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Leveraging TensorFlow and Machine Learning for Accurate Scholarship Portal Predictions

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Abstract: The utilization of machine learning (ML) techniques, particularly Tensor Flow, for predicting scholarship eligibility has become paramount in modern educational landscapes. This study proposes a predictive model leveraging Tensor Flow algorithm to forecast scholarship eligibility based on a comprehensive set of input parameters. These parameters include crucial academic metrics such as GPA, 10th and 12th percentage, alongside qualitative assessments like extracurricular activities, essay quality, and letters of recommendation. Furthermore, the model integrates socio-economic factors such as financial need, family background, and state of residence, along with indicators of leadership, volunteerism, and work experience. Implemented through Python Flask for a user-friendly interface, this system provides a seamless experience for users to input their data and receive predictions regarding their eligibility for scholarships. By harnessing the power of ML, this framework offers educational institutions and students a robust tool to streamline scholarship allocation processes, ensuring efficient and equitable distribution of resources to deserving candidates.

I. INTRODUCTION

Scholarships serve as a critical means for students to access higher education, often alleviating financial burdens and paving the way for academic success. However, the process of determining eligibility for scholarships can be complex and time-consuming for both students and institutions. Leveraging the power of machine learning (ML), particularly through algorithms like Tensor Flow, offers a promising solution to streamline and enhance scholarship prediction processes. Tensor Flow, a powerful ensemble learning technique, is employed to analyse the input data and make predictions regarding scholarship eligibility. By constructing multiple decision trees and combining their outputs, Tensor Flow mitigates overfitting and enhances the accuracy and robustness of predictions. This makes it particularly well-suited for handling the complexity and variability inherent in scholarship selection processes.

Python Flask is utilized to develop a user-friendly graphical interface (GUI) for the system. Flask's simplicity and flexibility make it an ideal choice for building web applications, allowing users to easily input their information and receive real-time feedback regarding their eligibility for various scholarships. The GUI enhances accessibility and usability, enabling students to navigate the prediction process with ease.

Overall, the integration of ML techniques, specifically Tensor Flow, with Python Flask for GUI development represents a novel approach to scholarship prediction. By automating and optimizing the evaluation process, this system facilitates fairer and more efficient distribution of scholarships, ultimately empowering students to pursue their academic aspirations without undue financial barriers.

II. LITERATURE SURVEY

Research papers that implement TensorFlow and machine learning (ML) for scholarship prediction in real-world scholarship portals typically focus on several key aspects: ML algorithms used, data pre-processing techniques, and evaluation metrics employed to assess model performance. One notable study in this domain is the implementation of a scholarship prediction system for a university's financial aid portal. This study utilized TensorFlow to develop a classification model aimed at predicting scholarship eligibility based on various factors such as student GPA, major, and extracurricular activities.

The research paper might detail the specific ML algorithms employed, such as logistic regression, decision trees, random forests, or neural networks implemented using TensorFlow. Each algorithm's suitability for the task and its performance metrics could be discussed. The paper would describe the steps taken to pre-process the data before feeding it into the ML model. This could include data cleaning (handling missing values, outliers), feature engineering (creating new features from existing ones), and feature scaling or normalization. By conducting a comprehensive literature survey on these topics, researchers can gain a deeper understanding of the existing knowledge and approaches in the field.

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III. EXISTING PROBLEMS

From the literature survey approach, we referred a few papers revolving around the same principle that had the following problems in them.

This consists of literature survey to prediction of scholarship by using Machine Learning and Data Mining technique.

Suma, V., [1] had used decision trees to evaluate student performance. Here an educational data set is considered and entropy and information gain of all the attributes present in the dataset is calculated. The attribute which consists of the highest information gain is considered as the root node of the tree. This classification algorithm is used to identify students with poor performance.

Mitra.Ayushi [2]. had proposed a scrum methodology to track the performance of the student in web-based education. In this methodology, the teacher describes the learning objectives and that teacher is responsible for monitoring the progress. Later evaluation of all the members is done.

Madhav S. Vyas, [3] made use of a decision tree model for academic performance prediction. The continuous values were converted to discrete values and the null values eliminated in the collection and pre-processing phase.

Ratik Fitriana,[4] describe among all technologies, the researcher used to analysis the data such as scholarship recipient prediction is data mining, Author describes the two methods which was used to predict the output such as k nearest neighbours (KNN) and linear regression algorithms. This study compares both methods in solving the scholarship recipient problem. Here the Author uses key parameters such as semester attendance, Grade point average, statement letter of active student, Family Card, Identity Card, Study Result Card.

