A Framework for Machine Learning Based Support System for Post-graduation Admission with the Case Study Conducted on D.K.M. College for Women, Vellore

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Abstract. India and other developing nations face difficulties building effective higher education systems, particularly when it comes to female students. Although the government made an effort, our nation did not benefit from its innovative and excellent educational policies. Indians still have a lot of issues with our educational system. The Indian government is aware that the current state of the world presents unique difficulties for the higher education sector. The UGC noted that a broad range of abilities will be expected of graduates in the humanities, social sciences, natural sciences, and business, as well as in a variety of professional fields like hospitality, tourism, agriculture, law, management, medical, and engineering. This knowledge cannot be adequately imparted during graduation, which ultimately leads to inadequate job. These include inadequate facilities and infrastructure, open seats in academic fields and poor faculty members thereof, low student enrollment rates, outdated and ineffective teaching strategies, falling standards for research, unmotivated students, crammed and cramped classrooms, and pervasive geographic, economic, gender, and racial imbalances. The post-graduation admission rate has significantly decreased in the past year at D.K.M. college for women in Vellore. A machine learning-based predictive analysis system is proposed to provide recommendations to improve PG admission. Taking into account the aforementioned scenario, the proposed work is primarily focused on the identification of issues, challenges, and decline factors of post-graduation admission from the perspectives of students, parents, teaching staffs, and management.

Keywords: Machine learning · Admission support system · knowledge based system · SVM · KNN algorithm

1 Introduction

People have the chance to ponder on the important social, cultural, governmental, economic, and spiritual problems that humanity is currently experiencing thanks to higher education. Specialized information and skilled individuals are made available by higher education for national development. India will have the greatest population of young people in the world in the upcoming decades. Yet there isn't a strong association between

people and higher education. The growing youth population can be a wonderful benefit if its potential for employment is realised. On the other hand, if we don't offer work and education, the Indian economy would suffer. A crucial instrument for achieving sustainability is education. The Education Commission's 1964–1966 statement, "The density of a nation," provided an explanation of the role that education plays in social and economic transformation.

1.1 Identified Challenges & Issues

Higher education in India is in a mixed state of development. In a nutshell, I'm trying to say that neither it is excellent nor is it all that horrible. Thus, we will discuss the number of universities, colleges, teachers, professors, and students enrolled in this paragraph. India will have more than 670 universities, at least 38,000 colleges, 817,000 professors and teachers, and more than 28 million students enrolled by the year 2020. Every year, there is an increase in the number of colleges, institutions, students, and teachers. Students from various universities apply to various programmes. For instance, approximately 14,000,000 people have applied for graduate courses across the nation. There are more than 20490000 students enrolled in post-graduate programmes. Around 1710000 students joined in the IDP programme for i-diploma and re-search, respectively. How much money the Indian government has set aside for education. The Indian government spent more than Rs 65,000 Crore in 2020. This sum is 17% higher than the same period last year. More than Rs 16,000 crore has been allocated by the government of higher education, a 20% increase from the previous year. In a similar vein, this year the government has allocated Rs 24,00 crore to IITs, Rs 1300 crore to NITs, and Rs 350 crore to IIMs. So, this is an overall assessment of higher education in India.

Since gaining our independence, building a robust and effective education system has been difficult. Several governments attempted to implement innovative and successful education systems, but they were insufficient for our nation. Indians continue to have numerous issues in our Education System. The Indian government is aware that the current state of the world presents numerous difficulties for the higher education system. According to the UGC, graduates from the humanities, social sciences, natural sciences, and business programmes would be expected to possess a wide variety of abilities, as well as those from a number of professional fields like hospitality, tourism, agriculture, law, management, and engineering.

The higher education system in India faces a number of fundamental issues. Inadequate infrastructure and facilities, open seats in academic fields, poor faculty, low student enrolment rates, outdated and ineffective teaching strategies, falling research standards, unmotivated students, crammed and small classrooms, and pervasive income, gender, and ethnic imbalances are some of these issues. In addition to these concerns about decreasing standards and a lack of facilities, there is reported exploitation of rural area students by many private education providers.

