

# ExamBoost: A Data-Driven Approach to Improve Student Exam Outcomes

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## ABSTRACT

This research provides a data-driven tool called ExamBoost that predicts student exam success based on controllable and uncontrollable factors and provides guidance via optimization modeling in how changing controllable behavior could lead to the greatest incremental change in exam performance. The motivation for this research is that the authors are themselves students and would like to know how to optimally change certain controllable decisions to boost exam performance, based on our individual and unique resource constraints. Our decision support tool could help students create a data-supported strategy to optimize their performance in classes, or help their instructors best steward them toward success. Our tool was developed using R-shiny, which helps bring the analytics and graphics capabilities of R to life for analytics professionals and their end-users.

## INTRODUCTION

Many students seek effective strategies to improve their exam performance. Our research aims to identify key factors that influence exam scores, distinguishing between those within a student’s control and those beyond it. While uncontrollable factors provide valuable insights for educators to better support students, our focus is on actionable factors. To assist students in optimizing their study efforts, we developed a model that highlights the most impactful areas for improvement.

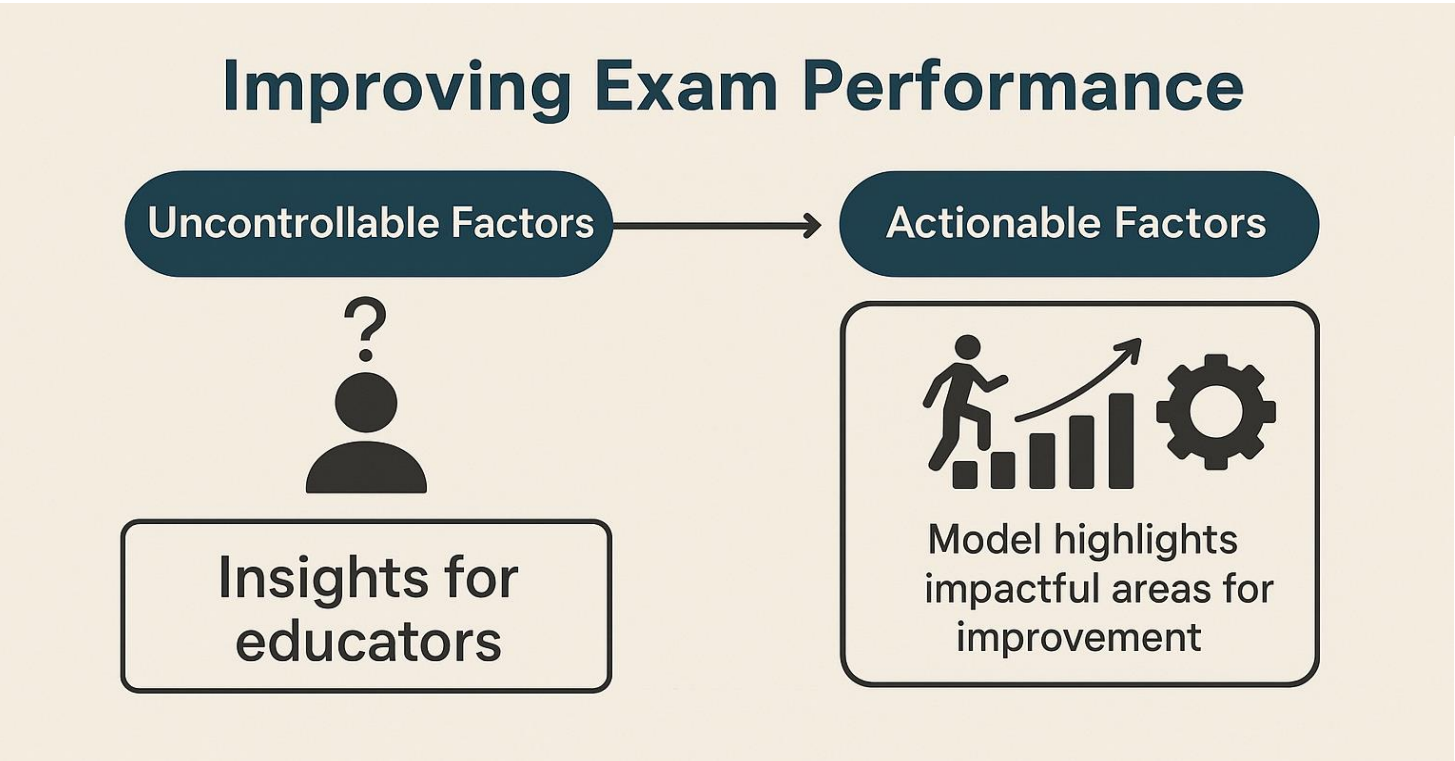


Fig 1. Student exam performance: controllable vs. uncontrollable factors

## RESEARCH OBJECTIVES

- Clearly state your research question(s) with bullets:
- What steps can students take towards improving their examination score?
  - What factors influence a student's exam score that are out of their control?

