

Markov Analysis Of Student Performance In Colleges Of District Lower Dir And District Malakand Pakistan

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Abstract

The present study measures the students' performance based on the obtained grade points in Secondary and Higher Secondary examination results in District Dir and District Malakand, Pakistan, using data from Khan et al. (2022). The transition probabilities from one grade to another grade are calculated for individual respondent by Markov Chain. The result indicates that students having low grade has very low probability to go to higher grades. While average grade students have comparatively higher probability to go to higher grade. Moreover, the higher-grade students have low probability to get higher grade, high probability to get low grade, moderate probability to get average grade. The education leader and parents should focus on the higher-grade students that they stay on his state i.e. to obtain the same grade in next examination.

Key words; measure, students' performance, grade points, transition probabilities, Markov Chain

1. Introduction

Education is an important aspect of life of human being. This is activity which separates human from the animal and other animals. Education is changing the thinking and behavior of human being into positive and creativity direction. Education plays a vital role to make individual a suitable person for society. It is also important to transform human heritage from generation to generation. It is very necessary to test that how the objectives of education have been achieved. The activity used for the testing is known as examination (Khatoun and Perveen, 2009). According to Rasul and Buksh, (2011), examination is a tool to evaluate the ability of candidates and to check the fitness of students for promotion to higher class. The system of testing performance is as old as education but formal analyzing of ability of students was starting in 20th century. (Saha and Sarmah, 2012).

Some studies have been done on estimating the transient probabilities of students' obtained grades using Markov Chain. Alawadhi and Konsowa (2010) used Markov Chain to find transient probabilities of the students' mean lifetimes in different levels of study in the colleges as well as estimated the percentage of dropping out of the system. Hlavaty and Domeova (2014) created a model of students' progress throughout the whole course using the Markov chain approach.

Brezavscek et al. (2017) applied the Markov Chain model to investigate the pattern of students' enrolment and their academic performance in a Slovenian higher education institution. Muhammad et al. (2019) estimated the transient probabilities of students' progression towards the next stage of the study program. The probation, withdrawal and graduation probabilities were also obtained.

Students usually showed same performance in examination annually. Small portion of students improve their grad/GPA in examination compared to previous one. Some student takes low grad/GPA in current examination than previous. To analysis statistically such movement from one grade to another or stay in the same grade, Markov chain have might use (Saha and Dhalai, 2013).

In the present study, transitions probability of students' obtained grades/GPA in HSSC and SSC is estimated. Markov chain process is used to assess the transition probability of grades/GPA of randomly selected students from District Dir Lower, District Malakand.

2. Research Design and Data Set

This paper applied the stochastic process to estimate transition probabilities by Markov chain

of obtained grades of college students in matriculation and higher secondary school using the data of Khan et al. (2022). Further, Markov chain have certain assumption, without which the Markov chain cannot be applicable (Auwalu, 2013). In the present study, we put the some assumptions to follow Markov chain. For detail of the assumption see Saha and Dhalai (2013) because same assumptions are followed in the present study. Moreover, for estimation of the transition probabilities the grade of students we adapt the methodology presented in Saha and Dhalai (2013).

3. Result and Discussion

Total of 72 sample selected from different colleges. The sampling method is mention in Khan et al. (2022). The obtained marks of students are showed in Table 1.

Table 1: Frequency distribution of obtained marks of respondent in HSSC examination

Obtained Marks (Total marks 1100)	Frequency	Percentage
500—579	13	18
580—659	31	43
660—739	17	24
740—819	08	11
820 and above	03	04
Total	72	100

Source: khan et al. (2022)

Table 2: Frequency distribution of obtained marks in SSC of students

Obtained Marks	Frequency	Percentage
380—499	09	12.5

500—599	25	34.7
600-699	28	38.8
700-799	08	11.3
800 and above	02	02.7
Total	72	100

Source: Khan et al. (2022)

Analyzing the data given in Table 1 and Table 2, we estimated of transient probability using Markov Chain. The estimated transient probabilities are given in Table 3. In this table, S_0 , S_1 , and S_2 denotes grade of students in HSSC and SSC examination. Here, S_0 represents low grade, S_1 represents average grade, S_2 denotes higher grade of students in HSSC and SSC examination.

The probability associated with various grade changes are called transition probability. That is the grade of student are either improved to higher

or stayed at same grade or decrease to low grade. Thus, three stats are possible, stay at same grade, improve, or impair. These are shown in Table 3. The probability that S_0 grade stay at same is 0.693 improve to S_1 is 0.273 further improve to S_2 is 0.034. Similarly, the probability that S_1 impair to S_0 is 0.360, remains at same stat is 0.436, improve to S_2 is 0.204. finally, the probability of higher grade i.e S_2 impair to S_0

is 0.598, goes to S_1 is 0.314, and remain at same stat is 0.088.

Table 3: transition probabilities of students grade in examination.

Obtained Grades	S_0	S_1	S_2
S_0	0.693	0.273	0.034
S_1	0.360	0.436	0.204
S_2	0.598	0.314	0.088

Analyzing the result, we come to know that students having low grade has very low probability to goes to higher grades. While average grade students have comparatively higher probability to geos to higher grade. Moreover, the higher-grade students have low probability to get higher grade, high probability to get low grade, moderate probability to get average grade. This is alarming point for the resident of the study area. The students who obtained higher grade are unable to maintained

their status. This inconsistency has many reason; carelessness of parents and teacher, growing age of students which leads to busy life. The teachers and parents both should focus on the higher-grade students that they stay on his state i.e to obtain the same grade in next examination.

References

1. Khatoon, S. and Parveen, F. (2009), Examination phobia among secondary level students, international research journal

- of arts & humanities (IRJAH) Vol. 37, 129-146.
2. Rasul, S and Buksh, Q. (2011), A study of factors affecting students' performance in examination at university level, *Procedia Social and Behavioral Sciences* 15, 2042–2047.
 3. Saha, G. and Sarmah, P. (2012). Stochastic modeling of the grading pattern in presence of the environmental parameter, *Electronic journal of applied statistical analysis*, 5(1),108 -120.
 4. Alawadhi, S., & Konsowa, M. (2010). Markov chain analysis and student academic progress: An empirical comparative study. *Journal of Modern Applied Statistical Methods*, 9(2), 26.
 5. Hlavaty, R., and Domeova, L. (2014). Students' Progress throughout Examination Process as a Markov Chain. *International Education Studies*, 7(12), 20-29.
 6. Brezavscek, A., Pejic Bach, M., & Baggia, A. (2017). Markov analysis of students' performance and academic progress in higher education. *Organizacija*, 50(2)
 7. Muhammad, M. A., Falgore, J. Y., & Sani, U. H. (2019). Analysis Of Students' academic Performance and Progression (Using Markov Chain Approach). *International Journal of Engineering Applied Sciences and Technology*, 4(07), 187-193
 8. Khan, Z., Saeed, K. and Farihasami. (2022). Factors Affecting Students' Academic Performance A case study of District Dir Lower and Malakand Agency, Khyber Pakhtunkhwa. *Indian Journal of Economics and Business*. 21(1), 339-342
 9. Auwalu, A. (2013), Application of Finite Markov Chain to a Model of Schooling, *Journal of education and practice*, 4(17), 1-10.
 10. Saha, G., & SAHA, G. (2013). Performance Measures of Students in Examinations: A

Stochastic Approach. *Pakistan Journal of Statistics and Operation Research*, 53-70