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A PER SONALIZED STUDENT ADVISORY SYSTEM USING MACHINE LEARNING

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Abstract : The "A PERSONALIZED STUDENT ADVISORY SYSTEM" is a multifaceted project designed to streamline the career planning and job search process for students and job seekers. The project encompasses a user-friendly web application featuring a central homepage with accessible options for career guidance. Leveraging advanced technologies such as machine learning and generative AI, the platform offers a suite of tools tailored to address various aspects of the career journey. The "Placement Eligibility Predictor" employs machine learning models to assess a student's eligibility for job placements based on key metrics including age, internships, backlogs, CGPA, and gender. Additionally, the platform includes a "Job Description Generator" that utilizes generative AI to produce customized job descriptions based on provided job titles. Furthermore, a "Job Title Predictor" predicts suitable job titles based on user-provided skills, while a "Cover Letter Generator" creates personalized cover letters tailored to specific job titles. Lastly, an "Interview Questions Generator" generates interview questions customized to the job title provided by the user. Together, these tools aim to empower users with personalized guidance and resources to enhance their career prospects and job search success.

Keywords: *Personalized Student Advisory System, Career Planning, Job Search Process, Web Application, Machine Learning, Generative AI, Placement Eligibility Predictor, Job Placements, Key Metrics*

1. INTRODUCTION

The project titled "A PERSONALIZED STUDENT ADVISORY SYSTEM" is a comprehensive platform developed to assist individuals, particularly students, in navigating the intricate landscape of career planning and job search. The platform serves as a centralized hub accessible via a user-friendly homepage, where users are presented with a range of options to cater to their career needs. Leveraging cutting-edge technologies such as machine learning and generative AI, the A Personalized Student Advisory System offers a suite of tools tailored to address different aspects of the career journey. At the core of the project is the "Placement Eligibility Predictor," which harnesses machine learning models to evaluate a student's suitability for job placements. By analyzing factors such as age, number of internships, backlogs, CGPA, gender, and the preferred prediction model, the Placement Eligibility Predictor delivers valuable insights into placement eligibility, aiding users in making informed decisions about their career paths. Furthermore, the platform features a "Job Description Generator" powered by generative AI, enabling users to generate customized job descriptions based on provided job titles. This tool empowers users with a deeper understanding of job roles and responsibilities, facilitating better alignment with their career aspirations. In addition to job description generation, the A Personalized Student Advisory System includes a "Job Title Predictor" that predicts suitable job titles based on user-provided skills. This functionality assists users in identifying potential career paths and opportunities aligned with their skill set. Moreover, the platform offers a "Cover Letter Generator" that leverages generative AI to produce personalized cover letters tailored to specific job titles. This feature enhances users' job application processes by providing them with professional and tailored cover letters that effectively highlight qualifications and suitability for the role. Lastly, the "Interview Questions Generator" generates interview questions

customized to the job title provided by the user. By offering tailored interview preparation materials, the A Personalized Student Advisory System equips users with the confidence and readiness to excel in job interviews. Overall, the A Personalized Student Advisory System aims to empower users with personalized guidance and resources to navigate the complexities of the job market, enhance their career prospects, and achieve success in their professional endeavors.

2. Literature Survey

2.1. Introduction

Student success in the job market hinges on various factors, including academic performance, relevant skills, and effective career preparation. Traditional advising systems often struggle to provide personalized guidance at scale. This literature survey explores research relevant to developing a "Personalized Student Advisory System" that leverages machine learning and generative AI to empower students in their career journeys.

2.2 Placement Eligibility Prediction

Predicting a student's placement eligibility can provide valuable insights for career planning. Several studies explore using ML models for this purpose.

- A study by Isah et al., 2020: <https://ieeexplore.ieee.org/document/10212409> demonstrates the effectiveness of decision trees in predicting student placements based on factors like CGPA, backlogs, and internship experience.
- Similarly, research by Singh et al., 2019 explores using random forests for student placement prediction, achieving promising results.