## DATA REVIEW

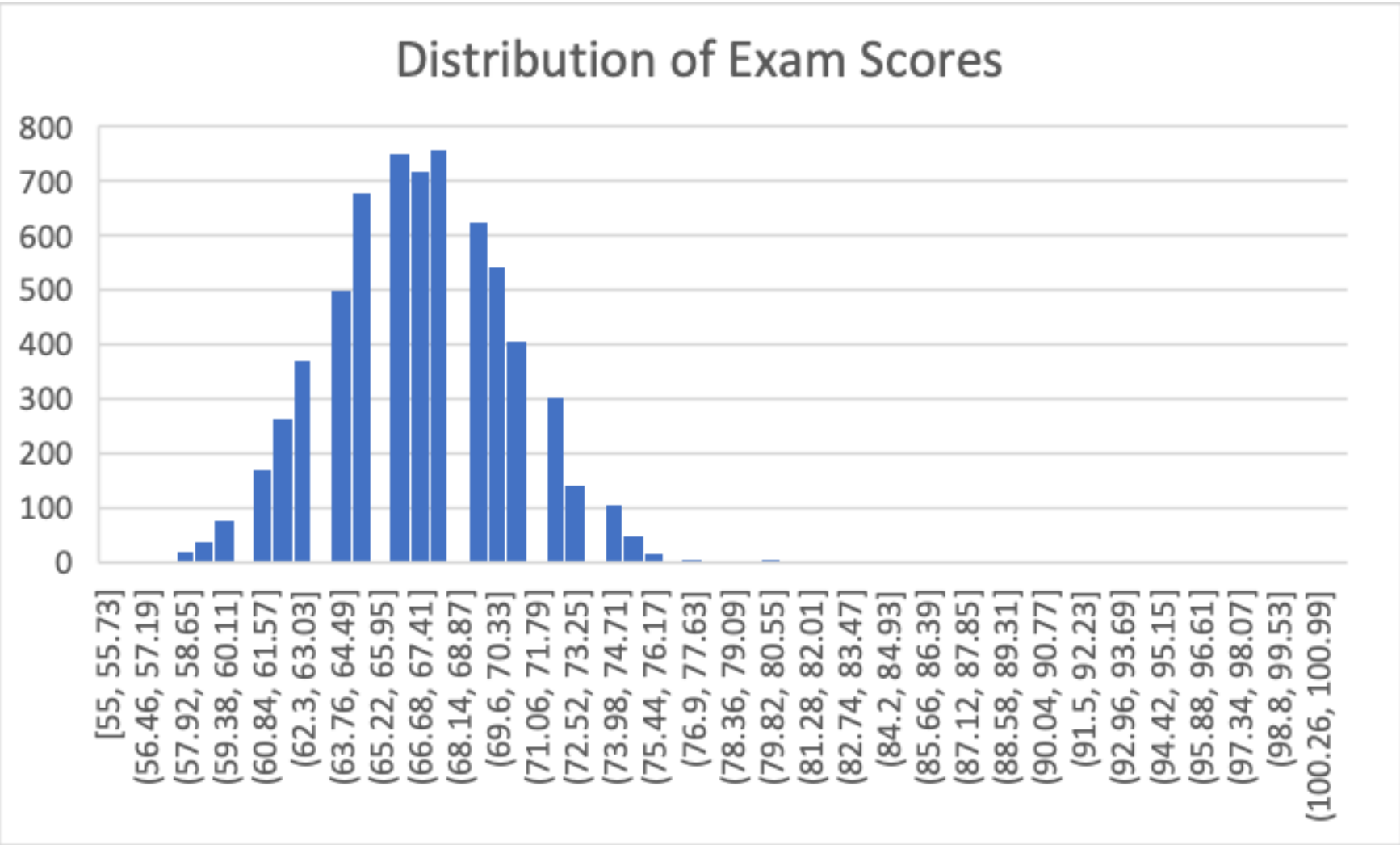


Fig 2. Exam Score Distribution

