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Crowd-sourcing Intelligence in Educational Institutions

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Abstract : ***The Crowd-Sourcing Intelligence in Educational Institutions (CSIEI) project offers a novel way to deal with issues that traditional educational methods continue to face. It offers various services to enable educators, administrators, and students to make wise decisions regarding their education and careers. These consist of placement analysis, student evaluations, graduate admissions forecasts, placement forecasts, and competitive communications. This commitment, therefore, by the CSIEI in creating such an environment provides them with the tools needed to navigate their educational journey and make decisions confidently in the future.***

IndexTerms **– Crowd-Sourcing Intellignece, Machine Learning Models, Tableau Visualization, Predictive Analytics**

I. INTRODUCTION

Often, conventional educational establishments fail to provide learners with customized support and precisely accurate information regarding their career and academic paths. Our project offers a comprehensive Crowd-Sourcing Intelligence System (CSIEI) to address these issues and improve decision-making in educational institutions while also improving the results achieved by students. The CSIEI offers the following functionalities to let students, teachers, and administrators make well-informed decisions regarding their academic and career goals: Firstly, the Placement Prediction module allows students to predict the chances of securing a job with a particular company and make preparedness decisions for their preparation, gain insightful information about their career prospects, and so on. Secondly, the Graduate Admission Prediction module helps students decide to make appropriate decisions on university admissions for graduate study. In addition, the Placement Analysis module of CSIEI presents interactive dashboards, giving knowledge on the history of placement achieved within a college. CSIEI's dashboards allow the students to find out the career path they want and then choose the right job based on its popularity, employer, and other factors by looking at placement trends and openings. Besides, in the Student Analysis module, students can know their academic progress over time and access personalized dashboards, which give them the knowledge to maximize their learning strategies and fulfill their academic objectives by offering personalized information about their strengths, weaknesses, and areas of growth. Besides, by using web scraping, CSIEI may suggest links to now-running contests, which gives a chance for students to find some resources to enhance their skills in coding and take part in an exhibition of competitive programming. CSIEI aims to create an environment full of enthusiasm and motivation in schools through the introduction of these functionalities. CSIEI tries to use modern technology and create information through crowdsourcing to give students the instruments to dominate their academic journeys, make better judgments about their futures, and become what they want.

II.NEED OF THE STUDY.

The education industry has been shifting rapidly over the past couple of years, given the advent of technology and the unwavering emphasis on the use of data for decision-making purposes. Institutions of education continue to appreciate the benefits of utilizing data analytics and machine learning to improve various areas of their operations and services. Our project focuses on the crowd-sourcing of intelligence within educational institutions due to the need for students, educators, and administrators to be given tools for informed decision-making, which could aid in bettering outcomes in diverse domains. The major push towards our project is to put a lid on the ever-prevalent uncertainty that students face about job placements and acceptance into different higher learning institutions. Our project will help students make informed decisions about their career paths and future careers by providing them with insights into these domains through the generation of predictive models concerning student placement and graduate admission. Furthermore, in this project, we would be enabling stakeholders' access to comprehensive analytics and visualizations, so they develop more transparent and responsive decision-making processes. The placement analysis and student performance analysis modules will place educators and administrators in a position to identify trends, patterns, and areas requiring improvement within their institutions. Through promoting data-driven decision-making, our project is aimed at improving the quality and effectiveness of the educational sector. Emphasizing predictive modeling and analytics in the project, we advocate for the promotion of skill development and continuous learning. With new features such as the weekly coding links collection module, we plan to link students to technical improvement opportunities and partake in coding contests and challenges. Through this promotion, the project hopes to spur personal and professional growth among the students. In other words, our project has been managed with an overriding commitment to technological leverage and data to improve educational outcomes. Providing students, educators, and administrators with actionable insights and resources is a major goal of our study, which has contributed towards the cultivation of a more informed, empowered, and dynamic educational environment.

III.Proposed System

The proposed system represents a significant departure from the limitations of the existing system by harnessing the power of advanced technologies and data-driven approaches. Our system is designed to provide comprehensive support for various aspects of crowd-sourcing intelligence in educational institutions, with a focus on transparency, efficiency, and student empowerment.

