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FUTURE PATHWAY AI-POWERED CAREER PREDICTION FOR STUDENTS BASED ON SKILLS AND ACADEMIC PERFORMANCE

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Abstract- In today's rapidly evolving job market, accurately understanding and predicting a student's career trajectory is of paramount importance [1]. This study aims to forecast the future career paths of students by leveraging a combination of their academic performance—specifically college CGPA—and their assessed skills, which are increasingly vital in the modern, competitive employment landscape. By integrating historical job placement data, the proposed system evaluates whether a student's profile aligns with the types of companies where graduates are most likely to secure employment [4]. Furthermore, it goes beyond mere placement prediction by identifying the specific roles and responsibilities that suit individual students based on their performance and competencies. A key objective of this work is to bridge the gap between student preparedness and industry expectations. To that end, the system offers personalized guidance on the future skills that students should develop to meet evolving industrial demands. This personalized information is delivered in a secure and confidential manner, ensuring privacy and trust.

Keywords: Career Prediction, Machine Learning in Career Guidance, Predictive Analytics, Personalized Career Planning.

1. INTRODUCTION

In the contemporary landscape of education and employment, where the demands of the job market are constantly evolving, the Career Forecast Project stands out as a groundbreaking initiative aimed at bridging the gap between education and employability [2]. As students navigate through a multitude of academic subjects, skill-building platforms, and career possibilities, the need for personalized and data-driven career guidance has become more essential than ever [5].

While traditional educational platforms—such as W3Schools, Code academy, and similar online learning environments—focus predominantly on content delivery and skills acquisition, they often lack the capability to guide students on how their unique academic profiles and competencies align with real-world career opportunities [7].

The Student Career Prediction Project takes a transformative and holistic approach by leveraging advanced machine learning algorithms, specifically Convolutional Neural Networks (CNNs), to analysing a wide array of student data. This includes academic performance metrics such as CGPA, detailed skills assessments.

By doing so, the system is not only able to predict likely career paths but also match students to specific roles and industries where they are most likely to succeed based on historical job placement data. What sets this initiative apart is its ability to deliver personalized, secure, and actionable career recommendations, empowering students with a deeper understanding of their strengths and how they align with current and future job market trends.

The system also suggests targeted skill development based on industry expectations, ensuring students are better equipped to meet employer demands and excel in their chosen fields [6].

Through this AI-powered guidance, students are no longer left to make career decisions in isolation but are supported by a predictive framework that helps unlock their full potential and chart a well-informed pathway toward success [9].

2. RELATED WORK

The current landscape of career guidance tools includes various Student Career Prediction Systems, which are primarily designed to predict students' academic performance and suggest potential career domains by analysing historical data. These systems serve as a bridge between academic evaluation and early career planning by identifying patterns in student behaviour and performance that align with specific professional fields.

The foundation of these systems typically lies in the collection of comprehensive student data—including academic records such as grades and CGPA, participation in extracurricular activities, and self-reported career interests [5].

Once the data is gathered, the system undergoes a data preprocessing stage where irrelevant or noisy data is filtered out, and essential features are selected to optimize model performance.

Subsequently, various machine learning algorithms are applied to this refined dataset to forecast academic performance and recommend suitable career paths based on similarities with historical student data and career trajectories.

These systems often come equipped with user-friendly interfaces, allowing students or administrators to input relevant information and instantly receive predictions. The output usually includes expected academic performance (e.g., final CGPA or subject-wise strengths).

However, while these systems offer valuable insights, they have notable limitations. Most existing models do not include feedback mechanisms, meaning that the system does not learn or improve based on the outcomes of past predictions. Additionally, they often fail to predict specific companies or roles that a student may be suited for, which limits the system's utility in real-world career planning and job market readiness.

From a deployment perspective, many systems ensure a degree of data privacy and security, complying with basic educational data handling regulations [1]. Ethical considerations, such as fairness in predictions and data transparency, are also maintained to a certain extent. Despite these efforts, there remains a significant opportunity to enhance these systems by incorporating personalized company-role mapping, industry-specific skill recommendations, and continuous learning models that adapt based on new data trends.

Thus, while the existing systems lay the groundwork for career prediction based on academic and extracurricular performance, they lack the depth and personalization needed to truly guide students toward specific roles in specific organizations, in alignment with real-time industry demands [4].

Moreover, most existing career prediction systems adopt a static, one-size-fits-all approach, often failing to accommodate the dynamic and diverse nature of students' personal growth, changing interests, and evolving industry landscapes. These systems typically provide broad career domain suggestions without considering real-time job market trends, company-specific requirements, or the continuous development of in-demand skills. The lack of interactive features, such as real-time analytics dashboards or adaptive learning paths, also limits student engagement and self-reflection [7].

