EXPLORATION OF FACTORS IMPACTING EDUCATIONAL STEADINESS USING MACHINE LEARNING TECHNIQUES – STUDY BASED ON EDUCATIONAL SECTOR OF PAKISTAN

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ABSTRACT

This research focuses on pointing out the reasons why students usually drop out of the educational sector and at which level of study. In the present work, a centralized mechanism to collect real-time data has been used that engages selected institutions and stakeholders for the whole process. The new system for this research collects all the academic information of a candidate in one place, regardless of their level of education. It enables students, parents, teachers, and educational authorities, such as school boards, the Ministry of Education, and other government departments, to assess the current state of education and strategize for improvements. The research aims to provide help to students, teachers, educational institutes, and the whole academic system to get all the previous and current records of the students. From the data, it is evident that we can obtain information regarding the number of students who discontinue their education at different educational stages. Subsequently, we can explore the reason behind this situation and make efforts to rectify it, aiming to preserve a high level of literacy in the country.

Keywords: Staediness; machine learning; Gaussian Process, Sequential Minimal Optimization Regression

INTRODUCTION

The literacy rate is a significant issue for every nation, including Pakistan. The success and progress of a country greatly hinge on the quality of education. Unfortunately, in Pakistan it is overlooked and undervalued, leading to one of the lowest literacy rates globally [1]. The main reason behind Pakistan's low literacy rate is the slow development and a flawed economic system [2].

The literacy rate in Pakistan varies across age groups. For individuals aged 55-64, the literacy rate is 30%, for ages 45-54 it stands at approximately 40%, for ages 25-34 it's 50%, and for ages 15-24 it exceeds 60%. This data shows a consistent pattern of a nearly 10% increase in literacy rate with each successive generation in Pakistan [2].

Education is essential and helps to contribute to a country's economic growth. It is a key part of a nation's overall progress. Both the government and the people of Pakistan must ensure that children have access to a quality education. This group work will help increase the number of people who can read and write, making the overall situation of the country better [3].

Regrettably, Pakistan lacks a centralized automated system to monitor its education sector. Moreover, issues such as ghost attendance, students skipping classes, and cheating are prevalent in schools and colleges across various cities in the country. To address these challenges and enhance the state of the education system, efforts have been made to develop a method aimed at improvement.

Education serves as a backbone for the development of every nation thus eliminating corruption from the education system is necessary for the survival of any country [4]. The education system in our country has posed numerous challenges that we have struggled to address.

During this research, a survey has been conducted focusing on schools, colleges, and universities, in order to identify the similarity and current procedures for evaluation of their performance and sharing it with the concerned authorities. It has been found that since each level of study (that is schools, high schools/colleges, and universities) has a different structure (annual / semester based), with different regulatory bodies at each level, no similarity has been found. Most of the academic record is managed manually (including student registrations, grades, attendance, etc.) hence it is not integrated. Each institute is responsible for keeping its record and presenting it to the regulatory bodies at the time of inspection. Due to manual keeping of records, there is a great chance of mishandling and forgery at the time of inspection [5]. Some institution manages their record using their own learning management system (mainly in private sector) but in most cases, it has been found that data keeping is done manually.

In order to transform the education system, it was needed to have a system that keeps the record of each student in order to make the real time data available, making the process transparent and easing authorities and inspection teams as well [6]. Conflicts exist on national level regarding the transformation of manual education data into digital data. Budget and resource allocation was also a big challenge for this process because every school, college, and university requires its own attendance system due to which a very high budget would be required [7]. The other main problem was collecting data from schools, colleges, and universities as collecting data in such a large quantity is not an easy task and the institutions are not always willing to share their personal records.

The education system in Pakistan, particularly in government institutions, faces significant challenges. Government schools and colleges commonly experience high levels of teacher and student absenteeism, often concealed from official records. Despite this, attendance records appear satisfactory even when teachers and students are not present for teaching or learning. A recent survey highlighted widespread corruption in the education sector, severely impacting over 150,000 government-supported schools nationwide. According to the Education Minister of Baluchistan, approximately 900 ghost schools and 15,000 ghost teachers were discovered in Baluchistan alone. These phantom educational institutions and absent teachers are major contributors to the decline in Pakistan's education system, negatively affecting students. Teachers, disengaged or absent, fail to support students, hindering their knowledge acquisition.

Insufficient emphasis on teacher skills and knowledge during hiring further aggravates the problem. Inadequately skilled teachers struggle to guide students effectively, jeopardizing their capabilities and future prospects [8].