We have analysed the last 6 years post-graduation admission data of 14 department altogether. The data interpretation is given below in Fig. 1.

Considering the fact, the proposed work is mainly focused on identifying the issues, challenges and the decline factors of post-graduation admission in the perspective of
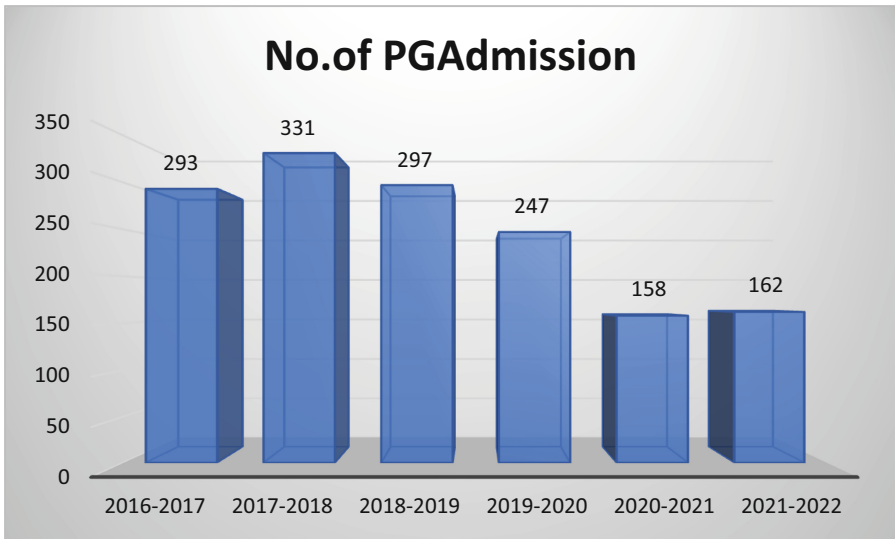
Fig. 1. Year wise PG admission

students, parents, teaching staffs and the management and a machine learning based predictive analysis system is proposed to give suggestion to improve PG admission.

A machine learning-based predictive analytic system is proposed in order to provide suggestions for how to enhance PG admission, taking into account the fact that the proposed work is primarily focused on identifying the problems, difficulties, and declination factors of post-graduation admission.

The main objectives, include

1. To use a cross-sectional survey to determine the problems, obstacles, and declination factors of post-graduation admission from the perspectives of students, parents, teaching staffs, and management.
2. Creating a predictive analysis system based on machine learning
3. Ideas for improving post-graduation admittance from the viewpoints of students, parents, teachers, and management.

The expected outcome of the proposed work is to list out issues and challenges faced by students, parents, staff and management during PG admission, to develop a machine learning model for predictive analysis with the best suggestion by the experts to overcome the challenges.

2 Related Works

A research study by Fathoni, and Retnawati, (2021), [1], aims to investigate the experiences of postgraduate students in online learning, describe the negative effects and barriers to online learning, along with solutions for them, and observe the potential that

emerges in the future following the Covid-19 pandemic's defeat. A survey of students was undertaken by Wankar et al., (2020) [4], to determine the engineering admission trends in India in recent years. The author outlined the elements that contribute to decline, including the difficulty of the curriculum, employment opportunities, wage offers, working conditions, etc. This study will concentrate on the state of engineering today and be able to help students choose their graduation programe. This study will concentrate on the present state of engineering and be able to help students choose their graduation course. The study's methodology is a random survey. Several researchers have given their time and effort to identifying the problems and challenges in higher education. To find the practices, some of the connected publications are examined. In their study, Singh (2017) [5], analyses the Problems and Challenges of Higher Education in India. The study discusses the nation's higher education system and its trend of evolution in light of the possibilities and difficulties facing the system under review. The writer suggested that, Give consideration to technology in the classroom. Chahal (2015) [6], conducted a performance analysis of India's higher education system as a whole. The author mainly concentrated on the overall performance of India's higher education system and tried to learn about the government's measures to increase the level of the educational system. The author concluded by saying that while higher education has experienced expansion in terms of institutions, enrolments, etc. over time, it has not been sufficient. Education is a process by which a person's body, intellect, and character are shaped and strengthened, according to Manas (2015) [3], analysis of the Indian educational system. It unites the emotions, the mind, and the head, allowing someone to develop an all-round personality identifying the best in him or her.

