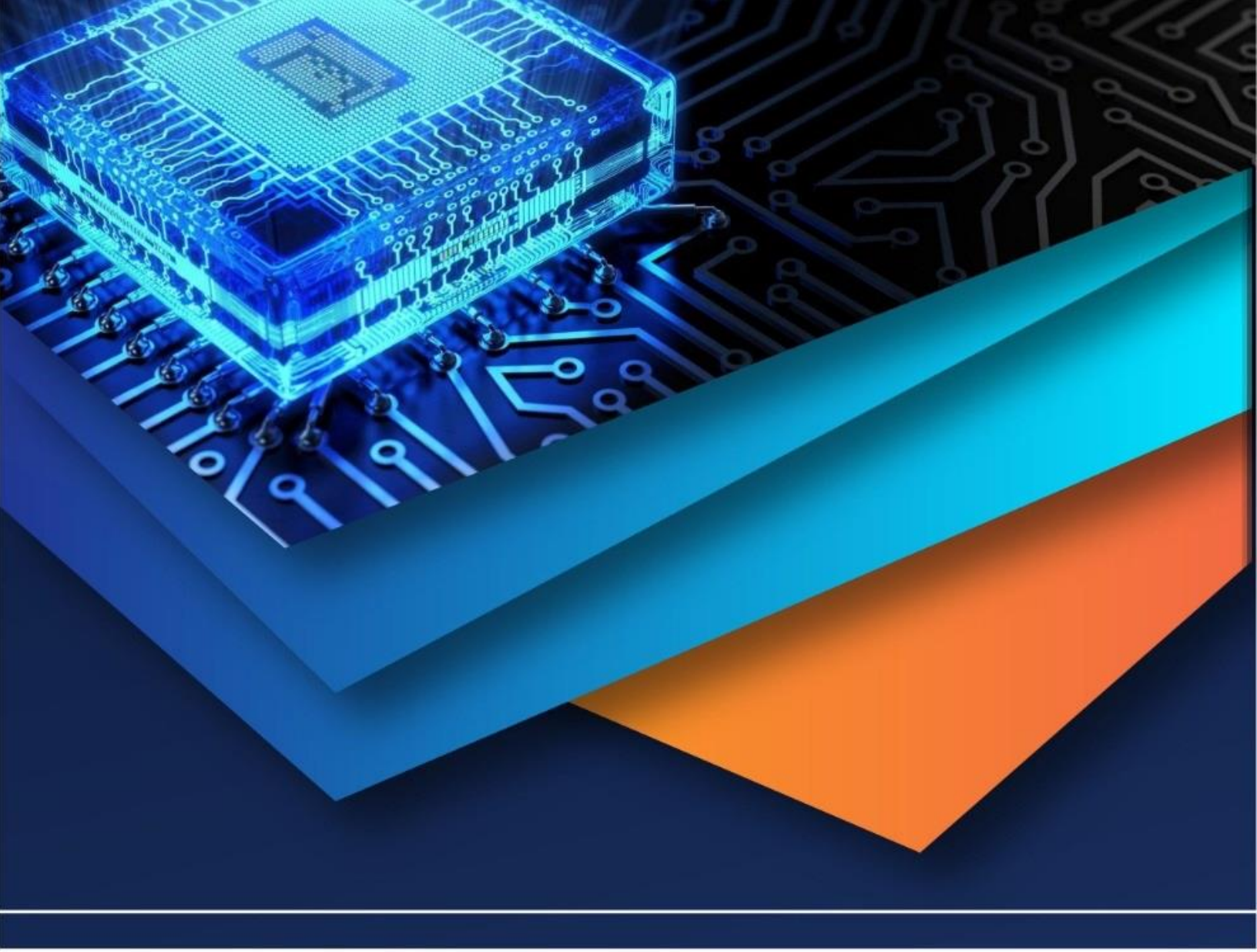
1) AI-Based Interview System: Integration of automated video interview analysis using natural language understanding and sentiment analysis.
2) Advanced Resume Builder: AI-generated resume templates with real-time optimization suggestions during creation.
3) Machine Learning Improvements: Continuous model retraining on recruitment outcomes to improve ATS scoring accuracy over time.
4) Mobile Application: Native iOS and Android applications for broader accessibility.
5) External Platform Integration: Real-time job feed integration with LinkedIn, Naukri.com, and Indeed APIs.
6) Multilingual Support: Extending NLP parsing to support resumes in multiple Indian and international languages.
7) Fraud Detection: Automated flagging of suspicious job listings using AI-based risk scoring algorithms.

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