Such an education system also represents the ineligibility of our government. The government should surveillance the education sector and should keep a record of schools and teachers. The government should acknowledge the quality of education and keep a check and balance on teachers as well as students. There should be a proper record of students registered per year and graduated per year. Due to a lack of education, many students also suffer while finding their jobs

LITERATURE REVIEW

Similar systems have been implemented globally, including in Turkey [9]. The integration of information technology in Turkish education began in 1984 when the Ministry of National Education established the "Specialized Commission on Computer Education at Secondary Schools." Their efforts up to 1990 encompassed computer procurement, software development, and teacher training for general and vocational secondary education institutions. Notably, substantial progress in computer-assisted education occurred during 1990-1999. Under the "Research on the Development of National Education" supported by the World Bank, initiatives were launched to expand computer usage and computer-assisted education. This included "Computer Piloting Schools" involving 53 schools and "Computer Laboratory Schools" involving 182 schools. In tandem, efforts were made to set new objectives for the year 2000 and actualize them. In addition to establishing computer labs and enhancing computer-assisted education in schools, the Ministry of National Education introduced the "Information System of the Ministry of National Education (MEBSİS)" to automate educational directorates at provincial and district levels, ensuring efficient and timely services. Over 7,000 computer teacher counselors and 460 computer training teacher counselors were trained to pioneer information technology use in educational institutions. Approximately 56,000 teachers received in-person training on information technologies, while a goal was set to provide distance education on information technologies to 100,000 teachers by 2005 [10].

Integration of Information Technologies (IT) into

EDUCATION

The integration of Information Technologies (IT) in education involves extensive efforts at all educational levels to incorporate and expand the use of new technologies, ensuring both teachers and students utilize IT effectively in all lessons [11]. Students in schools affiliated with open education institutions under our Ministry can efficiently register and study via the Internet through the Automation of Distance Education Services Project. This initiative begins by enabling students to access their course materials online [12]. Additionally, research and implementation are underway to guarantee swift and uninterrupted internet connectivity for schools, institutions linked to the Ministry of National Education (MONE), and their respective computer laboratories.

The research comprises four phases. ADSL internet access was successfully implemented in approximately 20,000 schools during the initial three phases. The remaining schools are slated to have ADSL internet access completed by October 31, 2005. As part of the Project on Education for the Future, measures have been implemented to enhance the quality of education. These include facilitating teachers in integrating information technologies into their classes, leveraging information technology to benefit students, transitioning to computer-assisted education, and optimizing the utilization of information technology classes in primary schools [13]. By the end of 2004, 20,000 teachers had received training, and the goal is to train a total of 60,000 teachers within three years—20,000 in 2005 and another 20,000 in 2006. Plans are in place to expand educational programs to encompass new schools as the number of information technology classes grows. The Cooperative Education Project aims to enhance educational environments by integrating information technologies into educational activities. This involves establishing an educational portal to facilitate teachers in sharing their activities and experiences related to integrating information technologies into existing educational programs. The project plans to build a

activities related to international projects Global Gateway have been performed. In the Basic Education Program, supported by the World Bank, IT classes will be set up in 15,000 schools in rural areas. In addition, coordinators of 18,000 IT classes will be trained, and 200,000 educational staff will receive training on computer skills and using computers for teaching. In this program, 51,465 computers were given to 26,276 primary schools. The schools received software, a printer, a power supply, and a scanner. In the Secondary Education Project, which is at a preliminary stage, there will be efforts to make education compulsory for 12 years in the future. There will also be a focus on increasing vocational and technical education in secondary schools, creating vocational programs, and meeting EU standards for education.

The project wants to improve how students are guided in choosing a career at secondary schools. They will use new teaching methods and technology to make lessons more flexible. The project also wants to improve the quality of schools and find out what each region needs in terms of school improvements.

The MONE will achieve goals such as making electronic changes in different areas and meeting hardware and software needs. This will be done through projects and infrastructure work done within the MONE. The Ministry of National Education wants to achieve the following goals in the 2000s to include Information Technologies (IT) in the Turkish education system:

• Hardware and software related to IT will be given to all schools along with primary education schools;

•All schools will have a reliable and speedy internet connection.

platform for sharing material among students, parents, and teachers [14].

An educational website has created a test version of a portal to help people find information. The Portal was tested for Accessing Information in 120 schools. Most

• Everyone at the school, including students, teachers, directors, parents, and school staff, will be able to use the IT system.

• There will be one IT class with 21 computers for every 500 students. Each faculty room will have at least 2 computers with internet and intranet connection, and the guidance services, libraries, and administration offices will have at least 1 computer with the same specifications.

• The training will be provided to teachers, students, directors, and school staff related to the software and to use IT effectively in education.

• The existing curriculum will be updated so that students can take advantage of their learning. They can access information on their own using technology to acquire education.

• We will continue working to prevent a gap between people who have access to technology and those who do not. We want to make sure that everyone can use technology at school.

• Technical support centers will be created for schools to help with updating and maintaining the IT hardware they use.

In this project data from all schools and colleges will be saved on one platform. Parents, students, teachers, government, and foreign institutes are the main stakeholders of the project. Parents, students, and teachers can view/update attendance and schedule, easily by a student management system. Where teacher's attendance will be marked through the biometric system and student's attendance will be marked through face detection.