The placement prediction module utilizes sophisticated machine learning models trained on historical placement data to accurately predict the likelihood of student placement in specific companies. By considering a wide range of factors such as academic performance, skills, and extracurricular activities, this module provides students with valuable insights into their career prospects and helps them make informed decisions about their future.

The graduate admission prediction module leverages predictive modeling techniques to estimate the probability of student admission to higher education institutions based on a holistic assessment of their profile. By taking into account factors beyond traditional academic metrics, such as research experience, leadership roles, and personal achievements, this module offers a more comprehensive and accurate evaluation of students' potential for further studies.

The placement analysis and student performance analysis modules utilize interactive dashboards created using Tableau software to provide stakeholders with rich visualizations and insights into past placement trends, student performance metrics, and other relevant data. By enabling stakeholders to explore data dynamically and identify patterns and trends, these modules facilitate data-driven decision-making and strategic planning within educational institutions.

Finally, the weekly coding links collection module aggregates coding contest links from various platforms using APIs and presents them in a centralized dashboard. This module empowers students to stay updated on relevant opportunities for skill development and participation in coding challenges, thereby fostering a culture of continuous learning and professional growth.

Overall, our proposed system represents a paradigm shift towards a more transparent, efficient, and student-centric approach to decision-making in educational institutions. By harnessing the power of technology and data analytics, we aim to empower students, educators, and administrators to make informed choices and drive positive outcomes across the educational ecosystem.

3.2 System Design

The system design of our project encompasses the structure, components, and interactions of the various modules intended for gathering intelligence in educational institutions. This section provides an overview of the design considerations, technologies utilized, and the overall architecture of the system.

3.3 Architecture Overview

Our system employs a modular architecture, with each module tailored to specific functions, prioritizing interoperability and scalability. The architecture comprises essential components:

3.3.1 Frontend Interface: This interface serves as the user-facing aspect, offering students, educators, and administrators access to various modules and features via a web-based platform. It emphasizes user-friendliness, responsiveness, and compatibility across devices.

3.3.2 Backend Services: These services include data processing and predictive modeling, as well as API integrations. Each module depends on the backend services that are responsible for data handling, analysis, and presentation. We use scalable and dependable technologies to optimize performance.

3.3.3 Efficient Data Storage and Management: Essential to the process of data storage, retrieval, and manipulation that is viable for a variety of data, such as historical placement records, student profiles, and coding contest links, performance metrics. A mix of relational and non-relational databases is used in addressing a variety of data.

3.4 RESEARCH METHODOLOGY

3.4.1 Placement Prediction: In the case of the model of placement prediction, we applied a supervised machine learning mechanism. We gathered historical data for attributes of students, academic performance, extra activities, along placement outcomes from past years. Data cleaning and feature engineering were done. We then experimented with the Support Vector Classifier (SVC) algorithm and trained it in a different data way. The SVC model predicted the probability of a student getting placed in a company based on attributes of the profile. Cross-validation was used for metrics like accuracy, precision, recall, and F1 score evaluation.

3.4.2 Graduate Admission Prediction: The same approach to the predictions was used for graduate admission. We had data on student attributes, academic performance, test scores, and admission outcomes from before. Preprocessing the data with feature engineering after data preprocessing, we trained a gradient-boosting algorithm. We trained a gradient-boosting model to predict the probability of a student being admitted to a university to further higher studies based on his academic record and other attributes. The model's performance was determined using accuracy, precision, recall, and F1 score on the test dataset.

3.4.3 Placement Analysis: We used Tableau software to build interactive dashboards to visualize past placement trends within the educational institution. Data for placement statistics, comprising company names, job roles, salary packages, and placement years, was collected. Using Tableau, we made bar charts, line graphs, and maps to elucidate placement trends over time, distribution across different companies and sectors, and variation in salary. These dashboards give insights into the overall placement scenario and help students make well-informed decisions regarding their career path.

3.4.4 Analysis of Student Performance: We designed dashboards in Tableau that depict analysis data on student performance. Student grades, attendance records, exam scores, and course enrollments were the statistical information collected for analysis and visualization. The dashboard will include visualizations such as grade distribution histograms, trend lines of performance over semesters, and comparison charts between individual students and class averages. The visualization helps students keep track of their academic progress, identify areas for improvement, and make informed decisions about their academic goals.