2.3 Job Description Prediction and Job Title Prediction based on Skills

Extracting relevant information from job postings and tailoring applications are crucial skills for students. Generative AI offers innovative solutions in this domain. Generative pre-trained transformers have emerged as powerful tools for text generation. Research by OpenAI: <https://openai.com/> showcases GPT's capabilities in generating different creative text formats.

- In the context of job descriptions, studies like Sun et al., 2023: explore techniques for job description summarization using.
- Similarly, Liu et al., 2020: propose methods for job title enrichment using NLP, enriching job titles with relevant skills and requirements.

2.4 Cover Letter Generation and Interview Question Generation

Crafting Compelling cover letters and preparing for interviews are significant hurdles for students. Generative AI offers assistance in these areas.

- Studies like Wang et al., 2022: <https://arxiv.org/abs/2204.08231> investigate automatic cover letter generation, demonstrating the potential of AI in this domain.
- While research on interview question recommendation systems is limited, NLP techniques used for exam question generation (e.g., Wu et al., 2020: <https://arxiv.org/abs/2004.09030>) might offer valuable insights for interview question generation.
- Research by Yu et al., 2023: <https://arxiv.org/abs/2305.10435> explores conditional text generation using generative AI models. This aligns with how your system generates cover letters and interview questions based on job titles.

3. OVERVIEW OF THE SYSTEM

3.1 Existing system

The existing system, the "Placement Eligibility Predictor," serves as the foundation for the project "A Personalized Student Advisory System." Here's a detailed description of the existing system. The primary objective of the Placement Eligibility Predictor is to assist students in assessing their eligibility for job placements based on various factors. It aims to provide information to students by predicting their likelihood of being placed in placement or not. The system takes into account several input parameters to make predictions. These parameters typically include: Age, Number of internships completed, Number of backlogs (if any), CGPA, Gender, Model preferences Using these inputs, the system employs a machine learning model to predict whether the student is eligible for placement. Upon accessing the system, students input their relevant details into the designated fields. The system processes these inputs through the pre-trained machine learning model. Based on the model's analysis, the system generates a prediction indicating whether the student is likely to be eligible for placement. The prediction output is displayed to the student, providing them with insights into their placement prospects. The output of the Placement Eligibility Predictor is typically binary, indicating whether the student is predicted to be eligible or ineligible for placement. In addition to the prediction, the system may provide insights into the factors influencing the prediction, such as highlighting areas of strength or areas needing improvement.

3.2 Proposed system

The proposed system, "A Personalized Student Advisory System," represents an innovative approach to supporting students in their academic and career endeavors. Building upon the foundation of the existing placement eligibility predictor, the proposed system integrates advanced features such as a job description generator, job title generator, cover letter generator, and interview question generator. These additions offer students personalized guidance and resources tailored to their individual interests, skills, and career goals. By leveraging machine learning and generative AI techniques, the system provides detailed insights into specific job roles, and skill requirements, empowering students to make informed decisions and prepare effectively for the job market. With a focus on enhancing personalization, accuracy, and usability, the proposed system aims to address the limitations of traditional advisory approaches and provide comprehensive support to students throughout their academic and professional journeys.

- The proposed system offers personalized guidance tailored to each student's unique interests, skills, and career aspirations. By leveraging advanced machine learning and generative AI techniques, it provides customized recommendations and resources to support individualized career planning.
- With features such as a job description generator, job title generator, cover letter generator, and interview question generator, the proposed system offers comprehensive support to students in various aspects of their career development journey. It equips them with the tools and resources needed to explore career opportunities, craft professional documents, and prepare for job interviews effectively.
- By providing detailed insights into specific job roles, industries, and skill requirements, the proposed system helps students make informed decisions about their career paths. It enables them to better understand the demands of different professions and align their skills and interests with relevant opportunities.
- The proposed system empowers students to take control of their career development by offering them access to valuable information and resources. It boosts their confidence by helping them articulate their skills and experiences effectively through personalized documents like cover letters and resumes.
- With automated features such as the job description generator and interview question generator, the proposed system streamlines the career planning process and saves students time and effort. It eliminates the need for manual research and document creation, allowing students to focus on other aspects of their academic and professional pursuits.
- The proposed system is designed to be adaptable and scalable, catering to the evolving needs and preferences of students as well as changes in the job market landscape. It can accommodate a wide range of users and educational institutions, making it a versatile tool for supporting career development initiatives across different contexts.