This project will also predict how many numbers of students in which field are passing every year through data mining that will help in designing the jobs.

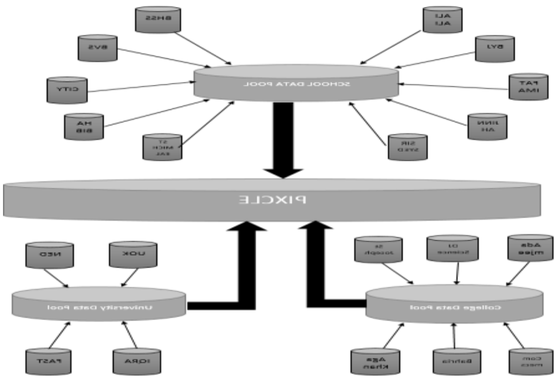
METHODOLOGY

In the first step, the sample segment of data collected from Schools, Colleges, and Universities has to be prepared for algorithms.

Data that is to be processed by WEKA needs conversion in. arff (attribute relation file format). Initially, PIXCLE collects the data and exports the same in CSV format which is then processed in the desired arff file format. It can be done in two ways; first either by WEKA explorer itself and secondly by defining the relations and attributes followed by data. The instance is named as relations and represented by @relation, properties are titled as attributes and represented by @attribute whereas the values (facts) are known as data and are represented in sequence after @data. Following is an example of an arff file:

@relation collegedata
@attribute Gender {Male, Female}
@attribute Institute {Adamjee, AghaKhan, Bahria, Commecs, DJ, Saint Joseph}
@attribute Category {Public, Private}
@attribute Program {PreEngineering, PreMedical}
@attribute Department {Science, Biology}
@attribute Marks real
@attribute Grade {A, B, B+, C, C+, F}
@data
Male, DJ, Public, PreEngineering, Science, 77, B
Male, DJ, Public, PreEngineering, Science, 76, B
Male, DJ, Public, PreEngineering, Science, 81, B+
Male, DJ, Public, PreEngineering, Science, 84, B+
Male, DJ, Public, PreEngineering, Science, 68, C+

There are two basic types of data, nominal and numeric. Most of the classifiers work on the attributes that are nominal in nature, for example, J48 Tree, JREP, etc. whereas, a regression can be applied on numeric data only. Classification has been done using Naïve Bayes technique, whereas comparative analysis using different forecasting techniques has been done.



Result and Discussion

Grades scored by students with respect to Gender

Figure 3.1
Gender Wise Distribution of Student Grades

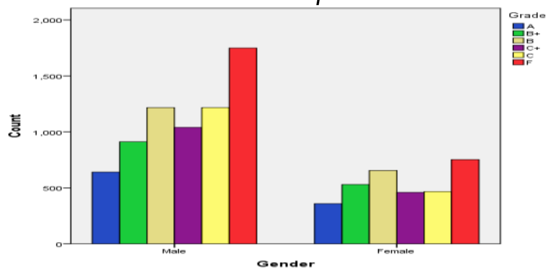


Figure 3.1 represents the distribution of grades scored concerning gender. The result indicates that male students have scored more A's, B+'s, B's, C+'s, C's, and F's.

Grades scored by students with respect to Sector

Figure 3.2
Sector Wise Distribution of Student Grades

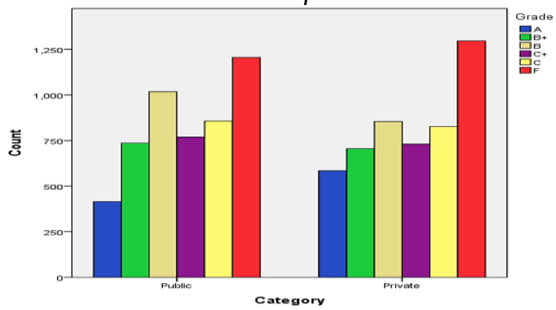


Figure 3.2 shows the grades scored by students concerning the sector. Results indicate that students in private sector institutions have scored more A's, whereas private and public sector students have equally scored B+'s, public sector students have scored more B's, C+'s, and C's, whereas private sector students have scored more F's in university.

Grade distribution concerning gender

Figure 3.3
Gender Wise distribution of Grades (Colleges)

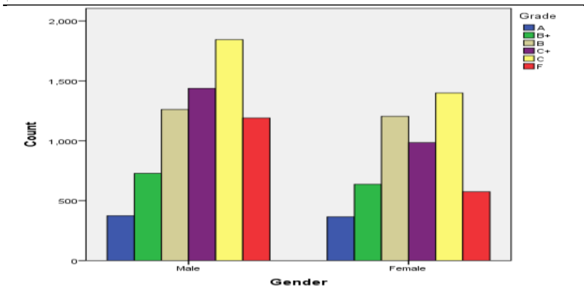


Figure 3.3 shows that both male and female students have scored the same amount of A's in college, whereas males have scored several B+'s, B's, C+'s, C's, and F's in college.

