

Research Paper

A Machine Learning Based Web Platform for Comprehensive Placement Preparation

Miss.T Venkata Sushmitha M.Tech
Assistant Professor
Department of Information
Technology
JB Institute of Engineering and
Technology Autonomous,
Baskar nagar,yenkapally,moinabad,
Ranga Reddy District, Hyderabad,
Telangana,India
susmithashetty203@gmail.com

G.Kiran Kumar
Student,
Department of Information
Technology
JB Institute of Engineering and
Technology Autonomous,
Baskar nagar,yenkapally,moinabad,
Ranga Reddy District, Hyderabad,
Telangana,India
gkirankumarchary2004@gmail.com

Ch.Shashank
Student,
Department of Information
Technology
JB Institute of Engineering and
Technology Autonomous,
Baskar nagar,yenkapally,moinabad,
Ranga Reddy District, Hyderabad,
Telangana,India
chittaloorishashank@gmail.com

V.Ajay Sai Ganesh
Student,
Department of Information
Technology
JB Institute of Engineering and
Technology Autonomous,
Baskar nagar,yenkapally,moinabad,
Ranga Reddy District, Hyderabad,
Telangana,India
vorugantiajaysaiganesh@gmail.com

Y.Akash
Student,
Department of Information
Technology
JB Institute of Engineering and
Technology Autonomous,
Baskar nagar,yenkapally,moinabad,
Ranga Reddy District, Hyderabad,
Telangana,India
yambariakash2020@gmail.com

Abstract - Today's competitive job market expects candidates to demonstrate their abilities through technical skills, analytical skills and strong communication skills as well as having an appropriate resume that reflects the skills needed in the workplace. Unfortunately, many students do not have sufficient access to an integrated system of personalized, centralized and smart preparation tools causing significant barriers to student employability. In light of these deficiencies, this project presents a new approach to a machine learning based web platform that provides students with an all-in-one preparation system that combines curriculum specific content, aptitude practice, resume assessment and a chat bot. The new system employs machine learning and natural language processing techniques including supervised classification models, keyword extraction, semantic similarity assessment and adaptive assessment algorithms to create a customized preparation process for each student. A combination of back-end application programming interfaces will be used to provide machine learning based performance evaluation and actionable feedback as well as real-time analytics and predictive models to enable users to identify their level of readiness for placement and to identify gaps or weaknesses in their skill sets needing improvement. Results from the evaluation of this system indicate the machine learning based platform will dramatically assist students in preparing for their placement by improving scores from quizzes taken during preparation, improving quality of resumes being submitted, and increasing the level of confidence of students moving into their placement process. Overall this project demonstrates that machine learning based platforms can reinvent how training and preparation occur for placements by providing

institutions and students with scalable, efficient and data driven preparation solutions.

Index Terms— Machine Learning, Natural Language Processing, Resume Analysis, Placement Prediction, Adaptive Learning, Web Platform, Student Employability, Chatbot, React.js, PostgreSQL.

I. INTRODUCTION

Finding a job after graduation is a significant achievement for many engineering graduates; however, there are still a lot of unknowns and challenges in terms of required skills for employment, employer expectations, and what others are doing in the way of competition. The job market continues to evolve at an unprecedented pace and all students are required to succeed academically, have the ability to think critically and communicate effectively, and solve complex technical issues. Traditional methods of preparing for placements, such as in-person workshops, using textbook resources, and taking aptitude tests from older resources, are not adequate to allow students to adequately prepare for what recruiters seek today. Additionally, students typically must wade through countless disorganized online resources across various platforms in order to find placement

preparation materials and will not find consistent organization of those resources. With regard to performance analytics, very few reliable or customized resources exist to assist students in

tracking their progress through the placement preparation process. These challenges highlight the need for students to have one central location to access an adaptive and intelligent resource to guide them through their placement preparation experience.

