

Data-Driven Optimization to Improve Timely Graduation

Prof. Dr. Ming Chen, Xuan Huang, Hongyu Chen, Xuemei Su, Jasmine Yur-Austin

California State University Long Beach, the United States

Abstract

With progressively declining state budget in the last two decades, timely graduation has become an increasingly more challenging problem for many public universities in the United States. Our research examines students' enrollment and performance data in a large college at the California State University Long Beach. Through data analytics, we identify four fundamental issues that lead to delayed graduation. We propose innovative solutions that directly tackle each of the four identified issues while systematically matching capacity and demand. Specifically, we propose major-specific degree roadmaps tailored to increase the chance students can successfully complete all required courses within the timely graduation window, taking into consideration possible major change behaviors. We develop two optimization models. The first model balances capacity requirements for various courses across different majors when designing their respective degree roadmaps. The second optimization model maximizes students' access to courses as well as capacity utilization. More specifically the second optimization model determines the class schedule in which all students are guaranteed a seat within their preferred time window in all required classes. We test our model using real dataset that spans an eight-year time window. The results demonstrated that the proposed models performed very well. The proposed approach can be applied to many institutions facing the timely graduation challenge.

Keywords: data analytics, scheduling, optimization, timely graduation.