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Research on the Impact of Different Measurements on Admission in Higher Education

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Abstract:

The higher education has been one of the most popular topics at present, and its admission process has always been the center focus. Many studies have been conducted on the higher education attain rate and its growth in different countries. Also, many researchers analyze the current admission trends and work to find what contributes to the admission. In this paper, a multiple linear regression model is used to analyze the relationship between 500 sample Indian students' chance of admission to Ivy graduate schools and their application materials. The significance of the results is also proven by compensated simple linear regression. Finally, it shows that GPA and standardized scores contribute the most to the chance of admission; the strength of the Reference Letter is also a relatively effective predictor; the research is a significant estimator, but its correlation with the admitting chance is weak. The test results give evidence of what Indian students should emphasize when they apply to Ivy graduate programs in the future.

Keywords: Higher education; graduate admission; multiple linear regression.

1. Introduction

Higher Education has been one of the most popular topics in personal development, and it is emphasized by people and society nowadays. Without a doubt, higher education is positively affecting all over the world. According to Routledge, with more interactions with communities, Higher Education can make the United States a more powerful, richer, and more equitable country [1]. For individual people, Higher Education can provide them with higher degrees and more practical skills, making them more eligible for job recruitment. According to some predictions, by 2025 about 40% of global labor will be filled with people who have accepted higher education, and according to McKinsey, the demand for high-skilled workers will rise, especially in healthcare and science and engineering-related fields [2, 3]. With higher education, individuals can have more chances to have higher-level employment and get better paid.

With the trend of expansion of higher education, in many countries, the higher educational attainment rate is constantly increasing. According to the U.S. Census Bureau, from 1960 to 2022 higher educational attainment in the United States has generally increased constantly, from 7.7% to 37.7% [4]. The

Number of colleges in India reached 50,577 in FY25 (as of July 29, 2024) and 43,796 in FY21, up from 42,343 in FY20. The number of universities in India reached 1,284 in FY25 (as of July 29, 2024), up from 760 in FY15 [5]. So, it can be indicated that performing higher education massively has been a global choice.

Since higher education is of high value among the public, its admission also becomes one of the most argumentative topics in the education field. Students' materials in the application are emphasized because they determine whether a student can be admitted and what his performance will be after admission. Murphy et al focused on the personal statement in academic admission and conducted a meta-analysis on the relationship between personal statements and other performance measurements (e.g. GPA) [6]. Actually, many people have claimed that a personal statement is not an essential predictor of a student's academic performance, and some even agree with the suggestion that personal statements should not be taken in the process of admission [7, 8]. Nevertheless, according to the results of the meta-analysis, researchers claimed that the predictive relationship between the personal statement and post-admission academic performance was not strong [6]. A personal statement can be essential, but it is not necessarily going to reflect one's academic skills. Relatively, in-course academic performance and standardized test scores (TOEFL, GRE, SAT) can better reflect one's academic skills. Another argumentative topic people are discussing frequently is the fairness of the admission. In China, the admission of high school students to colleges totally depends on the Chinese College Entrance Test, and the admission of undergraduate students to graduate schools also depends on a nationwide test. Such a method of admission is relatively fair because every student has the same opportunity and access to accept higher education. In other countries, admission equality is also discussed. Sang et al conducted research on the topic of whether the Graduate Record Examination (GRE) score should be removed from the admission process of graduate schools from a psychometric perspective [9]. In the past few years, there has been a fierce debate among many American universities stating that remote tests and economic hardship seemed to negatively influence Underrepresented Minority (URM) students. Also, some have declared that The GRE shows strong Black-White race gaps [10]. This is a legacy of systemic racism involving macro and historic factors. By studying and comparing the measurement of GRE and Undergraduate Grade Point Average (UGPA), researchers stated that there was no evidence to show a bias in GRE tests negatively affecting URM students and probably removing GRE scores from the admission process will harm URM students' interest [9]. This paper will focus on Ivy League graduate school admission among Indian students, finding different correlations between estimated admitting rates and different academic scores, and the academic performance of Indian applicants using a dataset from Jamboree education company.