As a result, students may find it challenging to take actionable steps toward their goals, despite receiving a career prediction. This gap underscores the need for a more intelligent, responsive, and holistic system that not only interprets academic and skill-based inputs but also aligns them with emerging career opportunities, evolving industry standards, and the student's unique potential.

3. PROPOSED SYSTEM

The proposed Student Career Guidance System represents a significant advancement over traditional models by integrating modern deep learning techniques—specifically, a Convolutional Neural Network (CNN) algorithm—to deliver highly personalized and accurate career trajectory predictions. domain suggestions, this approach dives deeper into the analysis of a student's academic performance, acquired skills, extracurricular involvement, and personal preferences to generate precise recommendations that align with individual aspirations and current industry demands will specify and verify cases.

The user-friendly interface a allows students to input their details, receiving personalized recommendations for the suitable companies and preferred roles.

Disadvantage: We can't take actions on the intruder based on the actions of the intruder. The Updation is not efficient in this system and we can retrieve the data easily.
Here a Collaborative case Administration (CPA for short) is proposed with the essential idea of CPA is that applications with similar functionalities. Every DBA has to accept the modification whichever had been done in the database. We can protect the data from multi hand administration. Any unauthorized person involves to leak the cases means a SMS notification will sent to the admin directly.
Advantages: This system take actions on the intruder based upon the actions of the intruder in multiple level of authentication. We can protect the data from multi hand administration

4.1 DATA PROCESSING

The data preprocessing module for the proposed student career guidance system is a pivotal step in optimizing the raw dataset for subsequent machine learning tasks. It begins by addressing data quality concerns, including the handling of missing values through techniques like imputation or removal, and addressing outliers that might skew the model's performance. Numerical features undergo normalization or standardization to ensure uniform scaling, while categorical variables are encoded for compatibility with machine learning algorithms. Strategies for handling class imbalances are employed to ensure fair representation of different career domains. Feature engineering techniques are applied to create new relevant features, and text data undergoes preprocessing steps like tokenization and stemming. Additionally, the module addresses multi collinearity, considers time series resampling when applicable, and meticulously splits the data into training and testing sets for model evaluation. Ethical considerations, including bias mitigation, are integrated into the preprocessing process.

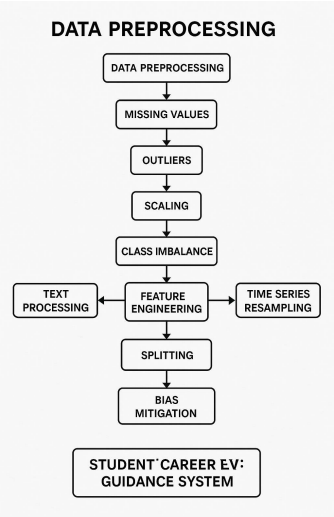

Fig. 4.1 Data Processing

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4.2 Convolutional Neural Network (CNN) algorithm

In the envisioned student career guidance system, the Convolutional Neural Network (CNN) algorithm serves as the cornerstone for making nuanced predictions based on diverse student data. Tailored to handle structured information beyond its traditional image recognition domain, the CNN is adept at discerning intricate relationships within academic performance metrics, skills, and extracurricular activities. Leveraging convolutional layers, pooling mechanisms, and fully connected layers, the model automatically learns spatial hierarchies and identifies complex patterns crucial for predicting suitable companies and preferred roles. Activation functions introduce non-linearity, and regularization techniques mitigate overfitting during training. The CNN's architecture is optimized through hyperparameter tuning, ensuring its adaptability to the specific task of student career prediction. Beyond its predictive capabilities, the model's interpretability is enhanced through visualization techniques, providing insights into feature importance.

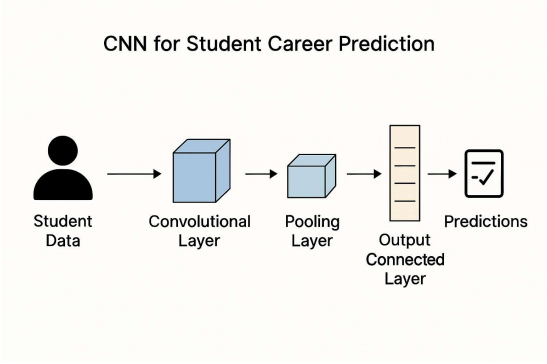

Fig.5.2. Conventional Neural Network (CNN)

4.3. Details Updation with Model Prediction

The model prediction and updating module in the student career guidance system is pivotal for maintaining accuracy and relevance. Leveraging the trained Convolutional Neural Network (CNN) model, this module generates predictions for students based on academic performance, skills, and relevant features, offering recommendations for suitable companies and preferred roles. An integrated user feedback mechanism facilitates input from students, educators, or career counselors on the accuracy of predictions and the alignment with their expectations. Systematic analysis of feedback guides ongoing model evaluation, measuring performance metrics and identifying areas for improvement. The dynamic model updating process involves retraining with new data and adjusting hyperparameters based on user feedback, ensuring the model evolves with changing trends.

