

Predictive Value of Tested Attributes for Prospective Students (UMASS Dartmouth)

James P. Donohue

May 2, 2022

Abstract

The purpose of this study is to find if a certain combination of traits was predictive of a prospective student passing preliminary testing for admission into University of Massachusetts Dartmouth. In order to confirm or deny this hypothesis we will first pick a sample of variables we believe are highly correlated with the passing/failure of a student in their preliminary year. Then, a logistic model and multinomial logistic model will be constructed and plotted to measure how well this sample of traits fits our hypothesis. It was found that attending workshops, advisor meetings, and peer mentor meetings during the semester improved the odds of passing, while the psychological examinations given before the semester had very little impact if at all on the outcome of any student's preliminary year.

Background and Significance

The vetting process for admissions at most institutions of learning is quite scrutinous. Many different facets of the applicant are considered. However, the specific deciding variables for most students vary on a case by case basis depending on the intention of said student's study. Students who pursue degrees in STEM, medical, or liberal arts fields tend to have a closer focus on standardized testing, while those who are in athletics or visual and performing arts are more so focused in extracurriculars.

The bottom line is that most colleges look for applicants and prospective students who will complete their degrees reasonably well and will cultivate a good image for the school as a whole. So which traits are most indicative of these goals? A study was conducted at the University of Massachusetts Dartmouth for a sample of students who were accepted into a preliminary year. The data from this study includes, in addition to GPA, SAT scores, and whether or not they passed, results from psychological tests, how many meetings/workshops they attended, which university requirements they satisfied, etc. The hypothesis is that a particular permutation of these data points will be predictive as to whether or not a student will pass their preliminary year.

Methods

To test the hypothesis that a particular permutation of data points will be predictive as to whether or not a student will pass their preliminary year, some eyeballing will be necessary. We will first choose some variables that we think logically correlate with the performance of a student. Then, a logistic model and multinomial logistic model will be constructed and plotted to measure how well these data points predict a student's success by observing how frequently the model correctly predicts this idea.

Lastly, we will construct a goodness of fit of the logistic curve. This process will be repeated multiple times based on which attributes we want to test. The first attributes we will test are based on academic development activities they may focus on while in their preliminary year: campus events/requirements, number of advisor meetings attended, peer mentor meetings attended, and workshops attended. Subsequently, psychological factors and GPA will also be tested.

Results

For the first model, we use the sum of the variables: Completed Course, Completed Summer Bridge, Completed Campus Event Requirement, Number of Faculty Advisor Meetings Attended, Number of Peer Mentor Meetings Attended, and Number of Workshops Attended as the Predictor:

Predictor	N	Success	Proportion Success
2	2	0	0.00
3	1	0	0.00
4	2	0	0.00
5	3	0	0.00
6	6	1	0.17
7	5	2	0.40
8	7	3	0.43
9	5	3	0.60
10	11	8	0.72
11	7	5	0.71
12	15	13	0.87
13	10	8	0.80
14	9	9	1.00
15	15	14	0.93
16	3	3	1.00
17	3	3	1.00
19	1	1	1.00

[predictor vs. proportion of success curve here]

[logistic model graph here]

We find that the model predicted approximately 81% of the students completion status correctly and fits the model with a Pearson's R-Squared value of 0.85.

[goodness of fit graph here]

Next, psychological attributes were analyzed: Dropout Proneness, Predicted Academic Difficulty, Educational Stress, Receptivity to Institutional Help, Receptivity to Academic Assistance, Receptivity to Personal Counseling, Receptivity to Social Engagement, Receptivity to Career Guidance, Receptivity to Financial Guidance, Desire to Transfer. The sum of these values will be used as the Predictor.

Predictor (rolling window)	N	Success	Proportion Success
200-299	7	6	0.86
300-399	7	6	0.86
400-499	12	8	0.67
500-599	15	9	0.60
600-699	20	13	0.65
700-799	20	17	0.85
800-899	11	7	0.63
900-999	1	0	0.00

[Predictor vs. proportion of success graph here]

[Logistic model here]

The logistic model for this summation should be a very poor fit, yet when using the multinomial logistic model, which considers each value independently, we expect the model to predict approximately 74% of the students completion status correctly and fits the model with a Pearson's R-Squared value of 0.67.

[Goodness of fit here]

Finally, we will use the sum of students Fall Semester GPA and Spring Semester GPA to predict whether or not they passed.

Predictor (rolling window)	N	Success	Proportion Success
0.00-0.99	12	0	0.00
1.00-1.99	3	0	0.00
2.00-2.99	9	0	0.00
3.00-3.99	14	4	0.29
4.00-4.99	16	16	1.00
5.00-5.99	30	30	1.00
6.00-6.99	16	16	1.00

7.00-7.99	7	7	1.00
-----------	---	---	------

[Predictor vs. Proportion of success graph here]

[logistic model here]

The logistic model for this summation was only incorrect in predicting for two of the sampled students. On the other hand, the multinomial logistic model which had observed all variables independently only incorrectly predicted the results for a single student. The Pearson R-Squared value for the goodness of fit for the logistic model is 0.999.

[logistic model here]

Conclusion

The purpose of this study is to find if a certain combination of traits was predictive of a prospective student passing preliminary testing for admission into University of Massachusetts Dartmouth. Three particular facets of student conduct were observed: their extracurricular activities, the results of their psychological exams, and their GPA at the end of the year. The psychological tests were not great predictors, contrary to their very design. Using a multinomial logistic model, the psychological tests correctly predicted the results of 74% of students, though this is suboptimal in many prediction models and algorithms. Using the student's extracurriculars during the preliminary year, such as how many workshops they attended and advisory meetings attended, predicted 81% of the student's results correctly. As expected, their GPA had the best correlation with passing the preliminary year, though this is not a novel discovery given academic success is causal of a good GPA anyways. It makes sense that students who attend more workshops, advisor meetings, etc., will increase their odds of passing. Effort and engagement are what would more actively predict academic success, however, and further study with these factors in mind may prove more fruitful in the future.