Grade distribution with respect to the sector of the institution

Figure 3.4: Sector Wise distribution of Grades (Colleges)

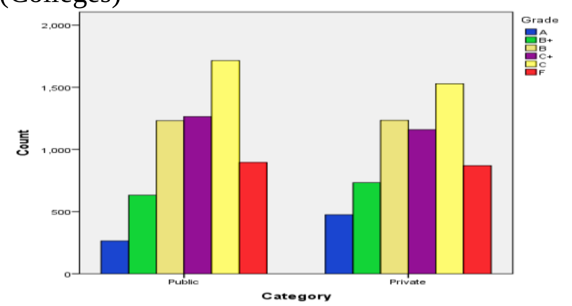


Figure 3.4 represents private sector college students who have scored more amount of A's and B+'s but the same amount of B's, public sector students have scored more amount of C+'s, C's, and F's.

Gender wise marks distributions of overall students enrolled in schools

Figure 3.5

Gender wise distribution of Marks (School)

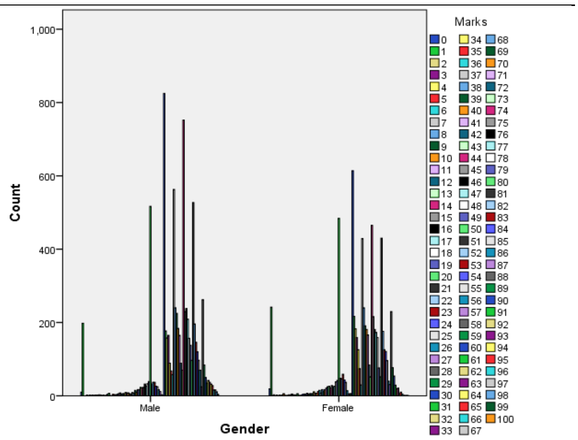


Figure 3.5 indicates the marks scored by students with respect to gender for a selected course. This data set represents that males are more high scorers than females in school.

Sector-wise marks distributions

The following distribution represents the comparison of marks scored by students who are enrolled in public sector schools and private sector schools.

Figure 3.6

Sector-wise distribution of Marks (School)

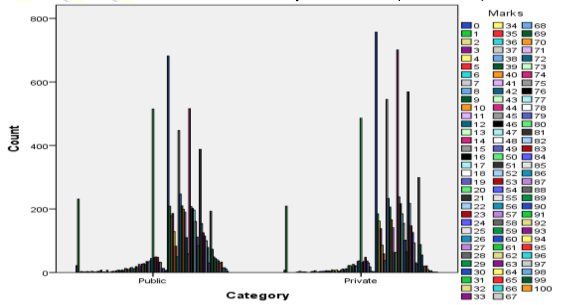


Figure 3.6 indicates the marks scored by students with respect to the sector of school. This data set represents that there are more high scorers in private sector schools as compared to the public sector.

Table 3.1

Monthly attendance record of Schools

Presence		Frequency	Percent	Valid Percent	Cumulative %
	.00	469	3.1	3.1	3.1
	1.00	453	3.0	3.0	6.1
	2.00	431	2.9	2.9	9.0

	3.00	428	2.9	2.9	11.9
	4.00	432	2.9	2.9	14.8
	5.00	464	3.1	3.1	17.8
	6.00	429	2.9	2.9	20.7
	7.00	460	3.1	3.1	23.8
	8.00	440	2.9	2.9	26.7
	9.00	444	3.0	3.0	29.7
	10.00	685	4.6	4.6	34.2
	11.00	1310	8.7	8.7	43.0
	12.00	1348	9.0	9.0	52.0
	13.00	927	6.2	6.2	58.1
	14.00	947	6.3	6.3	64.4
	15.00	935	6.2	6.2	70.7
	16.00	423	2.8	2.8	73.5
	17.00	372	2.5	2.5	76.0
	18.00	708	4.7	4.7	80.7
	19.00	717	4.8	4.8	85.5
	20.00	741	4.9	4.9	90.4
	21.00	731	4.9	4.9	95.3
	22.00	706	4.7	4.7	100.0
	Total	15000	100.0	100.0	

Table 3.1 shows the frequency of attendance for a sample month. It is observed that 469 students did not attend a single class for the whole month, and 453 students only appeared a single day in the entire month. Similarly, there are 706 students who attended their schools without any absence.