In addition, this module incorporates real-time data handling to ensure predictions are reflective of the most recent academic achievements and skill development. It supports modular data input, allowing updates to individual profile attributes without requiring full profile re-submission. The system also uses weighted prediction scoring, where specific features such as technical skills, internships, and certifications are prioritized depending.

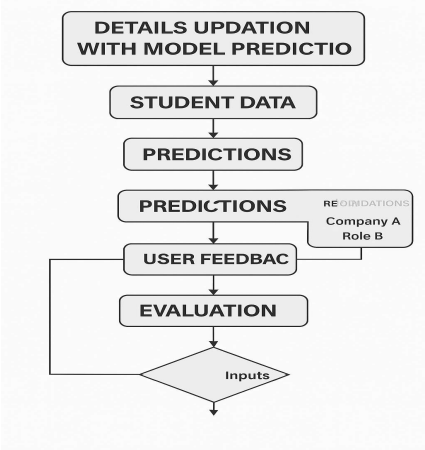

Fig.4.3. Details Updation with Model Prediction

4.4. Predicting companies and preferred roles

The Predicting Companies and Preferred Roles module within the student career guidance system employs the trained Convolutional Neural Network (CNN) model to generate personalized recommendations for students. Gathering input on academic performance, skills, and extracurricular activities, the module leverages the model's ability to discern intricate patterns, predicting suitable companies and preferred roles. Output includes detailed recommendations, offering insights into potential employers aligned with the student's profile. An integrated feedback loop ensures continuous refinement, allowing users to provide input on the accuracy of predictions. The module dynamically updates to reflect evolving industry trends, incorporates user-friendly presentation interfaces, and, if applicable, integrates with job platforms for real-time job opportunities

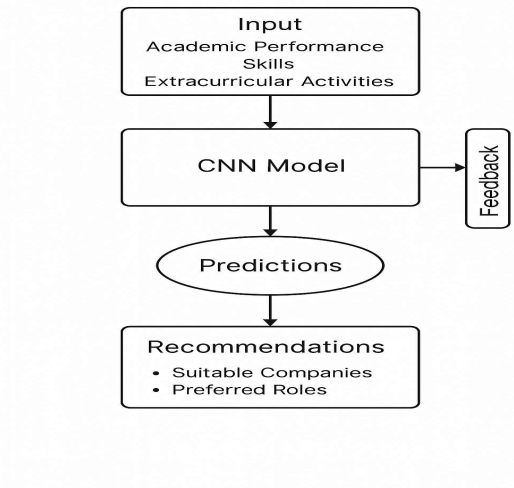

Fig.4.4. Predicting Companies and Preferred Roles

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4.5. Feedback Mechanism

The Feedback Mechanism module in the student career guidance system is designed to systematically gather insights from users, including students, educators, and career counselors, to enhance the accuracy and relevance of the system's predictions. Integrated into the user interface, this module prompts users to provide structured feedback on various aspects such as prediction accuracy, relevance of recommended companies and roles, and the usability of the system. Real -time submission capabilities allow users to share their thoughts immediately after receiving recommendations. The collected feedback is stored and logged for further analysis using data tools, facilitating continuous improvement. By integrating the feedback loop with the model updating module, the system ensures that user insights directly contribute to refining the Convolutional Neural Network model.

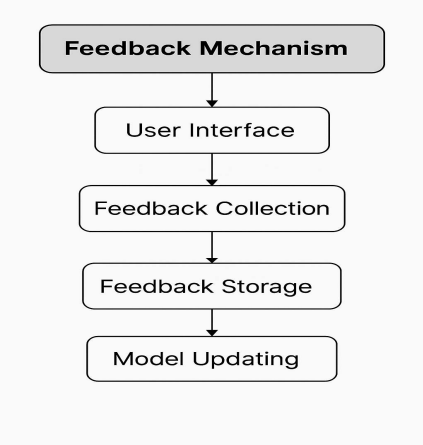

Fig.4.5. Feedback Mechanism

5. EXPERIMENTAL RESULTS

This Result discusses about the student career guidance system has generated personalized career recommendations by analyzing the user's academic profile and skillset. Based on the predictions for various cases are identified and the below Fig.5.1., Fig.5.2., Fig.5.3. and Fig.5.4. shows the implementation of personalized career recommendations.