Because of technological advancements in machine learning (ML) and Natural Language Processing (NLP), the past ten years have seen a major change in many different fields such as Education, Recruitment and Intelligent Tutoring. In terms of placement training, machine learning has demonstrated that it has the ability to predict how successful students will be after placement, analyze patterns of performance and provide personalized recommendations based on a student's learning style, behaviors. Natural language processing has also aided in functions such as resume parsing, skill extraction, keyword matching and chatbot-based assistance - things that used to be done by hand. Research also supports that using TI algorithms to create personalized learning systems increases student engagement, speeds up the retention of knowledge and allows for the student to adjust their pace through a course. Due to these advancements, it should be apparent that data-driven systems have become increasingly important in the modern educational setting. However, many institutions still teach using traditional, one size fits all methods of instruction that do not consider an individual student's strengths, weaknesses or skill gaps. Therefore, there is an urgent need for institutions to adopt an AI and data-centric approach in their teaching and learning practices. In order to utilize the benefits of intelligent technologies while overcoming the deficiencies of the existing systems, the proposed research provides a web-based platform utilizing machine learning, which brings all of the key components of placement preparation together into a single integrated system.

The intelligent placement preparation system is designed to help students prepare for and secure employment through technical subject matter (skill) learning modules, aptitude test practice tests, resume feedback with natural language processing (NLP) analysis, predictive analysis using supervised machine learning (ML) for assistance selecting a career, and chatbot for real time support. Students will have access to many learning tools/processes like analytics dashboards for measuring learning achievement, adaptive pathways for learning skills based on student performance data, and automation mechanisms for feedback on assignments/projects to help create a structured, customized, and measurable way to prepare for future employment opportunities as well as become an integral part of employer recruitment. The modular structure allows the same data from assessments/quizzes, student resumes, and student interaction with the platform to be used across each of the above learning components to generate meaningful insights and improve the efficiency of preparing to acquire employment. In addition to improving students' academic and technical preparedness for their chosen career paths, the intelligent preparation system is also intended to improve students' confidence, reduce inefficiencies with preparing for employment, and provide a scalable tool that can help colleges and universities to efficiently and effectively support large numbers of graduate students in preparing for their future employment opportunities. This project discussion will establish the basis for understanding the importance of the project, the design of

the project, and potential effects of implementing the intelligent placement preparation system

II. LITERATURE SURVEY

Machine Learning automation has developed considerably over the years, and it has now become an integral part of hiring and education assessment processes. Initial implementations of resume parsing and automated document processing were necessary to establish that Natural Language Processing would play a key role in identifying relevant data from semi-structured documents. The introduction of tokenization, keywords extraction, and semantic processing have laid the foundations for conducting resume evaluation, as evidenced by several studies ([1]–[4]).

Advances in intelligent resume parsing, using Neural Networks for feature extraction, and NER based on the segmentation of Natural Language, as demonstrated in many studies ([3], [4], [12], [13]), have improved document understanding methodologies by increasing the accuracy of classification of resumes and of skills being extracted from resumes, through the use of supervised Networks, latent topic Modelling, and explainable AI Pipeline methodology. The research detailed in [14] and [15], uses multigranularity and multimodal approaches to describe how contextual meanings have been identified from resumes that exist in more than one format, thus providing greater certainty to the effectiveness of automated evaluations of resumes when evaluating candidates for different job roles.

In addition to automated resume processing, machine learning models for predicting academic and placement outcomes have also experienced significant growth in technology advancements. References [5]–[7] show that supervised techniques like Logistic Regression, Random Forests, and SVM can model the relationship between academic metrics, brain behavior patterns (aptitudes), and competencies. Using these types of predictive models to look at employability is not only valuable in that they identify which factors are strongly correlated to employability, but they also give Institutions data-driven support strategies.

Many studies in Educational Data Mining ([8]–[11]) demonstrate that Learning Analytics are essential elements for one to be able to track their progress and predict future academic outcomes. They also demonstrate how Decision Trees, Neural Networks, and Ensemble Learning Models consistently outperform traditional statistical approaches for analyzing complex, multidimensional student data. Evidence from these studies supports that ML-based systems are capable of detecting learning gaps, classifying students into performance categories, and sending out early-warning signals—features that are critical to improving overall student success measures.

Research studies [5], [7], [17] and [18] show that by using many different forms of predictor data, including CGPA, project experience, technical assessment scores and involvement in extracurricular activities, we can increase the accuracy of our predictions about whether or not students will be placed on a campus by a substantial margin. These research studies show that non-linear classifiers and ensemble based models have been very successful at accounting for the variability of the student profile with respect to their predictions of recruitment outcomes from

the previous research studies. In addition, the systems developed in those studies provide students with actionable feedback regarding which skills or areas of their academic performance need to be improved.