Angela R. Bielefeldt [5] in her paper explains that differences between the civilization of engineering faculties when compared to scholarship of teaching and learning (SOTL) in engineering sector maintain themselves with all characteristics of faculty who involved in their activities. SOTL compared overall US engineering faculty based on a assistant professors percentage, a full professors percentage, women's percentage, employees percentage who worked at Baccalaureate and Masters institutions.

IV. METHODOLOGY

The proposed methodology aims to develop a Scholarship Prediction system utilizing Machine Learning (ML) techniques, primarily Tensor Flow, to predict scholarship eligibility based on various input parameters. The system will employ Python Flask to create a user-friendly GUI for ease of interaction.

The first step involves data collection and preprocessing. Relevant data points such as Student ID, GPA, 10th and 12th percentage, Extra Curricular Activities, Essay Quality, Letter of Recommendation Submitted, Financial Need, Major, State of Residence, Leadership Experience, Volunteer Work, Work Experience, and Family Background will be collected. This data will then undergo preprocessing, including handling missing values, normalization, and feature engineering to ensure compatibility with the ML model.

Next, the pre-processed data will be divided into training and testing datasets. The training dataset will be used to train the Tensor Flow classifier, while the testing dataset will be reserved for evaluating the model's performance.

The core of the system lies in the implementation of the Tensor Flow algorithm. Tensor Flow is a versatile ML algorithm known for its accuracy and robustness in handling complex datasets with numerous input variables. By leveraging Tensor Flow, the system will be able to effectively analyse the input parameters and predict the scholarship eligibility of a student.

Once the Tensor Flow model is trained, it will be integrated into the Python Flask framework to develop a graphical user interface (GUI). The GUI will provide a user-friendly platform where users can input their details, including GPA, extracurricular activities, essay quality, etc., and receive an immediate prediction regarding their eligibility for a scholarship.

The Flask framework will handle the backend processing, invoking the Tensor Flow model to make predictions based on the provided inputs.

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Furthermore, the system will incorporate mechanisms for result interpretation and feedback. Users will not only receive a binary output indicating their eligibility for a scholarship but also gain insights into the factors influencing the prediction. This feedback mechanism will help students understand areas for improvement and increase transparency in the decision-making process.

In summary, the proposed methodology entails data collection, preprocessing, model training using Tensor Flow, integration with Python Flask for GUI development, and provision of result interpretation and feedback mechanisms. By leveraging ML techniques and a user-friendly interface, the system aims to streamline the scholarship prediction process and enhance accessibility for students.

Here are the steps of overall flow:

1. Data Collection and Preprocessing:
   - Gather relevant datasets containing student information, including GPA, percentage in 10th and 12th grades, extracurricular activities, essay quality, letter of recommendation status, financial need, major, state of residence, leadership experience, volunteer work, work experience, and family background.
   - Preprocess the data to handle missing values, outliers, and categorical variables, ensuring the data is suitable for training the Tensor Flow model.

2. Feature Engineering:
   - Conduct feature engineering to extract meaningful insights and create new features if necessary, such as combining GPA and percentage scores, creating a composite score for extracurricular activities, etc.

3. Model Training and Evaluation:
   - Implement a Tensor Flow classifier using Python's scikit-learn library to predict scholarship eligibility based on the input parameters.
   - Split the dataset into training and testing sets to train and evaluate the model's performance.
   - Employ appropriate evaluation metrics such as accuracy, precision, recall, and F1-score to assess the model's effectiveness in predicting scholarship eligibility.

4. Hyperparameter Tuning:
   - Perform hyperparameter tuning to optimize the Tensor Flow model's performance. Experiment with different parameter settings such as the number of trees, maximum depth of trees, and minimum number of samples required to split a node to improve prediction accuracy.

5. Integration with Flask GUI:
   - Develop a user-friendly GUI using Python Flask framework to allow users to input student information conveniently.
   - Design the GUI to accept input parameters such as student ID, GPA, percentage in 10th and 12th grades, extracurricular activities, essay quality, etc., and display the predicted scholarship eligibility based on the Tensor Flow model's prediction.

6. Testing and Validation:
   - Conduct extensive testing of the Flask GUI to ensure proper functionality and user experience across different platforms and devices.
   - Validate the predicted scholarship eligibility results by comparing them with actual scholarship outcomes or expert judgment to ensure the model's reliability and accuracy.