Table 3.2

Monthly Attendance Record of Colleges

Presence	Frequency	Percent	Valid Percent	Cumulative %
.00	494	4.1	4.1	4.1
1.00	443	3.7	3.7	7.8
2.00	511	4.3	4.3	12.1
3.00	506	4.2	4.2	16.3
4.00	696	5.8	5.8	22.1
5.00	760	6.3	6.3	28.4
6.00	810	6.8	6.8	35.2
7.00	726	6.1	6.1	41.2
8.00	659	5.5	5.5	46.7
9.00	692	5.8	5.8	52.5
10.00	789	6.6	6.6	59.1
11.00	269	2.2	2.2	61.3
12.00	239	2.0	2.0	63.3
13.00	217	1.8	1.8	65.1
14.00	409	3.4	3.4	68.5
15.00	431	3.6	3.6	72.1
16.00	258	2.2	2.2	74.2
17.00	274	2.3	2.3	76.5
18.00	237	2.0	2.0	78.5
19.00	301	2.5	2.5	81.0
20.00	348	2.9	2.9	83.9
21.00	344	2.9	2.9	86.8
22.00	326	2.7	2.7	89.5
23.00	302	2.5	2.5	92.0
24.00	319	2.7	2.7	94.7
25.00	301	2.5	2.5	97.2
26.00	339	2.8	2.8	100.0
Total	12000	100.0	100.0	

Table 3.2 shows that there are 494 out of a total of 12000 students who did not appear in any of the days of the selected month. 443 students attended college once in the whole month, similarly only 339 students were punctual and attended their college the entire month.

Table 3.3

Monthly Attendance Record of Universities

Presence		Frequency	Percent	Valid Percent	Cumulative %
V	.00	375	3.7	3.7	3.7
	1.00	364	3.6	3.6	7.4
	2.00	363	3.6	3.6	11.0
	3.00	362	3.6	3.6	14.6
	4.00	367	3.7	3.7	18.3
	5.00	571	5.7	5.7	24.0
	6.00	448	4.5	4.5	28.5
	7.00	439	4.4	4.4	32.9
	8.00	440	4.4	4.4	37.3
	9.00	473	4.7	4.7	42.0
	10.00	425	4.2	4.2	46.3
	11.00	348	3.5	3.5	49.7
	12.00	352	3.5	3.5	53.2
	13.00	340	3.4	3.4	56.6
	14.00	325	3.2	3.2	59.9

	15.00	646	6.5	6.5	66.4
	16.00	328	3.3	3.3	69.6
	17.00	304	3.0	3.0	72.7
	18.00	323	3.2	3.2	75.9
	19.00	313	3.1	3.1	79.0
	20.00	294	2.9	2.9	82.0
	21.00	328	3.3	3.3	85.2
	22.00	291	2.9	2.9	88.2
	23.00	288	2.9	2.9	91.0
	24.00	299	3.0	3.0	94.0
	25.00	301	3.0	3.0	97.0
	26.00	293	3.0	3.0	100.0
Total		10000	100.0	100.0	

Table 3.3 shows that there are 375 out of a total of 10,000 students who did not appear in any of the days of the selected month. 364 students attended their lectures at university once in the whole month, similarly only 293 students were punctual and attended their university classes for an entire month.

Gaussian Processes (GP) are algorithms used to solve regression and probabilistic classification problems in supervised learning [15].

GP(s) is a collection of randomized variables, which have (consistent) joint Gaussian distributions that are indexed by certain criteria (time and space). In machine learning, it uses the method of "lazy learning" to compare points in the already existing data to measure the similarity between them to make predictions for an unseen point in the training data.

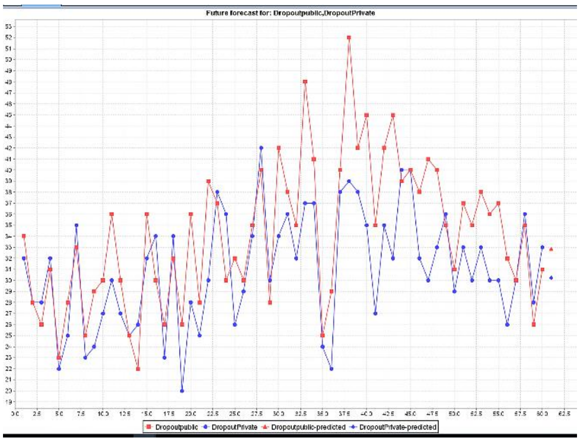
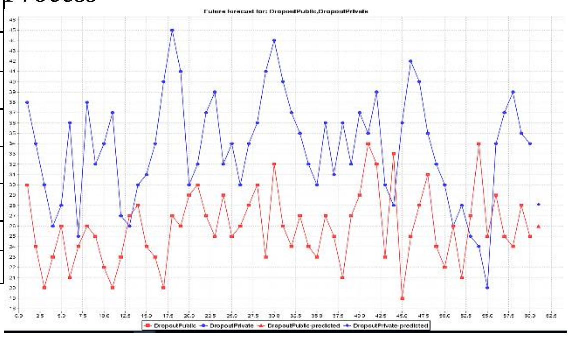


Figure 3.7 shows that when GP is applied to get the prediction on drop out students at the university level, the following pattern has been observed:

Figure 3.7

Forecast dropouts in Universities – Gaussian Process



LINEAR REGRESSION

Making predictions and learning from data can be easily accomplished through Linear Regression. Utilizing a graph and a straight line, the approach enables us to interpret the correlation between two elements. It may seem less exciting compared to other techniques, still it is widely employed to learn and analyze data.