These recent developments have begun to incorporate multiple intelligent components such as resume parsing, skill gap analysis, predictive analytics, and recommendation engines into contained platforms, such as those illustrated in [4], [18], and [19], as a result of the growing transition to a fully-integrated ML-powered ecosystem that addresses both improving employability and optimizing recruitment. These integrated systems have also demonstrated that merging NLP, classification models, and analytics dashboards results in the creation of a more customized and impactful environment in which to prepare for employment opportunities. The body of literature supporting this position connects all of the functions of an intelligent, multi-module platform, utilising ML and NLP, in accomplishing long-standing challenges associated with preparation for placement, evaluation of resumes, and predicting the performance of students.

III. EXISTING SYSTEM

Generally speaking, placement preparation platforms cater to different aspects of placement readiness via standalone tools. Thus, many students do not have a comprehensive view of the skills they need to develop based on their area of interest, their aptitude and their level of experience. For example, most coding practice sites focus on algorithm and coding skills that prepare for technical interviews while failing to provide training on other areas (e.g., aptitude tests, resume evaluations, or whether or not the student will get hired to do the job). Other tools that focus on aptitude provide numerical and logical reasoning-type questions but do not have any significant amount of engineering subject matter questions or the ability to personalize using machine learning. This makes it difficult for students to prepare as they have to go through multiple platforms in order to do so.

In addition, many institutions depend upon online learning management systems to store notes, videos, or question banks for students. However, these systems are usually static and do not provide students with any ability to perform adaptive testing, track their progress using data analytics, or receive feedback on their performance via automated systems. In turn, all students that access the same learning management system will have the same materials and because of this, development will be severely limited by how a student progresses through the program. Any type of progress tracking that exists typically only provides students with broad stroke or aggregate measures (e.g., number of tests passed, % of tests passed) and does not provide them with the ability to examine their progress on a granular basis (e.g., how many questions were answered correctly in each area of engineering that were included in a student's placement preparation program).

Many colleges use manual and semi-automated processes within their placement cells to evaluate resumes. The traditional methods of evaluating resumes (faculty reviews, peer review teams, and template-based resume creation) lack the intelligence to leverage NLP techniques to effectively

analyze resumes. Specifically, they cannot detect missing keywords, quantify the relevancy of applicant skills, or compare resumes to job descriptions, leading to inconsistent and subjective feedback. Furthermore, these methods do not support the automated classification of resumes for quality or track improvements to applicant resumes across multiple revisions.

Most placement systems today also do not incorporate predictive analytics to estimate an applicant's likelihood of obtaining a job via placement. Typically, applicants approach the placement season without any quantitative sense of their preparedness. Without the support of ML-driven prediction models, current placement systems cannot correlate applicant performance relative to academic GPA, skill ratings, technical test results, aptitude score, or quality of resume; therefore, students do not know the specific variables that will negatively impact their chances of being hired.

In addition, existing platforms do not have AI helper chat bot systems that can answer questions in real-time or assist in preparing for an interview. This leaves students to search for answers from third-party sources such as other websites or YouTube videos and interrupts their study flow. Without centralized interactions among learning modules technical subjects, aptitude, résumé building and prediction; students will have disjointed experiences preparing. Current systems lack a unified, scalable, and intelligent ecosystem that meets all student placement preparation need.

IV. PROPOSED SYSTEM

=The new system will be a fully integrated, machine-learning-based preparation for placements platform that centralizes all the required preparation activities into a single intelligent ecosystem, eliminating the need for students' use of multiple separate applications. The platform includes learning modules with respect to technical subjects, assessments of aptitude, analyses of resumes, predictive models for placement, and an AI-enabled chatbot, all available in one cohesive environment (the platform is composed of individual modules that are interlinked and therefore can use the data generated in one module to provide personalised recommendations/feedback in other modules linked to it). As a result of this connectedness, every student receives continuous guidance and real-time insights throughout their preparation process.

The Core Subject Learning module contains structured learning content around key engineering topics, along with quizzes and adaptive assessments for each topic. The Aptitude Module applies dynamic adjustments in difficulty level based on an individual's skill level progression through the assessment process. The Resume Analyzer leverages NLP technology to extract skills, identify missing keywords, reveal areas of weakness within a resume, and assign a score to the resume based on industry best practices. Collectively, these modules serve as the foundation for developing the technical knowledge, problem-solving ability, and the quality and consistency of a student's resume—all of which are three of the four primary components needed for successful placement.

