Lab G4. Student career

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I. Introduction

In the simulation, the goal is to develop a simulator to evaluate graduation time and final grades of students. It's necessary to consider some parameters as input of simulator, such as the total number of course, grade distribution of past students and probability of passing the exam. All the output metrics.

II. The simulation model

A. Input Parameters

There are some parameters that we need to consider as our inputs.

Total number of courses. All students may take a maximum of four courses per semester and may not attend exams of the same course more than four times per year. In general, the total number of courses per student is fixed at 12. If a student fails to pass the course more than four times, they will have to repeat the attention for the course in the following year.

Grade distribution for past students. The other critical input parameter is the Grade distribution based on previous students. As shown in Figure 1, we can get the probability of passing exam. However, we can only get the probability of grades greater than 18, but not those less than 18. In the simulation, I have created two lists, one for scores below 18 with a uniform probability distribution and another for scores above 18 with a probability distribution. Finally, I merged the two lists into one list of grades, and then chosen a random grade from it.

Probability of accepting a grade. It is also important to consider whether the student will be able to accept his or her grades. This is very much dependent on the student's personal wishes and is difficult to model. Therefore, I chose the Bernoulli distribution to generate data to which to simulate students' decisions.

B. Input Entities

There are two classes of entities I defined before simulating, Course class and Student class.

Course class. The course class include four properties, the current grade, course status, number of attend and course-ID, respectively. It could record the all exam information and update them every time after student attended a exam.

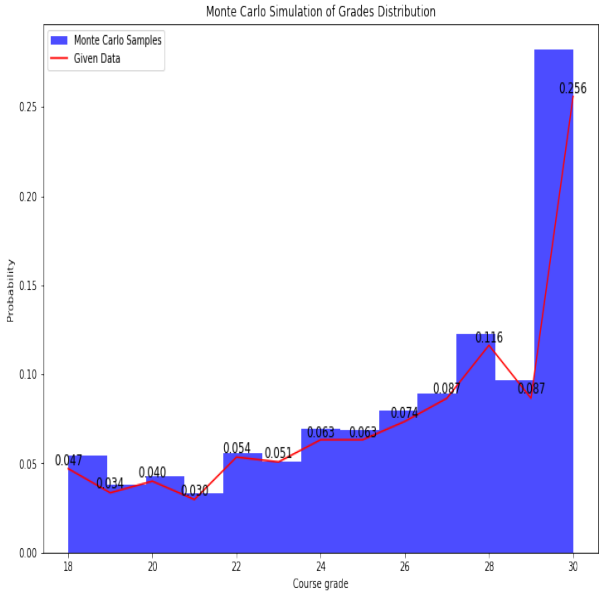

Fig. 1. Grades distribution

Student class. The student class also include four properties, the student-ID, graduation year, final-grade and total courses. When the graduation of student happened, the 'student' would record the final graduation information.

C. Output Metrics

Average graduation time and grade. The Student-List record graduation grades and time for all students. The average graduation grade was obtained by adding all grades and dividing by the number of students. The average time to graduation was calculated by adding all times and dividing by the number of students.

Average number of attended exams. The Passed-course-List record the number of attended exams for one student. The average number of attended exams could be divided by adding all number of attended exams and dividing by the number of courses.

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III. Results

As shown in Figure 2, the average number of exams taken by the 20 students varied. This displays that most of the students took the course exams more than 2 times but less than 6 times. The mean is 3.96225 and the variance is 0.99.

As shown in Figure 3, graduation time fluctuates between 2 and 4 years, and conversely graduation scores fluctuate between 90 and 110. Their are 0.81 and 12.0, respectively. The accuracy of all indicators was greater than 0.98 at the 95% confidence level.