Singh (2017) [5], analysis the study is also unique in the sense that it brings about better understanding of the present scenario in the higher education system in the country and its pattern of growth given the opportunities and challenges to the system under consideration. Lal, Pratima and Krishan (2018) [8], analyzed the problems in higher education in India and proposed the suggestions for improvements. The identified problems are low rates of enrolment, unequal access, poor quality of infrastructure and lack of relevance.

Pandya et al., (2015) [7], focused on the track of higher education hurdles and its recommendations while working on higher education difficulties and proposing recommendations for raising the standard of higher education. Also, it discusses the value of a good PhD. A few recommendations are also made in this context. A study was conducted to raise awareness, understanding, and intentions for postgraduate education by two authors Jepsen & Melinda (2011) [2]. From the viewpoint of current undergraduate students, the study investigates awareness, knowledge, and aspirations about postgraduate studies. An integrated framework for a knowledge-based obstacle information system using image processing techniques was built by Vasumathy (2021), [9].

Several researchers have contributed their work to identifying the problems and difficulties associated with the fall in post-graduate admission to higher education, as well as some suggestions for how to enhance the admissions process. The recommendations are exclusively based on the opinions of experts and the findings of surveys, according to a gap analysis of relevant works. Yet, no effort has been done to develop machine learning-based admission decline prediction. As a result, it is recommended that the proposed

work provide a comprehensive framework for a machine learning-based support system for post-graduation admission with a case study on D.K.M. college for Women, Vellore.

3 Proposed Methodology

The proposed methodology comprised of the four phases which includes data collection, data preprocessing, normalization of data, optimal feature selection, Machine learning algorithms implementation and validation. Figure 2 shows the proposed methodology for cross section data survey.

3.1 Data Collection

The first step in machine learning is data acquisition. The gathered raw dataset was further processed to create the best dataset for machine learning. Data collection is the process of acquiring pertinent data to carry out the goals and objectives of an artificial intelligence project. The following are samples for the survey questionnaire given to D.K.M. College for Women's final-year undergraduate students. The data collection model for the admission decline survey is displayed in Fig. 3.

1. Will you recommend this college to others for PG admission?
2. Are you satisfied with the teaching staff and their teaching methods?
3. Do you feel it is easier to register for different courses within the college?
4. Are you satisfied in college canteen food items?
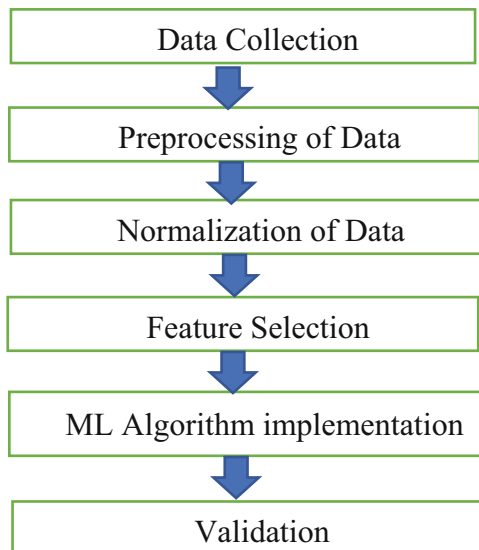5. Select from one choose for following questions [Basic Infra structure of the DKM]