In summary, this paper will use multiple linear regression to analyze different measurements of the sample Indian students and find the relationship between measurements and admitting rates.

2. Methods

2.1 Data Source

The dataset is collected from the Kaggle Website, which was provided by the Jamboree Education Corporation. Jamboree Corporation is an Indian company providing higher education exam preparations (SAT, GMAT, GRE, etc.) and admission services. The dataset is collected from 500 Indian students' estimated admission information to Ivy Graduate Schools. Such a dataset serves the function of a feature on the company website to help people estimate their possibility of being admitted by Ivy League Colleges. Besides the chance of admission, the dataset also provides different scores and admission measurements of 500 students (GRE, TOEFL, University Rating, etc.). The estimation feature estimates are based on previous experience of admission, and it can reflect the admission chances in the real world. Such a dataset can be used to test what measurement contributes more to admission chances.

2.2 Variable Selection

The dataset shows the sample students' standardized scores, college ratings, and the level of some other admission materials. All variables are GRE score, TOEFL score, University Rating, SOP Rating, LOR Rating, CGPA, Research index, and student's admission chances. Specific descriptions of variables are in the following table 1:

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Table 1. Variables Introduction

Variables	Descriptions
Serial No.	The number identity of each student in the 500-student sample
GRE score	Each student's Graduate Record Examination Score
TOEFL score	Each student's Test of English as a Foreign Language Score
University Rating	Each student's university & college ratings or reputations. Ranged from 0 to 5 (0 weakest and 5 strongest)
SOP	Each student's quality of statement of purpose. Ranged from 0 to 5 (0 weakest and 5 strongest)
LOR	Each student's quality of letter of recommendation. Ranged from 0 to 5 (0 weakest and 5 strongest)
CGPA	Each student's undergraduate Grade Point Average (GPA), ranged from 0 to 10 (0 weakest and 5 strongest)
Research	The measurement of whether a student has research experience
Chance of Admit	Each student's probability of being admitted to Ivy League. Ranged from 0 to 1

To conduct a multiple linear regression, the Chance of Admit is going to be chosen as the response variable, and the GRE score, TOEFL score, University Rating, SOP Rating, LOR Rating, CGPA, and Research index are explanatory variables.

2.3 Method Introduction

In this paper, a multiple linear regression model will be used. It's applied to test the linear relationship between one response variable and multiple explanatory variables. It can test the linear correlation strength shown by percentile, and get an equation containing all variables to show whether an explanatory variable is positively or negatively related to the response variable. Multiple linear Regression is simple and straightforward to read and interpret, and it's effective to analyze small-scaled datasets.

3. Results and Discussion

3.1 Linear Equation Obtained

By analyzing the dataset, a linear regression equation is obtained. It shows all the coefficients are positive, meaning the GRE Score, the TOEFL Score, the University Rating, SOP, LOR, CGPA, and the Research condition are all positively correlated to the Chance of Admit. It means when estimating the chance of admission, the higher the applicant's grades and scores are, the higher the chance they will probably be admitted.

$$ChanceofAdmit = -1.276 + 0.002 * GREScore + \ldots + 0.024 * Research \quad (1)$$

3.2 Multiple Linear Regression

According to Table 2, which shows the coefficient significance of each explanatory variable, the variables GRE Score, TOEFL Score, LOR, CGPA, and Research are all highly significant at 95% because their p-values are all fewer than 0.05. That means these explanatory variables are significant predictors of the Admission Probability. Also, the positive coefficients suggest that the correlation is positive, and the higher students' standardized scores and GPA are, the more research they have, and the more strength the reference letters have, the more likely they can have a higher admission probability. While the University Rating and the strength of the purpose statement are not significant estimators of the admission possibility, showing an applicant's university rating and purpose statement do not necessarily have an impact on the admission possibility. It reveals that based on Jamboree's experience, a student's concrete academic performances (Scores, Grades, Research output, etc.) have a greater impact on whether they can attend an Ivy League graduate school.