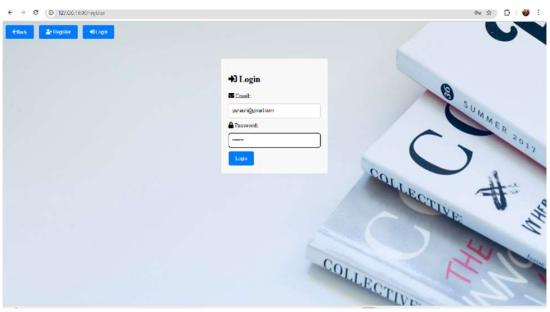

Fig.5.1. Login Page

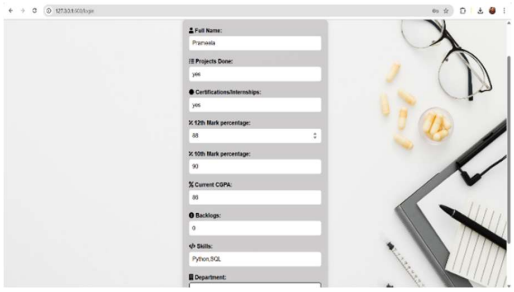

Fig.5.2. Collecting User Details

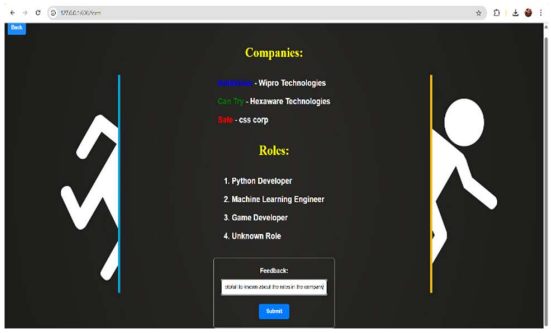

Fig.5.3. Result

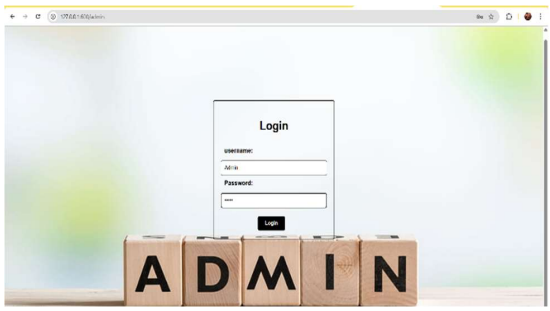

Fig.5.4. Admin Login Page

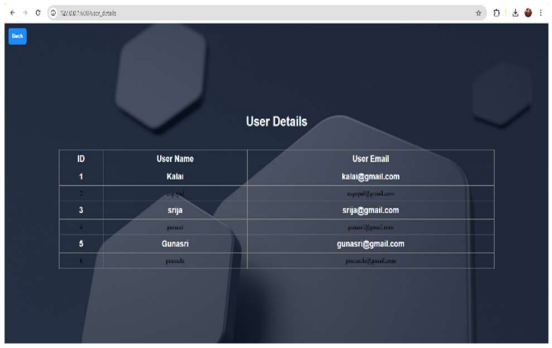

Fig.5.5. User Details

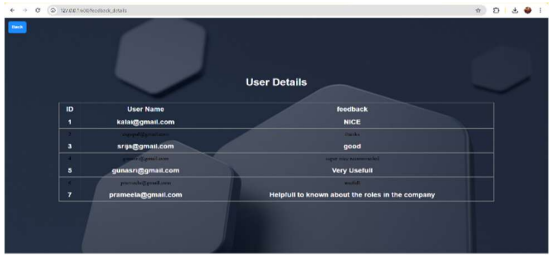

Fig.5.6. User Feedback

6. CONCLUSION

In conclusion, the student career prediction project represents a comprehensive and innovative approach to guiding students in their academic and professional journeys.

By leveraging the power of the Convolutional Neural Network (CNN) algorithm, the system excels in predicting suitable companies and preferred roles based on students' academic performance and relevant features. The project's current capabilities encompass personalized career recommendations, integrating academic performance, skills, and extracurricular activities.

These future developments aim to further refine the accuracy of predictions, enhance the user experience, and ensure that the system remains aligned with the dynamic nature of the job market and evolving industry demands.

As the project evolves, collaboration with educational institutions, industry partners, and continuous user feedback will be integral to its success. The commitment to transparency, privacy, and ethical considerations underscores the responsible development and deployment of the system.

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