The Placement Prediction Module enhances the intelligence of the system by predicting placement success rates based on

supervised machine learning algorithms, while considering all elements included in the placement profile (CGPA, Technical Quiz Scores, Aptitude Performance, Resume, Project History, and Skills) to create a numerical output that illustrates the likelihood of a student being placed. Additionally, the module provides additional information about how the performance in each area aids or hinders a student's preparation process based on the trends available within the other students' profiles.

The AI Chat Bot will act as an interactive learning assistant, able to answer any student's inquiry, explain concepts, provide interview tips and help guide the user to perform actions on the platform. To accomplish this, an NLP-based intent recognition system will allow the Chat Bot to create real-time responses for students. Since the Chat Bot is used within the learning workflow, students will receive help without exiting the platform, decreasing their use of third-party resources and increasing their continuity of learning.

All machine learning models are running as separate microservices and interact to the backend through secured API calls. User performance data, resume evaluations and prediction results are stored in the central database, using PostgreSQL, using efficient storage and retrieval methods. Visual analytics are provided via reports from a central location and help students keep track of their progress through the use of dashboards that have been created to be accessed in this manner.

This plan has been developed so all of its elements connect well together and work together effectively to give you a total and unique experience preparing for placement after you leave school and that all parts of the process work properly together to provide a total and unique experience in preparing for placement after you leave school.

The benefits include:

- Create one place for all required activities: technical learning; aptitude practice; resume review; and prediction, in one location.
- Provide an individual experience to each user based on their performance through adaptive quizzes and machine learning-based analysis.
- Remove the manual review of resumes by automating resume evaluations using natural language processing.
- Provide a data-driven prediction of a student's readiness to be placed through machine learning models.
- An ai chatbot will aid in providing answers to inquiries made by students by providing support through real-time access to answers and/or assistance and not having to ask faculty or others for assistance in getting those answers.
- Provide unbiased, consistent predictions and evaluations through the use of machine learning models.

System Model

User Interaction Layer: The user interaction layer consists of the following elements: dashboard, quizzes, resume uploading, and chatbot. The user interaction layer processes user data and returns interaction results for those users. Backend Processing Layer: The backend processing layer contains the business rules for the application, including user authentication/authorization, data storage/retrieval, and communications with the machine learning (ML) microservices.

The machine learning section of the application consists of numerous individual machine learning modules including: placement prediction engine; resume analysis engine; and chatbot / inquiry classification engine. Each of the ML modules receives information from users and produces relevant results. The data storage section consists of PostgreSQL database management system containing diverse structured record types including user profile records, test results, resume features, ML placement prediction outputs and analytics logs.

The modular design of the system ensures an efficient flow of information between all of the system's components while providing a means for future enhancements to be implemented efficiently using maintainability and scalability principles. Data-based visual reports and custom suggestions will utilize these ML model derived results to generate both visualization reports as output for each student's experience and performance metrics. With modular design, this system has been built to allow smooth movement of data between all its components while still providing the ability to accommodate future system improvements through design concepts relating to scalability and maintainability.



Source: Generated by the proposed system.

V. IMPLEMENTATION

Using modular, service-oriented architecture, the designed system provides a flexible, scalable, easy to maintain and integrate way of implementing different functions within the system. As separate modules, these front-end, back-end, database, and ML services communicate with one another via

secure RESTful APIs. Because each subsystem is decoupled from each other, any one of the subsystems can be enhanced or scaled independent of other systems.

The focus was on creating a simple, user friendly experience from our initial designing phase using the React.js programming language for front-end development. Key user interaction interfaces include login and registration pages, dashboards, subject modules, aptitude modules, the resume upload window, and an interactive chatbot panel. Through the use of the virtual DOM and component-based architecture, React provides an efficient means of managing state, rendering dynamic content, and a smooth end-user experience that is critical in educational platforms that require ongoing user interaction and provide immediate feedback.

The infrastructure for the back-end was built using the Node.js and Express.js server-side frameworks to provide support for; [Event-driven, non-blocking] architecture, high-throughput application performance, and concurrent access by multiple users. The Express.js framework is used to create the routing, Middleware for authentication, and data validation layers.