This tool is utilized to examine a linear equation in order to determine if there is a correlation between a variable that is influenced by another factor, and one or multiple other variables. To express a linear relationship mathematically, we can write:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_n x_n$$

Where:

- y is the response variable
- The **model coefficients** are represented as β. The values will be "learned" while fitting/training stage of the model.
- β_0 is the intercept value.
- β_1 is the value of coefficient for X1 (the first feature)
- βn is the value of the coefficient for Xn (the nth feature)

Figure 3.8 shows the forecasting for possible drop out students from colleges with respect to sector using linear regression:

Figure 3.8

Forecast dropouts in Colleges – Linear Regression

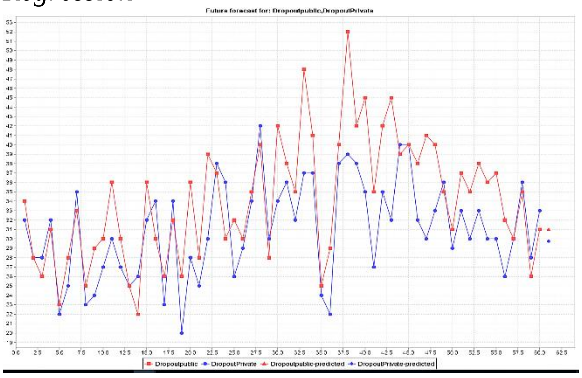
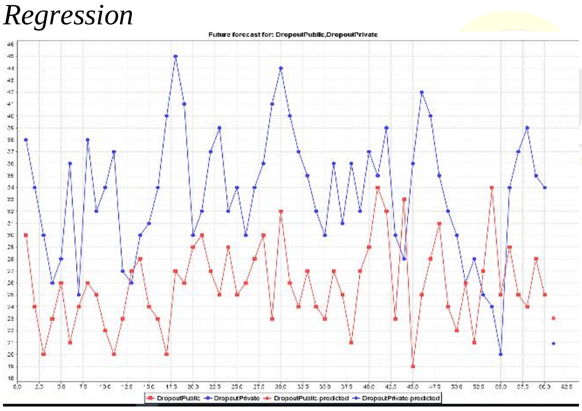


Figure 3.9 shows the forecasting for possible drop out students from universities with respect to sector using linear regression, results are shown as:

Figure 3.9

Forecast dropouts in Universities – Linear Regression



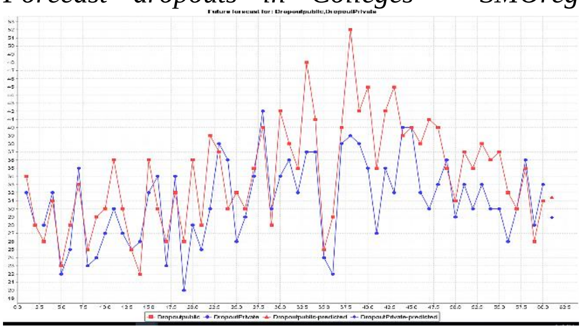
SMOreg stands for "Sequential Minimal Optimization Regression". SMOreg is a type in WEKA that uses the Support Vector Machine (SVM) method for analyzing Regression.

The Support Vector Machine (SVM) is mostly utilized in machine learning to sort the data into groups and estimate numerical solutions. The technique of SVM Regression doesn't require pre-set parameters because it uses Kernel functions instead. This technique involves changing data into a space with more dimensions to make it easier to group, although it looks strenuous to separate those using straight lines. After this, the technique finds groups in the data values to help arrange the information better and changes the data to show these groups as straight lines. By doing so, it enables us to use new information to calculate numerical values of the group it belongs to.

Figure 3.10 shows the forecast of drop out ratio of college students using SMOreg, following are the results:

Figure 3.11

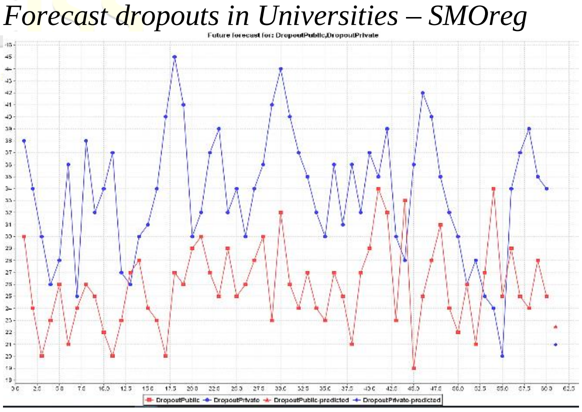
Forecast dropouts in Colleges – SMOreg



shows the prediction of dropouts from the university using SMOreg, following are the results:

Figure 3.12

Forecast dropouts in Universities – SMOreg



Comparison of Models:

After processing the same parameters using Gaussian process, linear regression, and SMOreg, there is difference in trends predicted by models. In order to compare the same, absolute mean errors indicated by three processes have been analyzed. Following are the outcomes when we consider the dataset for performance of institution:

The outcome of Gaussian Process:

```
=== Cross-validation ===
=== Summary ===

Correlation coefficient                  0.9
Mean absolute error                      0.3
Root mean squared error                  0.4
Relative absolute error                 19.2
Root relative squared error             22.7
Total Number of Instances               20
```

Outcome of Linear Regression:

```
=== Cross-validation ===
=== Summary ===

Correlation coefficient                  0.9714
Mean absolute error                      0.15
Root mean squared error                  0.5
Relative absolute error                  8.1818 %
Root relative squared error             22.9857 %
Total Number of Instances               20
```

Outcome of SMOreg:

```
=== Cross-validation ===
=== Summary ===

Correlation coefficient                  0.9735
Mean absolute error                      0.1895
Root mean squared error                  0.4754
Relative absolute error                 10.3358 %
Root relative squared error             21.8553 %
Total Number of Instances               20
```

Comparing mean absolute error of the three models, linear regression has the lowest value of 0.15 whereas Gaussian process has the highest value of 0.3529. Whereas value of Root mean squared error is lowest in SMOreg 0.4754.

Forecasting using a Time Series Modeler (SPSS)

In this section, data from private sector schools have been analyzed. Student admissions and drop out ratio have been processed.

Private Sector Schools Student Enrolment And Dropout Detail

A seasonal time series pattern has been seen in the current data set as the time period taken into observation is known and recorded on a quarterly basis that starts from January 2017 and ends at October 2021 for all the cases mentioned below. The simple seasonal model has been applied in order to know the periodic trend present in the data regarding a number of admissions and dropouts on a monthly basis for a period of five years.

Figure 3.12

Trend Forecasting – Private School

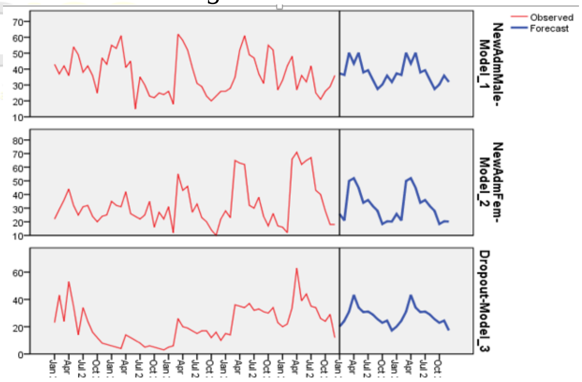
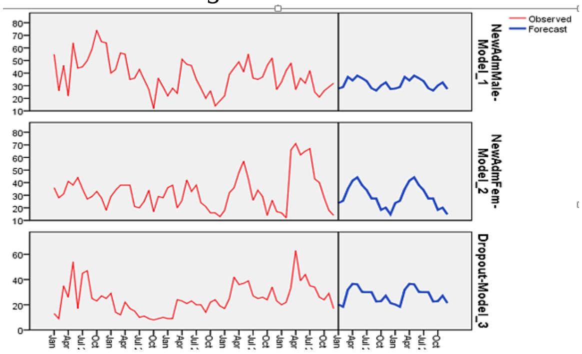


Figure 3.12 shows the trend of the number of students on a quarterly basis, having recorded values starting from January 2017 to Oct 2021 and forecasted values from April 2020 till October 2021. A peak can be seen in a number of Male admissions in the months of April, July, and October as per the recorded values. Whereas the forecast shows peaks in the months of January, April and July. New admissions female has peaked in the months of April and July. Whereas the forecasted values show peaks in April. Drop-outs are highest in the month of April as per the recorded values and forecasted values also show a peak in April.

Figure 3.13

Trend Forecasting – Public Schools



New admissions of male students in public sector schools have a peak in the month of October as per the recorded values whereas the forecasted trend does not show any peak at all. It is quite the same for every quarter. New admissions of female students are highest in April and July as per the recorded values, whereas the forecast shows a peak in April. Drop-outs in public sector schools are highest in April as per current values, whereas the forecast shows a similar trend for all the quarters.

