

## **Business Brief: Reducing University Dropouts Using Predictive Models**

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**Opening Statement**

The challenge of student retention has become increasingly significant, affecting both the academic integrity and financial health of institutions like ours. An in-depth analysis by our data science team of 4,424 enrolled students, revealed that 1,421 -- 39.15% of the cohort did not continue in their degrees as it led them to drop out of the university. These statistics underline an urgent need for data-driven strategies to proactively identify and assist students at risk of leaving before graduation time. Leveraging state-of-the-art machine learning algorithms, we developed a predictive model with an accuracy rate of 91%, capable of accurately forecasting students most likely to drop out. This model allows for early identification of at-risk students, enabling us to offer personalized interventions that could range from academic support to financial aid tailored to their specific needs. These measures can be implemented well before students reach a critical point of disengagement.

In our analysis, our team has revealed key patterns, including significant academic, socioeconomic, and behavioral indicators that correlate strongly with dropout risk. The findings from this model are not only actionable but scalable, positioning the university to enhance student success, improve retention rates, and strengthen financial sustainability through increased tuition retention. This briefing will present the results of our analysis, explain the methodology behind our predictive model, and propose a roadmap for implementing these data-driven strategies. Our team aims to empower university leadership to take decisive action based on these insights, ensuring our institution remains competitive, financially robust, and academically distinguished.

**Substance of the Brief:**

The issue and why we can help:

The biggest problem for universities is when students drop out before graduating. This is a big problem for the university and it affects them in several ways. First, student success is affected and this reflects poorly on how the university helps students achieve their goals. Second, the university will lose tuition fees that would have been paid by those students. Lastly, when a school has a big dropout rate it hurts how other people and prospective students view the school.



In order to help solve this problem this project was created to predict which students are at higher risk of leaving the university. Using student data we created models that analyzed academic performance and student background demographics and predicted the students at most risk of leaving the university. With the results the schools could act quickly and offer students resources, such as tutoring, counseling, or financial aid, to help students stay on track. As a result of being able to keep more students in their program, the university not only helps more students succeed but also improves its financial situation and strengthens its reputation. This in turn helps more students graduate and pave the way for better opportunities for both the university and the students.

### **Supporting Evidence and Key insights:**

This business report underscores that dropout rates within higher education constitute a considerable challenge, affecting not only individual students but also the more comprehensive economic and societal frameworks. High dropout rates contribute to a loss of potential skilled labor, adversely affecting economic growth, employment, competitiveness, and productivity. Furthermore, these rates have profound consequences on the personal lives of students and their families, with wider societal ramifications. Addressing this issue is crucial for promoting sustainable economic development and advancing social equity. A key research finding reveals that socioeconomic factors are critical in determining whether students succeed or drop out of college or university. Key factors like family income, tuition costs, and available scholarships play a crucial role in shaping students' commitment to their academic journey. Students who have a stable financial situation, whether through timely tuition payments or generous scholarships, tend to remain enrolled and engaged in their studies. This highlights the vital role of financial support systems in enhancing student retention and success.

The study examines the use of machine learning models to forecast student dropout and academic achievement. The dataset employed includes a variety of demographic, academic, and socioeconomic variables, which serve as the foundation for building predictive models. These models are instrumental in evaluating the probability of student dropout or academic success. They are also integrated into a comprehensive Learning Analytics tool designed to enhance institutional interventions. One prominent



case is the system at Arizona State University (ASU), which has developed a sophisticated risk assessment mechanism to bolster student retention and promote academic success. This system, as part of the eAdvisor program, continuously monitors students' academic progress with respect to their degree requirements. When deviations from the intended academic path occur, the system promptly identifies these students as “at risk” and issues notifications to both the student and their academic advisor. Such early detection enables timely interventions, which may include personalized advising, customized learning plans, and tailored support services—all of which aim to help students stay on track and achieve their academic goals. The dataset used in the research consists of 4,424 records with 35 attributes, including demographic details, macroeconomic indicators (such as unemployment and inflation rates), and academic performance data across semesters. Spanning ten academic years from 2008 to 2019, and covering multiple undergraduate programs, this dataset offers significant potential for comparative analyses within the field of educational data mining.

The study highlights the significance of early detection of students who are at risk of dropping out. It uses predictive models to classify students into three categories: dropout, enrolled, or graduate. By identifying at-risk students early, institutions can allocate resources effectively to those who require the most support. Timely, data-informed interventions can greatly enhance retention rates and academic performance. Additionally, the research tackles the problem of unequal class distributions, a frequent issue in educational data mining. There are often more dropout cases than successful completions, and researchers took this disparity into account to ensure their machine-learning models deliver strong predictions. This adjustment improves the accuracy and relevance of the findings for institutions seeking to lower dropout rates.

**Business Goals:**

The main goal of this project is to help universities in the successful implementation of effective, data-driven strategies for identifying and supporting at-risk students to prevent dropout. This will improve the outcomes of student success as well as the institution's financial stability by keeping more students enrolled. This approach ensures that resources are channeled more effectively to focus on where support





is needed most. By improving retention rates and reducing the number of dropouts, the university can improve student success outcomes and enhance its financial stability. This approach also ensures that resources are allocated more efficiently, allowing the university to focus support where it's needed most.

**Call to Action**

We would like to invite university decision-makers to partner with us in implementing this predictive model for better student retention. The use of this tool will help you allocate resources where they are most needed, offer early support for students, and improve the overall success of your institution. Get in touch with us today so that we can work out a suitable time for the demo or discuss the customization of this solution for the specific needs of your university.