3.3 Software Requirements:

Programming Language – Python	:	2.8.2
Machine Learning Scikit-learn	:	1.3.1
Machine Learning Sklearn	:	0 0.post10
Data Manipulation – Pandas	:	2.1.1
Data Manipulation – NumPy	:	1.26.2
Data Visualization – Matplotlib	:	3.8.0
Data Visualization – Seaborn	:	0.13.0
Jupyter Notebooks	:	5.4.0
IDE – VSCode	:	1.86.0
google-generativeai	:	0.3.2

3.4 Hardware Requirements:

Processor	:	11th Gen Intel(R) Core (TM) i5-1135G7 @ 2.40GHz, 2419 MHz, 4Core(s), 8 Logical
Processor(s)		
Storage	:	512GB
RAM	:	8GB
Display	:	1920 X 1080 resolution
Mouse	:	Min USB
Keyboard	:	Min USB

4. Technologies Used

4.1 Python

Python is a versatile and widely-used programming language renowned for its simplicity and readability. Its extensive ecosystem of libraries makes it well-suited for a variety of tasks in data analysis, machine learning, natural language processing, and web

development. In your project, Python serves as the primary programming language for implementing various components such as data preprocessing, machine learning model development, generative AI integration, and web application development using Streamlit. Python's versatility makes it an ideal choice for developing a personalized student advisory system. Its extensive library ecosystem provides solutions for various tasks such as data preprocessing, machine learning model development, natural language processing, and web application development. Python's simplicity and readability also contribute to faster development cycles and easier collaboration among team members. Python's data analysis libraries, including pandas, NumPy, and seaborn, play a crucial role in your project. These libraries enable you to manipulate, analyze, and visualize large datasets efficiently. For example, pandas facilitates data preprocessing tasks such as cleaning, transforming, and aggregating student and job data, while seaborn and matplotlib allow you to create insightful visualizations for exploratory data analysis and model evaluation. Python is widely used in the field of machine learning for developing predictive models and data-driven applications. With libraries like scikit-learn, TensorFlow, and PyTorch, you can implement various machine learning algorithms, including regression, classification, clustering, and deep learning, to address different aspects of your project. For instance, scikit-learn provides tools for building and evaluating placement prediction models, while TensorFlow and PyTorch offer advanced capabilities for training deep learning models for text generation and other tasks.

4.2 Machine Learning

Machine learning involves developing algorithms and models that enable computers to learn patterns from data and make predictions or decisions without being explicitly programmed. ML techniques are invaluable for tasks like predicting placement eligibility, generating job descriptions, and recommending career paths based on student data. In your project, machine learning techniques are used to develop predictive models for tasks such as placement eligibility prediction. By analyzing historical student data, these models can identify patterns and correlations that help predict students' likelihood of being eligible for placement opportunities. Machine learning plays a pivotal role in developing predictive models for tasks such as placement eligibility prediction in your project. By analyzing historical student data, machine learning algorithms can identify patterns and correlations that help predict whether a student is likely to be eligible for placement opportunities based on factors such as academic performance, internships, backlogs, and CGPA. Techniques such as logistic regression, decision trees, random forests, and gradient boosting can be applied to build predictive models that accurately classify students into eligible and ineligible categories. Feature engineering is a critical aspect of machine learning model development, particularly in projects involving predictive modeling. In your project, feature engineering involves selecting and preprocessing relevant features from the available student data to train the predictive models effectively. Techniques such as data cleaning, normalization, feature scaling, and feature selection may be applied to prepare the input data for training the machine learning models. Evaluating the performance of machine learning models and optimizing their parameters are essential steps in your project's development process. Techniques such as cross-validation, hyperparameter tuning, and model selection help assess the robustness and generalization capabilities of the predictive models. Metrics such as accuracy, precision, recall, F1-score, and area under the ROC curve are commonly used to measure the performance of classification models and guide model selection and optimization decisions.