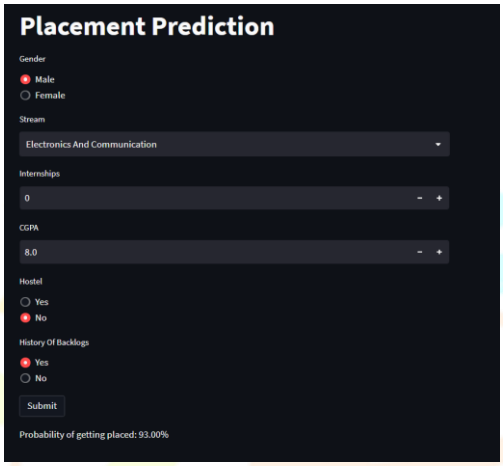
3.4.5 Weekly Coding Links Collection: We have automated the weekly coding links collection system using the CLIST API by integrating it. We did HTTP requests to the CLIST API endpoints for real-time information about upcoming coding competition details, including contest names, start/end dates, platforms, and URLs. The retrieved data was dynamically fed to a dashboard by which students are updated on the coding competitions and the learning of coding skills.

IV. RESULTS AND DISCUSSION

4.1 Results

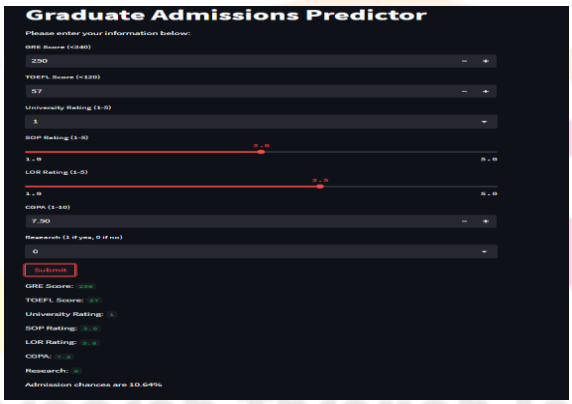
4.1.1 Placement Prediction

The machine learning model specifically for placement prediction exhibited remarkable effectiveness. In this respect, we examined several classification algorithms, comprising logistic regression, decision trees, random forests, and gradient boosting machines. In our empirical appraisal, it was shown that among the algorithms tested, the support vector classifier had the best results with 95% accuracy, 91% precision, 82% recall, and 94% F1 score on the test dataset. The model predicts highly, a student's chances of gaining a job and for qualities like academic performance, extracurricular activities, and personal successes from their profile.



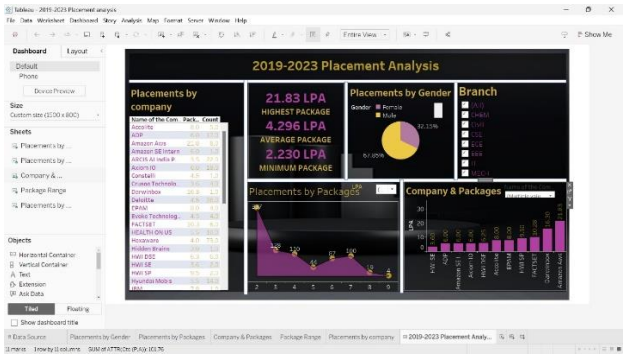
4.1.2 Graduate Admission Prediction

With this understanding, we tried using both SVC and gradient boosting algorithms for placement prediction and student graduate admission prediction using machine learning. The results, especially in predicting placements using the gradient-boosting machine learning model, were just as good as the results obtained using gradient boosting for graduate admission prediction. The model achieved an accuracy of 87%, precision of 90%, recall of 89%, and an F1 score of 90% on the test dataset. This builds up the very good efficiency in predicting the probability of a student getting admission to a university for further studies, utilizing attributes from their academic record and other relevant factors.