The use of JSON Web Token (JWT) provides for secure communication between the user and application and provides protection of user privacy by securing the session and preventing access by unauthorized users. The backend functions as a conduit for communicating between the front end (user interface) and the various microservices performing the backend functions of machine learning (ML). It is responsible for orchestrating all API requests related to quiz submissions, upload of resumes, queries made to the chatbot, requests for a prediction, and requests for visualizing data. The application design incorporated features of error handling, rate limiting, and input filtering to improve the reliability and security of the application.

PostgreSQL is being utilized as the back-end database solution for this project because it is a reliable form of database management, and it can support an ACID-compliant transactional model. AOther features include the ability to efficiently work with huge amounts of data and to work with surrogate keys; so it is widely regarded as a fairly mature and stable relational database solution.

The schema that was built within PostgreSQL accommodates all of the structured data collected from the users including demographic information, quiz and aptitude test results, resume analysis, and predicted placement results. The design of the application required that there were separate tables for each type of data so that they could be easily queried for analysis. With regard to processing large amounts of data, there are significant features within PostgreSQL that permit the efficient processing of large data sets from quizzes, and for performance tracking, along with having features that allow for efficiency in indexing and querying. To support future enhancements, such as reinforcement learning, and enhanced personalization based on user history, a log table was created to capture data from the chatbot interactions with, and the activity of, users.

The application machine learning components were developed using Python, and the libraries used were scikit-learn, pandas, NumPy, spacy, and Flask. The production of machine learning

models in the application was achieved through a number of ML workflow steps including dataset preparation, data cleaning, normalization, feature extraction and feature scaling. The Placement Prediction module models used academic data, technical quiz results, aptitude scores and resume attributes from students to train the following models: Logistic Regression and Random Forest. The Resume Analyzer employed a large amount of NLP processing and used spaCy in order to extract keywords from resumes and identify skills and semantic similarity scores with job descriptions.

These services exposed API endpoints that can hit the backend to get predictions and results in real-time. By using a microservices architecture, ML components are kept separate from the rest of the application, allowing for them to be updated or retrained without affecting main application logic. The system was fully encapsulated using Docker, providing a uniform platform to facilitate the development, testing, and production life-cycles of the database application. Each module in the system (frontend, backend, machine learning microservices, and PostgreSQL database) was created as a separate container. The application was deployed using a cloud platform, providing for availability and scalability of the application to student users.

The entire system has been thoroughly tested: unit tests for individual components; integration tests for interaction between modules; and load tests for the system's performance during peak times. When testing the system on actual students, it provided valuable feedback and allowed us to make improvements to the usability of our design, as well as the user interface (UI), with regard to overall speed and accuracy of generated recommendations. In short, the product has been developed through good engineering practice and application of present-day technologies such as modern web development and advanced machine learning methods.

VI. CONCLUSION

Machine Learning (ML) can enhance placement preparation by automating the processes associated with it, improving the quality of the experience, and providing personalized feedback to users. The web-based platform combines five key functions – subject learning (technical skill), aptitude evaluation, resume analysis, placement forecasting, and an AI driven chatbot – to eliminate the siloed experience educational institutions currently provide their students when preparing for placements.

The user's preparation will be built on a structured and adaptive methodology, and according to their personal performance and targeted career objectives. Having all of these functions integrated into one platform will greatly increase students' motivation and provide them with consistent skills development. The results of the experiment evaluated the effectiveness of the system to enhance user placement readiness. Quantitative results demonstrate that the platform realized a high level of accuracy predicting placement outcomes. Qualitative results show that users felt more confident, had less friction accessing the different learning modules, and were able to derive meaningful insights that would not have been possible via current methods.

In summary, this platform provides a scalable and intelligent approach to address some of the current issues that exist with placement preparation. The modular architecture provides the means for future enhancements that may include: deeper integration of deep learning technologies; personalized interview simulations; increased analytics capabilities; and industry-specific training modules. As colleges and universities continue to implement technology-based solutions, this machine-learning (ML)-enabled system can provide benchmarks to guide future generations of placement preparation. The findings of many study suggests that by integrating machine learning technologies and established structured learning pathways/protocols will yield improved student outcomes and better prepare students to enter the workforce.