4.3 Generative AI

Generative artificial intelligence focuses on creating models that can generate new, original content, such as text, images, or music. These models are trained on large datasets and can generate realistic output based on learned patterns. In your project, generative AI is utilized for tasks such as generating job descriptions, job titles, cover letters, and interview questions. By leveraging pre-trained generative models, you can create personalized and contextually relevant content tailored to individual student needs and preferences. Generative AI techniques enable the automatic generation of human-like text based on learned patterns from large text corpora. In your project, generative AI is utilized for tasks such as generating job descriptions, job titles, cover letters, and interview questions. By leveraging pre-trained generative models, such as OpenAI's GPT model or Google's generative AI APIs, you can create personalized and contextually relevant content tailored to individual student needs and preferences. These generative models are trained on vast amounts of text data and can produce coherent and plausible text outputs that mimic human writing styles. Generative AI models can be conditioned on specific inputs or prompts to generate targeted outputs. In your project, the generative AI models are conditioned on inputs such as job titles, skills, or job descriptions provided by students to generate relevant content. By providing context and constraints to the generative models, you can control the content generation process and ensure that the generated output aligns with the student's preferences and requirements.

4.4 Streamlit

Streamlit is a Python library used for building interactive web applications for data science and machine learning projects. It allows developers to create intuitive user interfaces with minimal code and effort. In your project, Streamlit serves as the framework for developing the user interface of the personalized student advisory system. It enables you to visualize data, present model predictions, and provide interactive features for students to explore career-related information and receive personalized guidance. Streamlit is a

Python library used for building interactive web applications with minimal code. It allows developers to create data-driven applications that enable users to visualize data, explore insights, and interact with machine learning models and generative AI features seamlessly. In your project, Streamlit serves as the framework for developing the user interface of the personalized student advisory system, providing a user-friendly and intuitive interface for students to access career-related information and receive personalized guidance. Streamlit simplifies the process of web application development by providing a high-level API for creating interactive elements such as sliders, buttons, and dropdown menus. Developers can write Python scripts to define the layout and functionality of the application, eliminating the need for HTML, CSS, or JavaScript coding. This streamlined development process accelerates iteration cycles and enables rapid prototyping and deployment of new features and updates to the advisory system.

Economical Feasibility:

The project incurred minimal costs as it utilized existing resources such as laptops and free software libraries. Since no external licenses were required, there were no direct expenses related to software acquisition. As there were no wages or salaries involved in the development process, the project did not incur labor costs. This significantly reduces the financial burden typically associated with software development projects. By leveraging existing resources and working collaboratively as a team, the project maximized resource utilization and minimized the need for additional investments. While the project may not have incurred direct financial costs, it's essential to consider the opportunity costs associated with allocating time and effort to its development. The resources spent on this project could have been used for other initiatives or projects with potentially higher returns or strategic importance. Despite the minimal financial investment, the project offers potential benefits such as improved student outcomes, enhanced institutional reputation, and increased efficiency in career guidance services. These intangible benefits should be considered when evaluating the overall economic feasibility of the project. Since the project did not involve significant financial investments, the associated financial risks are relatively low. However, it's important to assess other risks such as technical challenges, user adoption, and long-term sustainability to ensure the project's success.