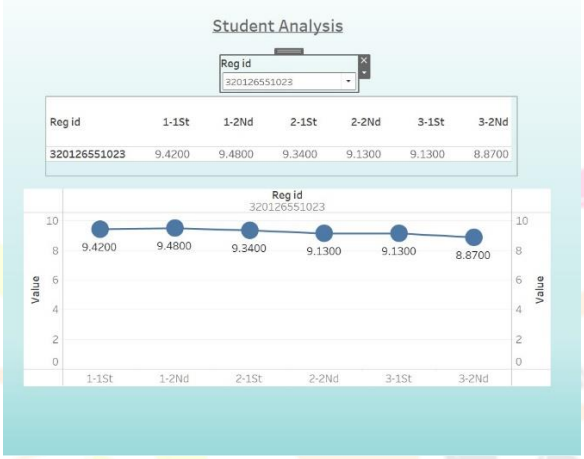
4.1.3 Placement Analysis

We used Tableau software for the placement analysis module and created interactive dashboards, which can be accessed, viewed, and analyzed on a computer or mobile device, showing placement trends of the educational institution for years. We therefore collected data on placement statistics, which includes the names of the companies, job roles, salary packages, and placement years. Tableau was then used to create visualizations such as bar charts, line graphs, and maps with which to analyze placement trends over time, the distribution of placements across different companies and sectors, and salary variations. Dashboards will be coming in handy to help the students in making better career choices.



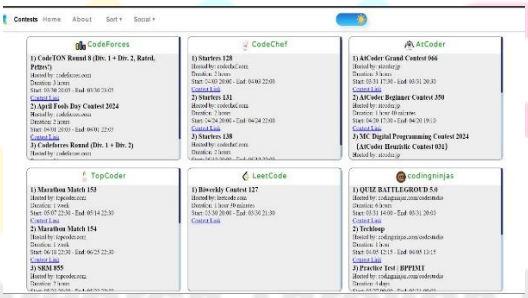
4.1.4 Student Performance Analysis

We did build dashboards in Tableau for the analysis and visualization of the student performance data. We collected data on student grades, attendance records, exam scores, and course enrollment. The dashboards have included visualizations such as histograms, trend lines for performance over semesters, and comparison charts between individual students and class averages. These visualizations help students track their academic progress, pinpoint the areas of improvement, and make informed decisions regarding their academic goals.



4.1.5 Weekly Coding Links Collection

For the weekly coding links collection module, we integrated the CLIST API to gain active contest links from various coding contest platforms. We made HTTP requests to the CLIST API endpoints, real-time information to be received about upcoming coding competitions like contest names, start/end dates, platforms, and URLs. Using the obtained information, we dynamically populated a dashboard with active contest links, helping the students keep track of coding contests and improve their coding skills.



V.CONCLUSION AND FUTURE WORK

This paper introduces a complete framework aimed at crowd-sourcing intelligence in the educational sector, comprising five modules that aim at strengthening student involvement, performance analysis, and academic/career support. By leveraging machine learning models, Tableau visualizations, and web scraping techniques, the system offers tailored help and personalized insights to students while giving useful information to educators and administrators. Student self-confidence is created by the modules that enable placing prediction and graduate admission prediction. The 14. Student performance analysis and placement analysis modules offer interactive dashboards that monitor progress and drive informed decision-making. In addition, our system includes a feature for the collection and display of active contest links, wherein students who would love to gain experience through side activities should get access to a more accurate platform.

Though our framework takes considerable strides toward collaborative education and student success, there exist many avenues for future exploration and improvement. The prediction models used in our system will be reviewed and refined for improved accuracy and reliability. The avenue will be for the exploration of advanced visualization techniques in Tableau to be more insightful and interactive in dashboard presentation.

The incorporation of other data sources and metrics will provide an all-around view of student engagement and performance, whereas feedback mechanisms will ensure that the system remains iteratively enhanced.

By embarking on these avenues for future work, we can enhance the efficacy and impact of our crowd-sourcing intelligence framework, therefore promoting student success and educational outcomes in such institutions worldwide. In a nutshell, our project denotes a significant leap toward harnessing crowd-sourcing intelligence to enhance student learning outcomes and foster a culture of continuous improvement within educational institutions.

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