Figure 3.14

Trend Forecasting – College

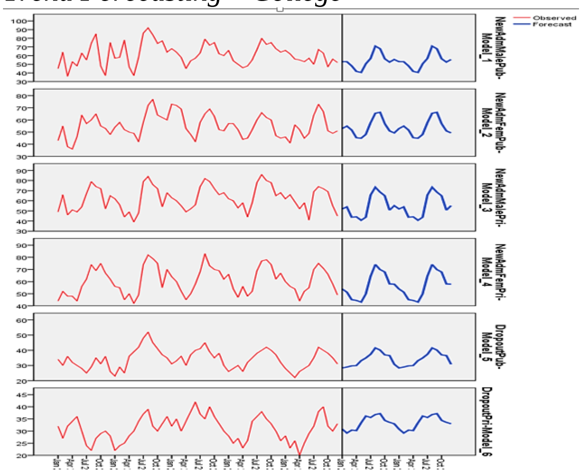


Figure 3.14 shows that new admissions of male students in public colleges are highest in the month of July and the forecast also shows a peak in the month of July. New admission female is highest in July, April, and October, whereas the forecast shows a peak in July. New admission male in private sector colleges shows a peak in October, July, and January, whereas the forecast shows a peak in July. New admission female private sector colleges show a peak in October and its forecast shows a peak in July. Drop-outs in the public sector show a peak in October whereas the forecast shows a peak in July. Drop-out private sector colleges have a peak in July and the forecast shows a peak in July and October.

Figure 3.15

Trend Forecasting University data

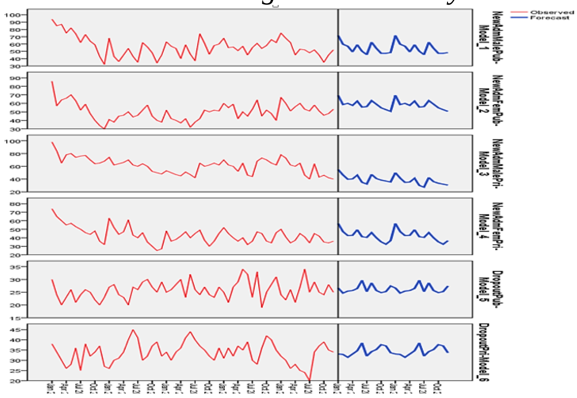


Figure 3.15 represents that new admissions males in public sector universities show a peak in January, whereas the forecast also shows a slight peak in January. New admissions for females in public universities are highest in the month of January and then there is a decline in admissions throughout the year. Whereas the forecast shows a moderate flow of admissions throughout the year.

New admissions males in private sector universities are also highest in January and then there is a drop in April. Whereas the forecast shows a moderate flow. New admissions for female private sector universities are highest in January, April, and October then there is a trend with slight upward and downward moves. Whereas the forecast shows a peak in April and the lowest in January.

Drop-outs for public sector universities have a very sharp upward and lowest trend with a peak in July and lowest in October. Whereas the forecast does not show a wavy trend. Drop-outs for private sector universities are highest in July for one year and the lowest in July for the next year. Whereas the forecast shows peaks in July and the lowest values in April.

Hence evaluating and analyzing the performance of institutions at each level of study can play a vital role in the progress of the educational sector of the country. This study would help to give insight into the latest data of institutions and monitor and analyze the progress in terms of student retention, attendance, examination results, etc.

CONCLUSION

Examining and assaying the performance of educational institutes at every instructive level is critical for advancing the country's educational position. This examination would give a high perception of the current data of these institutions, allowing for the monitoring and analysis of progress concerning criteria similar to student retention, attendance, and examination outcomes.

Furthermore, this academic portal will manage the archives of all the educational institutes both public and private, and by employing the data, obtained from this portal, in different dimensions it may help to identify trends and analyze various other critical points regarding the educational budget.

LIMITATION AND STUDY FORWARD

This study was conducted across selective public and private sector schools, colleges, and universities, primarily due to budget constraints. Additionally, the resistance from administration and faculty members, who lacked prior familiarity with IT education systems, posed a significant challenge to adoption. IT-based education systems encountered resistance and backlash from individuals unaccustomed to this mode of learning. Nevertheless, there is potential for successful implementation in smaller degree-awarding institutions and technical institutes within Pakistan, as well as registered Madrassahs, once awareness and understanding of the benefits of such an educational approach are effectively communicated and embraced.

CONFLICT OF INTEREST AND ETHICAL STANDARD

The authors confirm no conflicts of interest that could potentially affect the study's interpretation. Furthermore, this research adheres to ethical principles, ensuring informed consent and voluntary participation, safeguarding the privacy and confidentiality of participants, maintaining integrity and honesty in reporting, upholding respect for participants' rights and dignity, complying with legal and ethical guidelines, promoting transparency and openness in research practices, and fostering accountability and responsibility for ethical conduct throughout the research procedure.

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AUTHOR'S CONTRIBUTION

The first author perceived and implemented the study, developing its essential conception. The second author carried on computational analyses and estimated the results, while the third author performed a pivotal part in classifying the writing. The last author offered invaluable support in improving the overall study. Their cooperation and devotion enhanced the value and depth of this study.

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