REFERENCES

- [1] R. Shaikh, M. M. Mallebhari, and S. Siddavatam, "Automated Resume Parser Using Natural Language Processing," *International Journal of Research in Interdisciplinary Studies*, vol. 3, no. 4, pp. 25–26, Apr. 2025.
- [2] B. V. Brindashree and T. P. Pushphavathi, "HR Analytics: Resume Parsing Using NER and Candidate Hiring Prediction Using Machine Learning Model," *International Journal of Research in Engineering, Science and Management*, vol. 6, no. 12, pp. 217–221, Dec. 2023.
- [3] R. Shettar and S. JH, "Resume Parsing System using NLP and Semi-Structured Supervised Networks," *Journal of Intelligent Data Analysis and Computational Statistics*, vol. 1, no. 3, pp. 21–27, Sep. 2024.
- [4] K. Sanyal et al., "Intelligent Resume Parsing and Job Recommendation via Web-Based CV Analysis System," *International Journal for Research in Applied Science and Engineering Technology (IJRASET)*, 2025.
- [5] V. S. Agrawal and S. Sheth, "Predictive Analysis of Campus Placement of Student Using Machine Learning Algorithms," *Journal of IoT and Machine Learning*, 2024.
- [6] M. Kumar et al., "Predicting College Students' Placements Based on Academic Performance Using Machine Learning Approaches," *International Journal of Modern Education and Computer Science*, vol. 15, no. 6, pp. 1–13, 2023.
- [7] A. Pathak et al., "A Machine Learning Framework for Predicting Student Placement Outcomes," *IIETA Journal of Intelligent Systems and Informatics*, 2025.
- [8] B. Albreiki, N. Zaki, and H. Alashwal, "A Systematic Literature Review of Student Performance Prediction Using Machine Learning Techniques," *Education Sciences*, vol. 11, no. 9, 2021.
- [9] N. R. Yadav and S. S. Deshmukh, "Prediction of Student Performance Using Machine Learning Techniques: A Review," in *Proc. Advances in Machine Learning and Data Engineering*, Atlantis Press, 2023, pp. 637–648.
- [10] M. Yağcı, "Educational Data Mining: Prediction of Students' Academic Performance Using Machine Learning Algorithms," *Smart Learning Environments*, vol. 9, article 11, 2022.
- [11] A. Namoun and A. Alshantiti, "Predicting Student Performance Using Data Mining and Learning Analytics Techniques: A Systematic Literature Review," *Applied Sciences*, vol. 11, no. 1, 2021.
- [12] K. Khelkhal and D. Lanasri, "Smart-Hiring: An Explainable End-to-End Pipeline for CV Information Extraction and Job Matching," *arXiv preprint*, Nov. 2025.
- [13] V. Jagwani et al., "Resume Evaluation through Latent Dirichlet Allocation and Natural Language Processing," *arXiv preprint*, Jul. 2023.
- [14] E. Kesim and A. Deliahmetoglu, "Named Entity Recognition in Resumes," *arXiv preprint*, Jun. 2023.
- [15] F. Jiang et al., "Towards Efficient Resume Understanding: A Multi-Granularity Multi-Modal Pre-Training Approach," *arXiv preprint*, Apr. 2024.
- [16] Z. Shaikh, Y. Bootwala, and M. A. Shaikh, "Resume Ranking Using ML and NLP," *International Journal of Advanced Research in Computer and Communication Engineering*, 2022.
- [17] V. N. Rao and P. Dhanalakshmi, "Campus Placement Prediction Using Machine Learning," *International Journal of Intelligent Systems and Applications in Engineering*, vol. 10, no. 4, pp. 771–777, 2022.
- [18] P. Verdia et al., "PLACIFY: AI-Based Placement Prediction and Skill Gap Analysis," *International Journal for Research in Applied Science and Engineering Technology (IJRASET)*, 2025.
- [19] P. Rasal et al., "Resume Parser Analysis Using Machine Learning and Natural Language Processing," *International Journal for Research in Applied Science and Engineering Technology (IJRASET)*, 2023.
- [20] M. M. Hussain et al., "Prediction of Student's Academic Performance through Data Mining Approach," *Journal of Informatics and Web Engineering*, vol. 3, no. 1, pp. 241–251, 2024.