Technical Feasibility:

Google Generative AI offers advanced capabilities for generating text-based content, which aligns well with the project's requirements for tasks like job description generation, cover letter generation, and interview question generation. Ensure compatibility and access to the required Google Generative AI models and APIs. Additionally, consider any limitations or usage restrictions associated with these services. Development: Streamlit provides a user-friendly interface for developing interactive web applications in Python, making it suitable for creating the frontend of the personalized student advisory system. Ensure that Streamlit's capabilities meet the project's UI/UX requirements and that it can handle the expected user traffic and interactions effectively. Machine learning techniques are widely used and well-established for tasks like placement prediction based on student data. Implementing machine learning models for this purpose is feasible, especially with libraries like scikit-learn or TensorFlow. Consider the availability of labeled training data, model training and evaluation requirements, and the computational resources needed for training and inference. Pandas is a versatile and widely used library for data manipulation in Python, making it suitable for tasks like loading, preprocessing, and analyzing student and job data. Ensure that Pandas can handle the expected volume and variety of data efficiently, and consider optimization techniques for improving performance if necessary. Using dotenv for managing environment variables is a common practice in Python development and is feasible for configuring sensitive information like API keys or credentials. Ensure proper handling of environment variables to maintain security and prevent accidental exposure of sensitive information. Pickle is a standard tool for serializing Python objects, including trained machine learning models, making it feasible for saving and loading models. Be mindful of potential security risks associated with unpickling untrusted data and Consider alternative serialization methods if security is a concern.

Social Feasibility:

Students are likely to embrace a personalized advisory system that provides tailored guidance and support for their career development. Ensure that the user interface is intuitive, user-friendly, and accessible to students of varying technical backgrounds. Solicit feedback from students during the development process to address their needs and preferences effectively. Students may have concerns about the privacy and security of their personal information, especially if the system collects sensitive data for placement prediction or other purposes. Implement robust security measures to protect student data, such as encryption, access controls, and compliance with data protection regulations (e.g., CCPA). Provide clear and transparent information about data handling practices to build trust with students. Students may expect the advisory system to adhere to ethical principles and standards, such as fairness, transparency, and accountability. Ensure that the system's algorithms and decision-making processes are fair and unbiased, avoiding discrimination based on factors like gender, race, or socioeconomic status. Provide explanations or justifications for system recommendations to enhance transparency and accountability. Students from diverse backgrounds may have different needs and preferences regarding accessibility and inclusivity in the advisory system. Design the system to be accessible to students with disabilities, ensuring compatibility with screen readers, alternative input methods, and other assistive technologies. Consider the linguistic, cultural, and educational backgrounds of students to provide inclusive support and guidance. Engaging students

actively in the career planning and decision-making process can enhance their sense of empowerment and ownership over their academic and professional trajectories. Design interactive features and functionalities that encourage students to explore career options, set goals, and take proactive steps towards their desired outcomes. Provide personalized recommendations and resources to support students' individual aspirations and interests. Establishing channels for students to provide feedback and suggestions can help improve the usability, effectiveness, and relevance of the advisory system over time. Implement feedback mechanisms such as surveys, suggestion boxes, or user forums to gather input from students on their experiences with the system. Actively monitor and respond to feedback to address concerns and continuously enhance the system based on user input.