Table 2. Regression Coefficient Table

	Coefficient	Std. Error	Beta	t	p	VIF
Constant	-1.276	0.104	-	-12.232	0.000**	-
GRE	0.002	0.001	0.149	3.700	0.000**	4.464
TOEFL	0.003	0.001	0.120	3.184	0.002**	3.904
Uni. Rating	0.006	0.004	0.048	1.563	0.119	2.621
SOP	0.002	0.005	0.011	0.348	0.728	2.835
LOR	0.017	0.004	0.111	4.074	0.000*	2.034
CGPA	0.118	0.010	0.507	12.198	0.000*	4.778
Research	0.024	0.007	0.086	3.680	0.000*	1.494

Table 3 and 4 show the result of the model summary and ANOVA of the linear regression. The R2 value is called the coefficient of determination, which reveals how much the variation in the dependent variable can be predicted from the independent variables/ can be explained by this multiple linear regression model. The R2 is 0.822, meaning over 82% of the response variable variability can be captured and explained by this linear model, showing a strong linear correlation between the response variable and explanatory variables because the exact values highly fit the model. Adjusted R2 is a more accurate value of the coefficient of determination and its value is also about 82%, still showing a strong linear correlation.

Table 3. Model summary

R2	Adjusted R2	F- value	D-W value
0.822	0.819	F (7, 492) = 291.75, p=0.000	0.796

Table 4. Analysis of Variance

	Sum of Squares	df	Mean Square	F	p-value
Regression	8.170	7	1.167	291.75	0.000
Residual	1.770	492	0.004		
Total	9.940	499			

According to the analysis of variance, the Mean Square Regression is obtained from SSRegression/ DFRegression, and the Mean Square Residual is obtained from SSResidual/ DFResidual. the F value is obtained by dividing the Mean Square Regression by the Mean Square Residual, and the p-value of F is highly significant at the 95% level. That means at least one explanatory variable is a significant predictor of the response variable admission possibility, and that shows the multiple linear regression model obtained makes sense. So, this model can be a model used to predict the admission possibility of an applicant.

3.3 Compensated Simple Linear Results

Based on the analysis results, the significant explanatory variables GRE Score, TOEFL Score, LOR, CGPA, and Research are used to conduct separate simple linear regressions one by one. Different results can show the correlations between Admission possibility and different variables, and it can suggest which variables contribute the most to admission. The simple linear regression is used to test the accuracy of multiple linear regression results (Figure 1 and 2).

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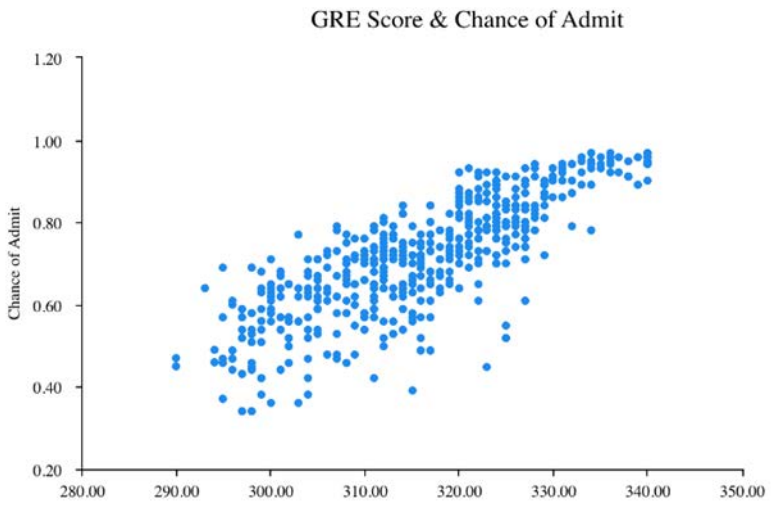