IV. Conclusion

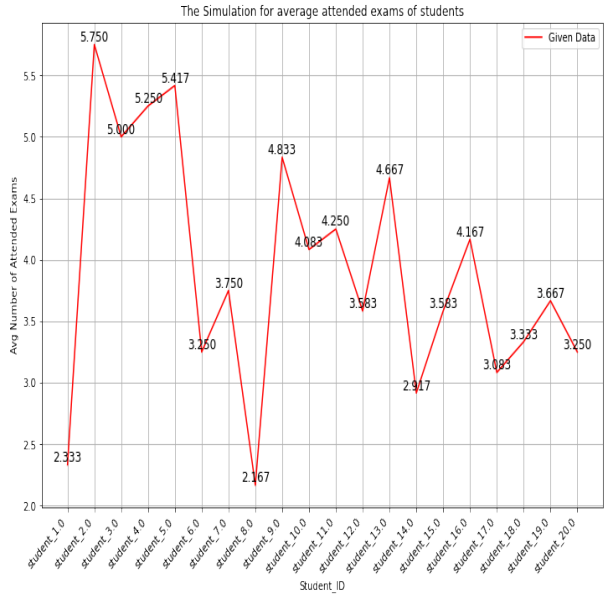

Fig. 2. Attended exams distribution

TABLE I
MEAN AND VARIANCE FOR STUDENTS WITH DIFFERENT GRADUATION CONDITIONS

Table	The graduation simulation for students		
	average attended Exams	*graduation year*	*graduation grade*
Mean	3.96225	3.048000	101.511864
Variance	0.99189	0.815104	12.056145
Accuracy	0.988649	0.986896	0.998135

It is very clear from Figure 4 that the final year of graduation is strongly correlated with the average number of exams, with a correlation rate of 0.7. This is consistent with reality. On the contrary, the final graduation grade is almost independent of the other parameters. The results show that the number of exams taken and the time to graduation have almost no effect on the final graduation grade, but if too many exams are taken, it will lead to a shorter time to graduation.

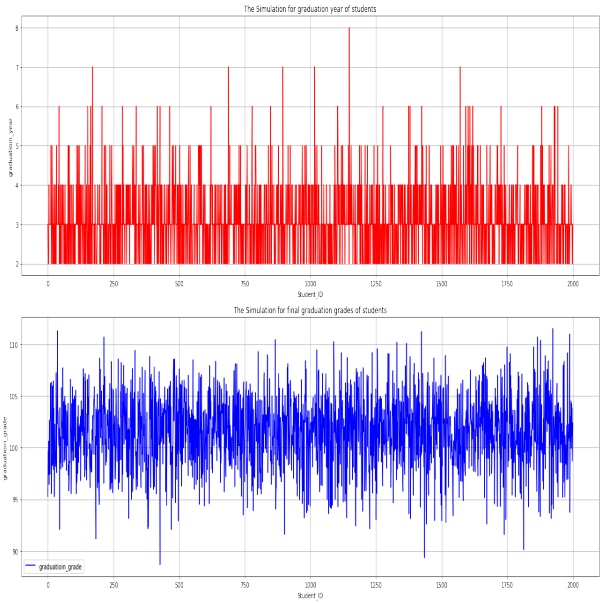

Fig. 3. Graduation grades and year

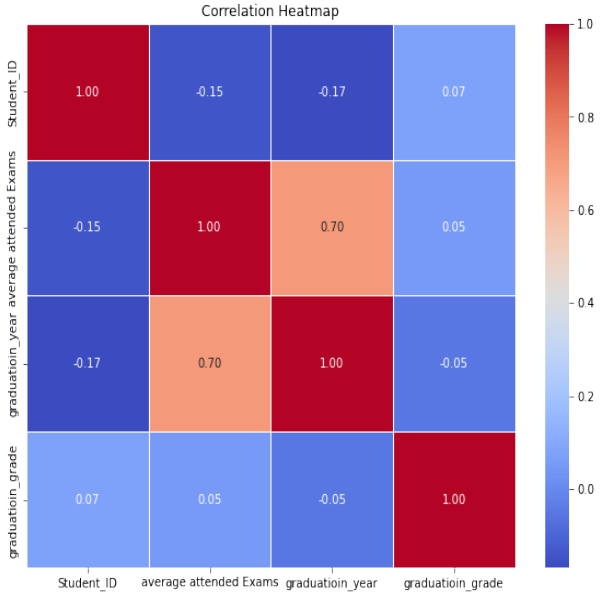

Fig. 4. Graduation grades and year