7. Deployment and Scalability:
   - Deploy the scholarship prediction system on a web server or cloud platform to make it accessible to a wider audience.
   - Ensure scalability of the system to handle many user requests efficiently without compromising performance.

8. Documentation and Maintenance:
   - Document the entire development process, including data preprocessing steps, model training procedure, GUI implementation, and deployment instructions, to facilitate future maintenance and updates.
   - Establish a maintenance plan to address any issues or updates required in the future, such as retraining the model with new data or incorporating additional features based on user feedback.

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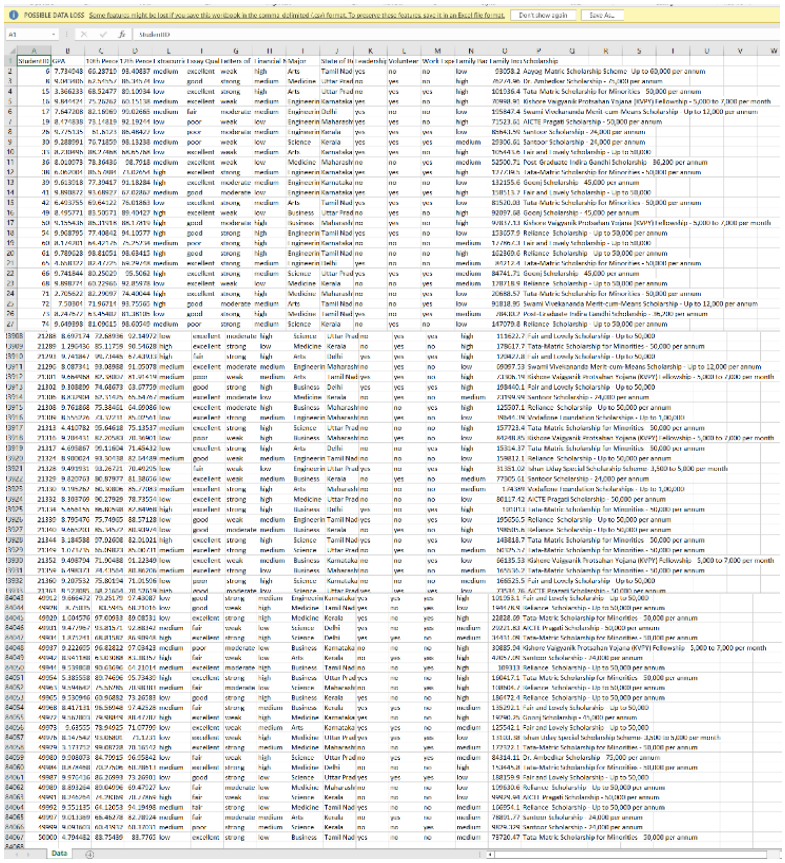
Data Set :



V. WORKING

Scholarship Prediction Using Machine Learning leverages advanced algorithms, particularly Tensor Flow, to predict scholarship eligibility based on a comprehensive array of input parameters. These parameters include essential academic metrics such as GPA, 10th and 12th-grade percentages, as well as qualitative factors such as extra-curricular activities, essay quality, and the submission of letters of recommendation. Additionally, the model takes into account socio-economic indicators like financial need, family background, and the state of residence.

Moreover, the system considers the applicant's chosen major and evaluates their involvement in leadership roles, volunteer work, and professional experience. By analyzing these multifaceted inputs, the model provides a nuanced understanding of each candidate's qualifications, ensuring a fair and thorough evaluation process.

Python Flask serves as the backbone for the graphical user interface (GUI), offering a seamless and intuitive experience for users interacting with the system. Through Flask, users can input their relevant information and receive real-time feedback on their scholarship eligibility. The interface is designed to be user-friendly, guiding applicants through the process while also providing transparency regarding the factors influencing their eligibility.

One of the key strengths of this system lies in its utilization of Tensor Flow, a powerful machine learning algorithm known for its ability to handle complex data and produce accurate predictions. By employing Tensor Flow, the model can effectively capture the nonlinear relationships between input variables and scholarship outcomes, resulting in robust and reliable predictions.

Overall, Scholarship Prediction Using Machine Learning with Tensor Flow represents a sophisticated approach to streamlining the scholarship application process. By leveraging cutting-edge technology and a diverse range of input parameters, the system offers a fair and comprehensive assessment of each candidate's eligibility, ultimately facilitating access to educational opportunities for deserving students.