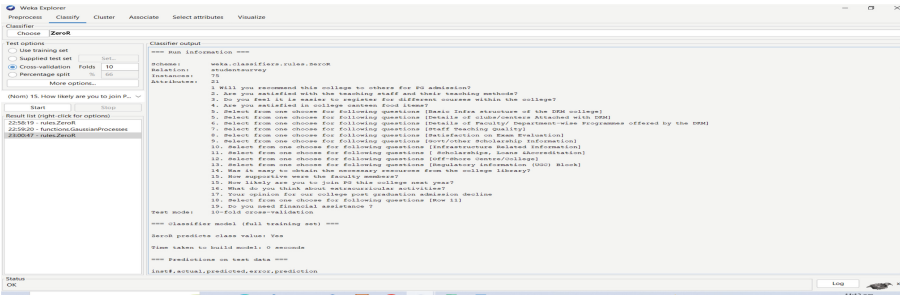**Fig. 2.** Proposed methodology cross sectional data survey

Fig. 3. Data Collection Model for admission decline survey using WEKA machine learning Tool

5. Select from one choose for following questions [Details of clubs/centers Attached with DKM]

6. Select from one choose for following questions [Details of Faculty/Department-wise Programs offered by the DKM]

7. Select from one choose for following questions [Staff Teaching Quality]

8. Select from one choose for following questions [Satisfaction on Exam Evaluation]

9. Select from one choose for following questions [Govt/other Scholarship Information]

10. Select from one choose for following questions [Infrastructure Related Information]

11. Select from one choose for following questions [Scholarships, Loans &Accreditation]

12. Select from one choose for following questions [Off-Shore Centre/College]

13. Select from one choose for following questions [Regulatory information (UGC) Block]

14. Was it easy to obtain the necessary resources from the college library?

15. How supportive were the faculty members?

15. How likely are you to join PG this college next year?

16. What do you think about extracurricular activities?

17. Your opinion for our college post-graduation admission decline

18. Select from one choose for following questions [Row 11]

19. Do you need financial assistance ?

20. Any Suggestions to improve post graduation admission?

3.2 Data Preprocessing

Before using the acquired data to create a machine learning system, it needs to be cleaned up, filled out, polished, and overall made sure that the data can really obtain useful information out of it. Data preprocessing is a broad phrase that includes a variety of tasks, from data formatting to the creation of ideal features.

3.3 Data Normalization

Data normalization is a scaling technique used in machine learning to convert the values of numerical columns in the dataset to a standard scale. Not all datasets in a model require it. It is only necessary when the ranges of the features in machine learning models differ.

3.4   Feature Selection

A pre-processing method known as feature selection picks a subset of the raw features, improving interpretability without adding any new information. The main objectives of feature selection

1. Feature selection process, eliminates irrelevant and noisy features by keeping the ones with minimum redundancy and maximum relevance to the target variable.
2. Feature selection process, reduces the computational time and complexity of training and testing a classifier, so it results in more cost-effective models.
3. Feature selection process, improves learning algorithms' performance, avoids overfitting, and helps to create better general models.

3.5   Machine Learning Algorithm Implementation

By putting a machine learning algorithm into practice, you can gain a thorough understanding of how it operates. By conceptualizing vectors and matrices as arrays and using computational intuitions for the transformations on those structures, you may use this understanding to help you internalize the mathematical description of the algorithm.

When a machine learning algorithm is implemented, several micro-decisions must be made, yet these choices are frequently omitted from the formal method descriptions. Since relatively few individuals take the effort to implement some of the more complex algorithms as a learning exercise, studying and parameterizing these options can swiftly propel you to intermediate and advanced level comprehension of a certain approach.

3.6   Data Validation

By training the model on a subset of the input data and testing it on a subset of the input data that hasn't been used before, you may validate the model's effectiveness. Cross-validation procedures generally involve setting aside a portion of the dataset as a validation set, training the model using the training dataset, and assessing model performance using the validation set. Do the next step if the model works well on the validation set; otherwise, look for problems.