Fig. 1 GRE Regression

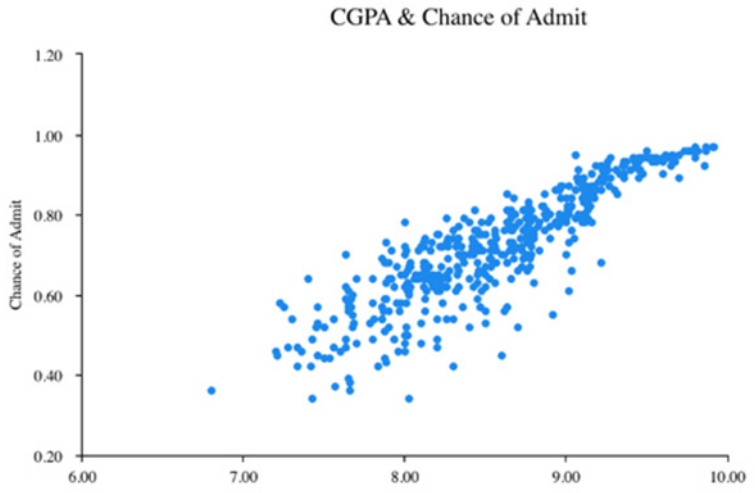

Fig. 2 CGPA Regression

By conducting separate simple linear regression and depicting scatter plots, it is observed that among all the significant explanatory variables, students' GPA has the highest correlation with Admission chance with an R2 of about 80%. It reveals that based on Jamboree's experience, the GPA, which shows a student's consistent efforts at college, can mostly influence a student's admission chance. What's more, the GRE score and TOEFL score also have strong linear correlations with admission chances, both showing an R2 of over 60%. It can be inferred that the higher one student's standardized scores are, the more likely they can be admitted into Ivy graduate programs. The strength of the Letter of Recommendation, it shows an R2 of 41.6%, which indicates an intermediate linear correlation between the chance of admission and the strength of reference letters. It still works out that a higher strength of reference letters can positively affect the admission results, while it does not work as importantly as GPA and standardized scores. Research shows the weakest linear correlation with the chance of admission, with an R2 of only 29.8%. The correlation shows having research experiences or not does not have a strong linear correlation with a student's chance of admission. By significance test, all five explanatory variables are still statistically significant in simple linear regression tests, indicating the same results as the multiple linear regression test.

4. Conclusion

This study focuses on analyzing different correlations between a student's chance of admission to Ivy graduate schools and some possible influential factors: the GRE score, TOEFL score, University Rating, SOP Rating, LOR Rating, CGPA, and Research by using multiple linear regression test.

Based on the multiple linear regression results, GRE

score, TOEFL score, LOR Rating, CGPA, and Research are significant predictors of a student's chance of admission, all with positive correlations. The significance test results are demonstrated by conducting compensated simple linear regression tests. Also, by analyzing R-squared values, the GRE and TOEFL scores, and college GPAs are the factors that contribute the most to the estimated admitting possibility, which reveals that based on Jamboree applying experience, grades and academic performances can most likely influence the result of admission. Also, the strength of Reference Letters also plays a key role because it shows a relatively high correlation with the chance of admission. The linear regression test in this study can provide real-life references about how Indian students should prepare and what directions they should emphasize when applying to graduate programs of the Ivy League. However, there are some questions still worth working on continuously as an extension of this study. First, people still have to know what the conditions of other nations' students are. Whether they also have higher chances of admission with better academic performances. Second, it should be acknowledged if the real admission rate is still related to the factors that have proved to be significant contributors in this study. After all, higher education and its admission will remain a key focus of the crowd in the future, and further research on how to improve admission ought to continue.

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