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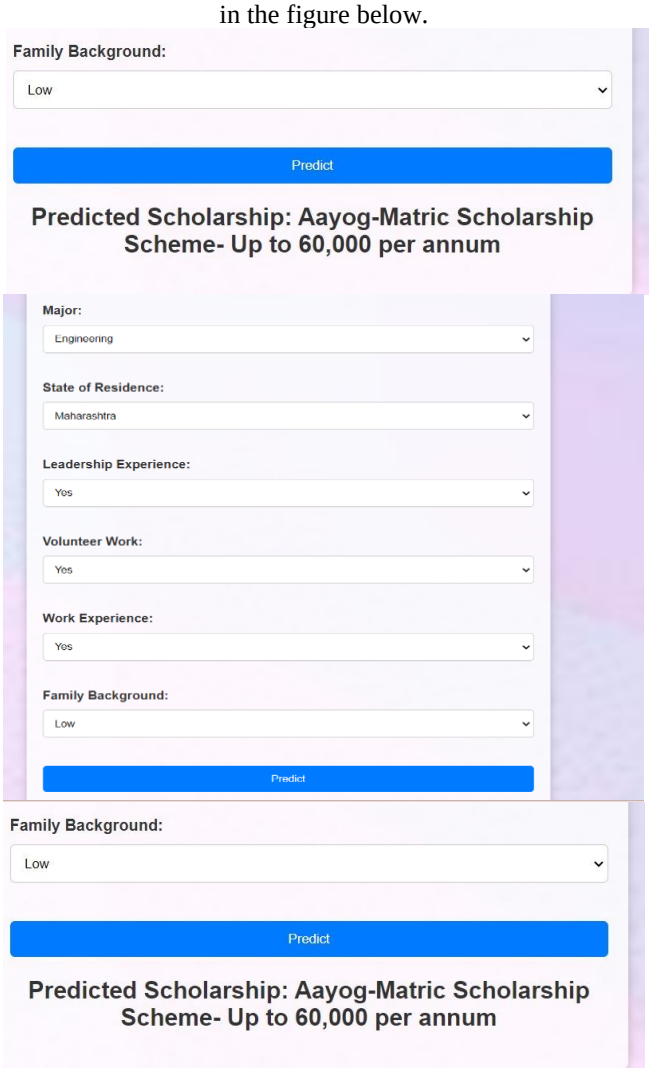
VI. RESULT AND DISCUSSION

After carefully reviewing the problems occurring in the referred papers, our model came up with using Tensor Flow as the main algorithm for processing and matchmaking with respect to different data attributes

The accuracy achieved for our model is 90 percent and a single scholarship scheme is displayed in the output as shown in the figure below.



VII. FUTURE SCOPE

Integration of Additional Data Sources:
Incorporating diverse data sources can enrich the predictive power of the model and provide a more comprehensive understanding of students' qualifications. For instance:

High school transcripts offer a longitudinal view of academic performance and trends, enabling the model to assess academic consistency and growth. Standardized test scores like SAT/ACT can serve as objective measures of students' aptitude and readiness for higher education, aligning with specific scholarship requirements. External datasets such as college acceptance rates or scholarship award statistics provide contextual information that can inform the model's predictions and recommendations.

Handling Unstructured Data:
Unstructured data, such as student essays or letters of recommendation, presents valuable insights into students' qualitative attributes and personal narratives.

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Importance of Explainable AI:
Incorporating explainability into the predictive model enhances transparency and fosters user trust by providing clear insights into the decision-making process. Methods such as LIME (Local Interpretable Model-Agnostic Explanations) or

SHAP (SHapley Additive exPlanations) can be utilized to:
Generate localized explanations for individual scholarship recommendations, highlighting the specific features and factors driving each prediction.

Enable students to understand why they are being recommended for certain scholarships, empowering them to make informed decisions about their educational pursuits.

VIII. CONCLUSION

In conclusion, this research paper has examined the implementation of a portal for various scholarships using machine learning algorithms and other web portals. Through the application of machine learning prediction analysis, accurate and reliable predictions can be made regarding the eligibility and suitability of students for specific scholarships. The developed recommended system has demonstrated its capability to generate personalized scholarship recommendations based on user profiles, preferences, and eligibility criteria. This has the potential to significantly streamline the scholarship application process and increase the chances of students receiving relevant scholarships that align with their needs and aspirations.

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