4   Framework for Machine Learning Based Post-graduation Admission Support System

The researchers' primary goal is to create a user-friendly interface for the admissions process. All the information that is currently maintained manually will be computerised by the suggested method. It is not necessary for different people to handle different portions once the information has been entered into the computer. All the reports may be kept up to date by just one person. The security may also be provided in accordance with the user's expectations, which include: Case allows for the storage of large amounts of data. This method allows for flexible file or data maintenance. Updating stored records is simple and requires little extra work. Editing stored data and processes is simple. Case allows for the generation of reports. The less labor-intensive aspect of this system is more significant than the fact that accurate computations are done.
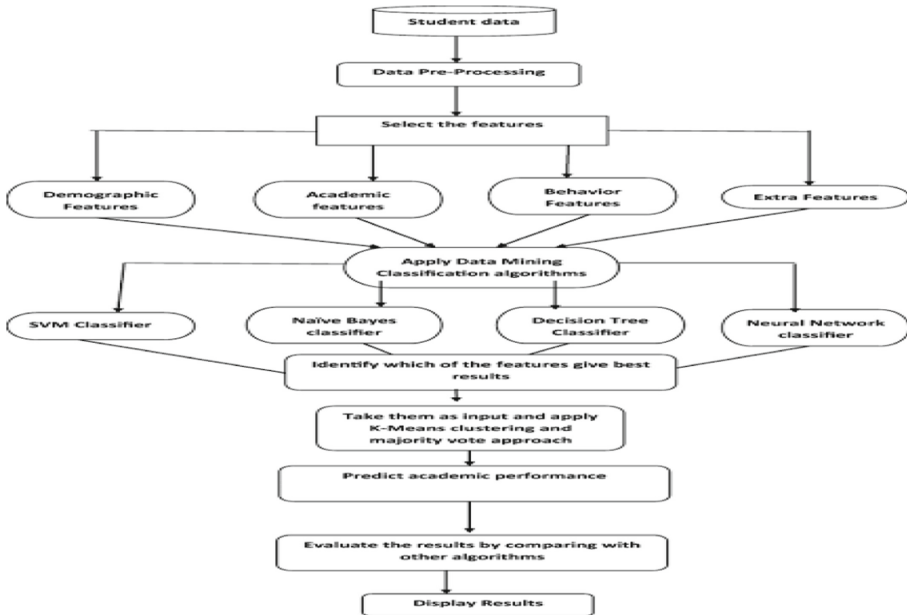
Fig. 4. Framework for machine learning based support system for post-graduation admission

4.1 The Proposed Computational Process for Machine Learning Model is as Follows

- Create a preference list using data analysis techniques using the user's input. Depending on the user's input, the preference list changes.
- Use functions from the Panda library to retrieve data from the database. The functions utilised are loc, query, and iloc.
- The results are then placed in a new dataframe and sorted in ascending order of the cut-offs when the necessary processes have been completed.

Figure 4 depicts the comprehensive framework for a machine learning-based admissions support system with a case study of D.K.M. College for Women, Vellore.

4.2 Advantages of Proposed Model

- Students from rural background find it difficult to do the necessary analysis and prepare a preference list. This idea will be beneficial for them.
- Students who belong to multiple categories face difficulty in analyzing cut-offs in each of these categories and predict the best colleges they can get an admission in.
- Example: A student belonging to SC category will either choose SC-R (Scheduled Caste- Rural) or SC-G (Scheduled Cast-General), depending on whether they are from rural background or not respectively. However, a student from SC-R has a greater chance of getting a better college compared to a SC-G student.

Fig. 5. Machine learning model based on survey

- Whatsoever is the student's rank, this application will aid them in finding the best branch and college for his/her rank.
- The student must input his rank, category, and preferred branches. The computeraided system will display the list of all the colleges he/she is likely to get admitted in.
- The output data frame can be sorted according to user requirements i.e., according to branch, college, or location. This acts as an additional filter.
- With this system, students can very easily obtain the details of colleges, branchwise, category-wise, and district-wise as well.
- The system greatly reduces the stress on students and helps in making right choice of colleges.
- The same system can be used for other common entrance tests by just changing the database (cut-off data). The codebase remains the same.