5. Architecture

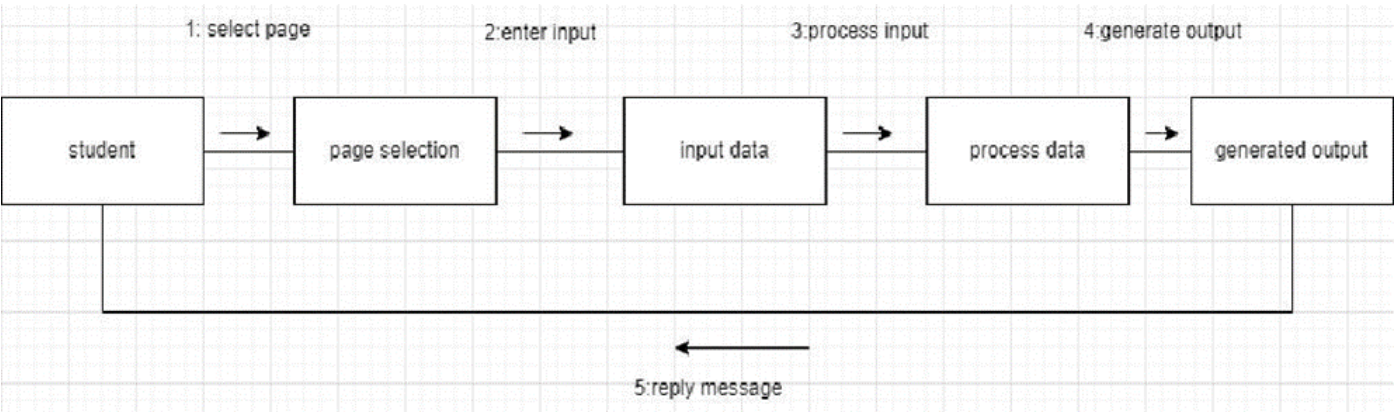


Fig 1: System Architecture

6. RESULTS SCREENSHOTS

Enter your Age here...
22

Enter number of Internships you done....
5

Enter your CGPA here...
9

Enter the number of Backlogs...
0

Select your Gender..
☐ Male
☒ Female

Enter your Stream here...
Mechanical

Select the Model
All

Eligibility Result

Fig 2: Input Data for Placement Eligibility Predictor



Fig 3: Output of Placement Eligibility Predictor



Fig 4: Input Data for Cover Letter Generator

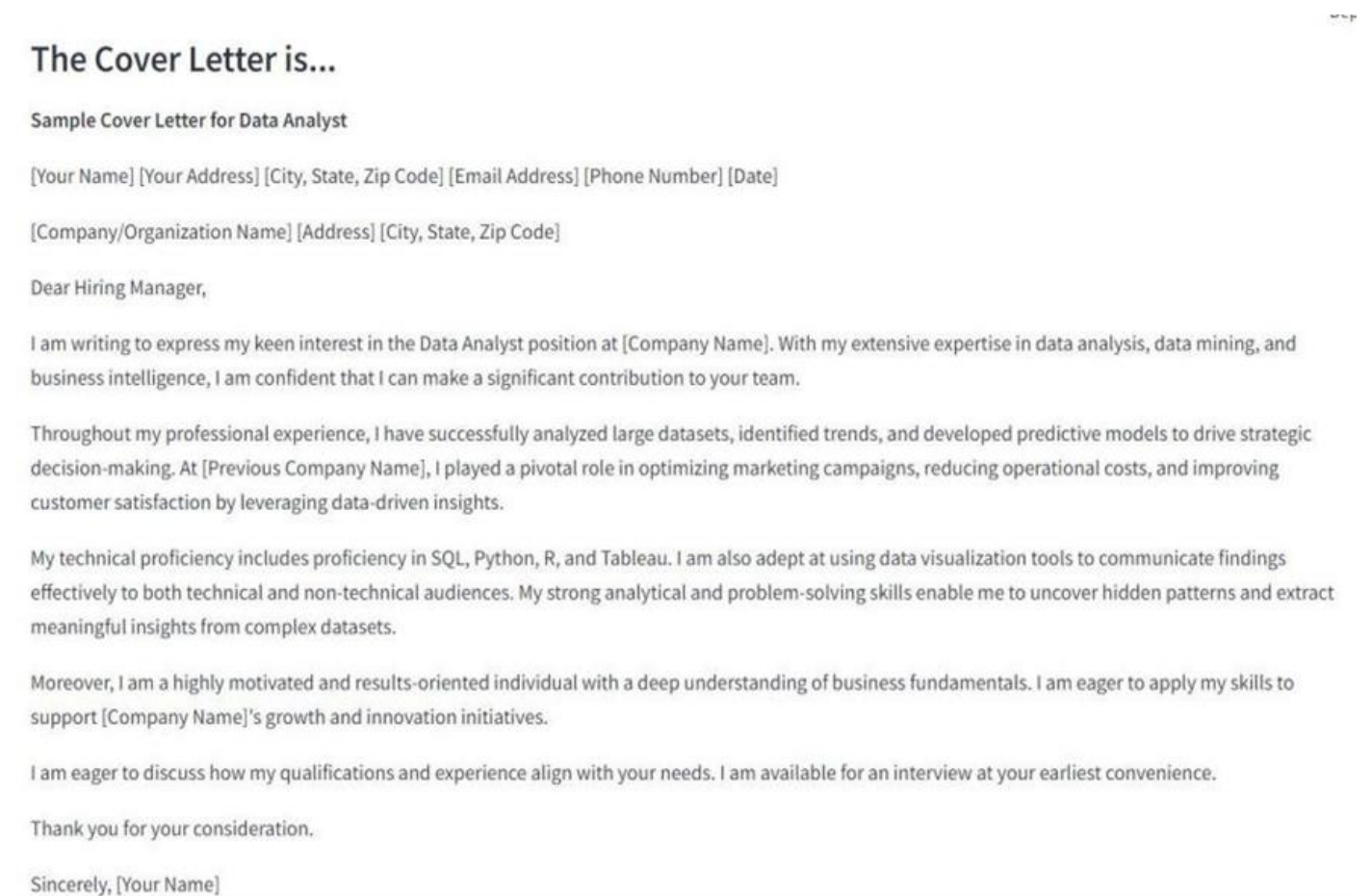


Fig5: Output of Cover Letter Generator

7. CONCLUSION

We've successfully developed a comprehensive system aimed at enhancing students' career prospects and aiding them in their Placement Journey. Through the integration of various modules such as placement eligibility prediction, job title generation, job description generation, cover letter generation, and interview questions generation, we've created a versatile platform that Provides students' diverse needs in navigating the Placement Journey. Our system empowers students by providing personalized guidance based on their unique Job Titles, skills, and Personal Data. The placement eligibility prediction module helps students check their placement Eligibility status, while the job title generation module suggests potential Job positions aligned with their skills. The job description generator helps students by providing a job description based on the job title provided and cover letter generator modules help students by providing cover letters based on the job title provided by the student. Moreover, the integration of the interview questions generation module offers students valuable data of questions for interview preparation, enabling them to anticipate and address potential questions related to their desired roles. By leveraging generative AI technology, we've automated and streamlined various aspects. saving students time and effort while providing them with tailored guidance and support. In the pursuit of enhancing the educational experience and empowering students for success in their academic and professional journeys, "A Personalized Student Advisory System" has emerged as a valuable tool. Through a comprehensive study and the implementation of predictive models, this project has illuminated the potential of leveraging academic and placement details as a reliable source for predicting placement eligibility.

8. FUTURE ENHANCEMENT

- Personalization and Customization Features - Implement user profiles where students can save their preferences, career goals, and past experiences to receive more personalized recommendations and guidance. Allow users to customize generated content further by providing feedback or input on the generated results, enabling iterative refinement based on user interactions.
- Integration with External APIs and Databases - Integrate with external job posting APIs or databases to provide real-time job listings and updates, enriching the platform with current industry trends and opportunities. Connect with professional networking platforms (e.g., LinkedIn) to import user data and leverage social connections for personalized recommendations and networking opportunities.
- Enhanced Job Matching and Recommendation System - Develop a job matching algorithm that analyzes students' profiles and preferences to recommend tailored job opportunities that align with their skills, interests, and career goals. Implement machine learning techniques to continuously learn from user interactions and improve the accuracy and relevance of job recommendations over time.

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