4.3 Expected Outcome of the Proposed Work

1. List of issues and challenges faced by students, parents, staff and management during PG admission
2. Machine learning model for predictive analysis of post-graduation admission
3. Suggestion by the experts to overcome the challenges

4.4 Implementation Results of Machine Learning Model for PG Admission

The Fig. 5, Fig. 6 and Fig. 7 shows the implementation results of machine learning model.

The quality measures to evaluate the machine learning model based on user input include Precision, Recall, and f-measure. It assigns a single score to the curve using a variety of threshold settings. A score of 1.0 represents our proposed model with perfect skill through which the model identifies the Strength and weakness of admission procedures based on D.K.M. college for Women, Vellore. The score can then be used as a point of comparison between various models on a binary classification problem.
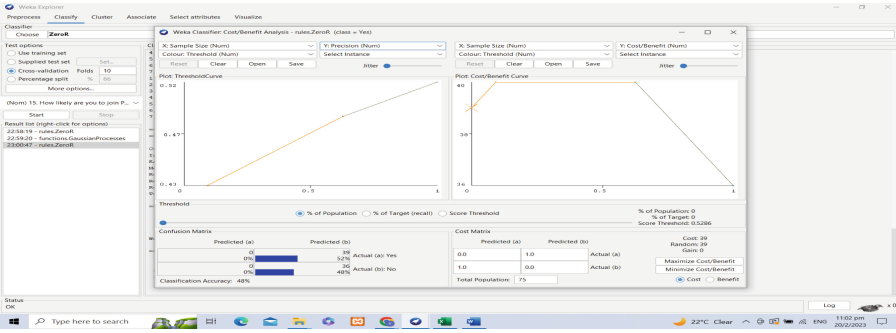
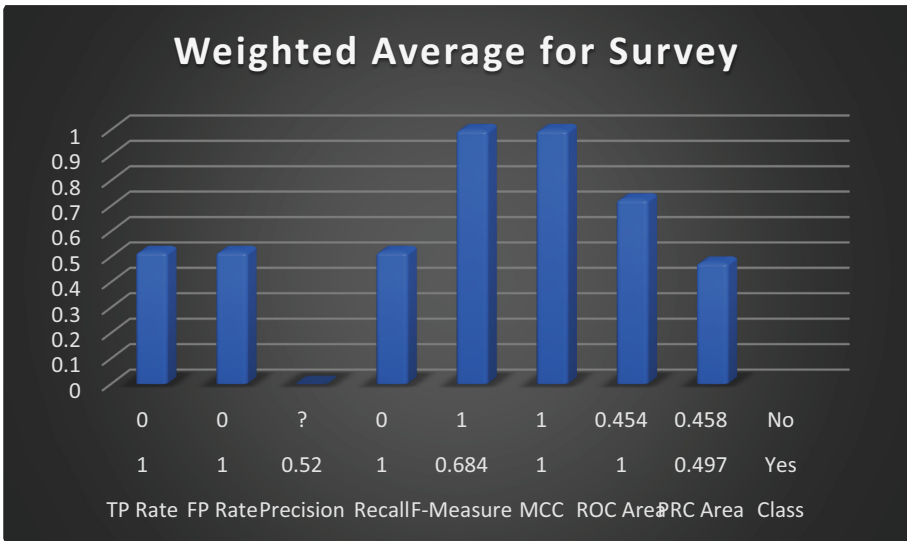**Fig. 6.** Analysis of each question on Machine learning model based on survey

Fig. 7. Weighted average of Machine learning model

5   Conclusion

We require an educational system that is progressive, modern, and capable of adjusting to meet the needs of a changing society, economy, and international environment. The regulatory organisations and higher education system in India must promptly identify the major problems and develop policies to address them. The impact of only one or two universities is minimal. Future will be ours if the government supports projects that advance our educational system. The goal of having the largest economy in the world won't be difficult to realise because we will be able to match and compete with other nations. Several scholars are attempting to pinpoint problems and obstacles faced by Indian female students in higher education, but none of the researchers have provided a

machine learning-based solution. Hence the proposed work is relevant to the stated scenario. The proposed model identifies the Strength and weakness of admission procedure based on D.K.M. college for Women, Vellore.

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