## METHODOLOGY

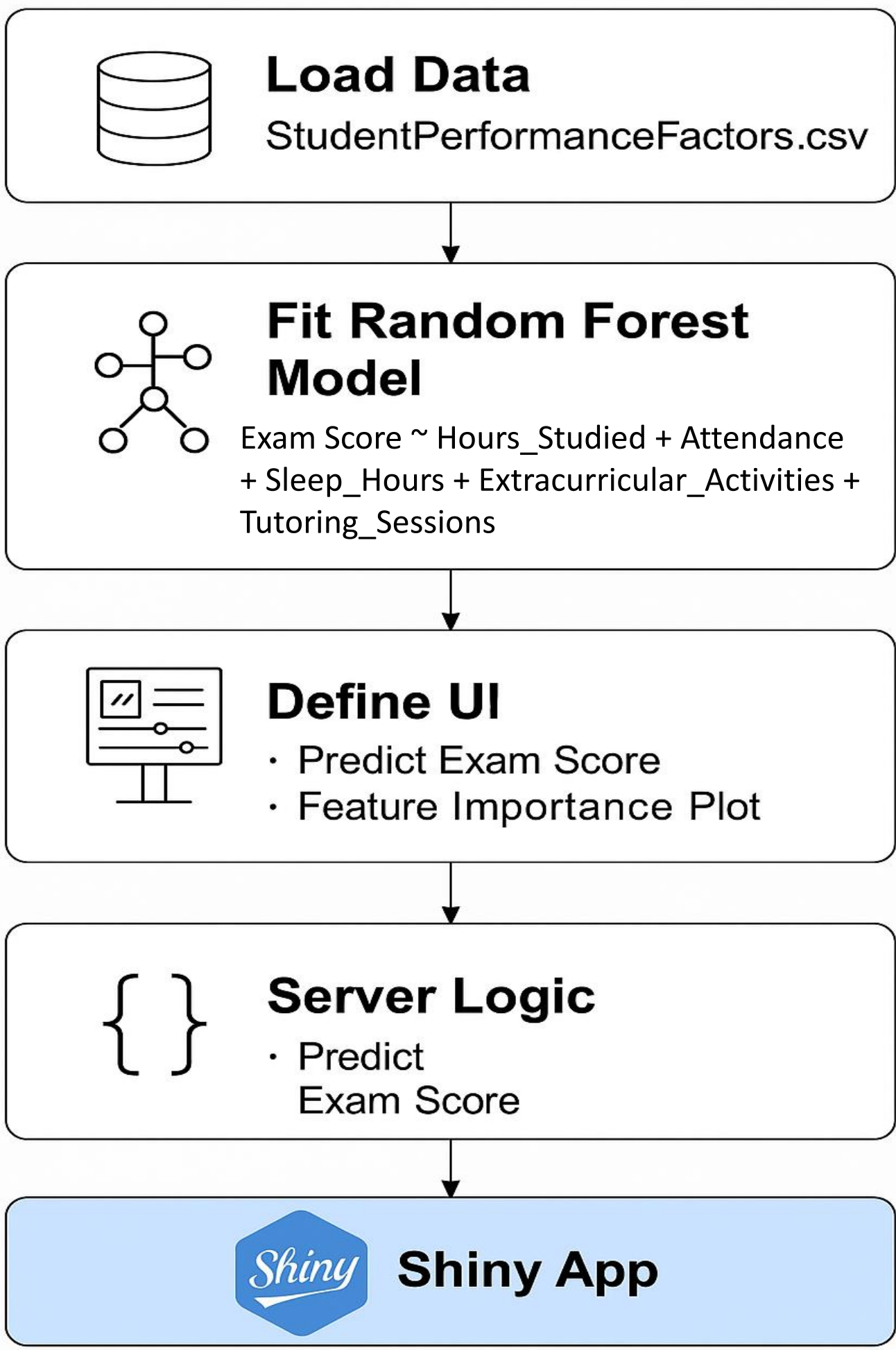


Fig 3. Model Flow Chart

## STATISTICAL RESULTS

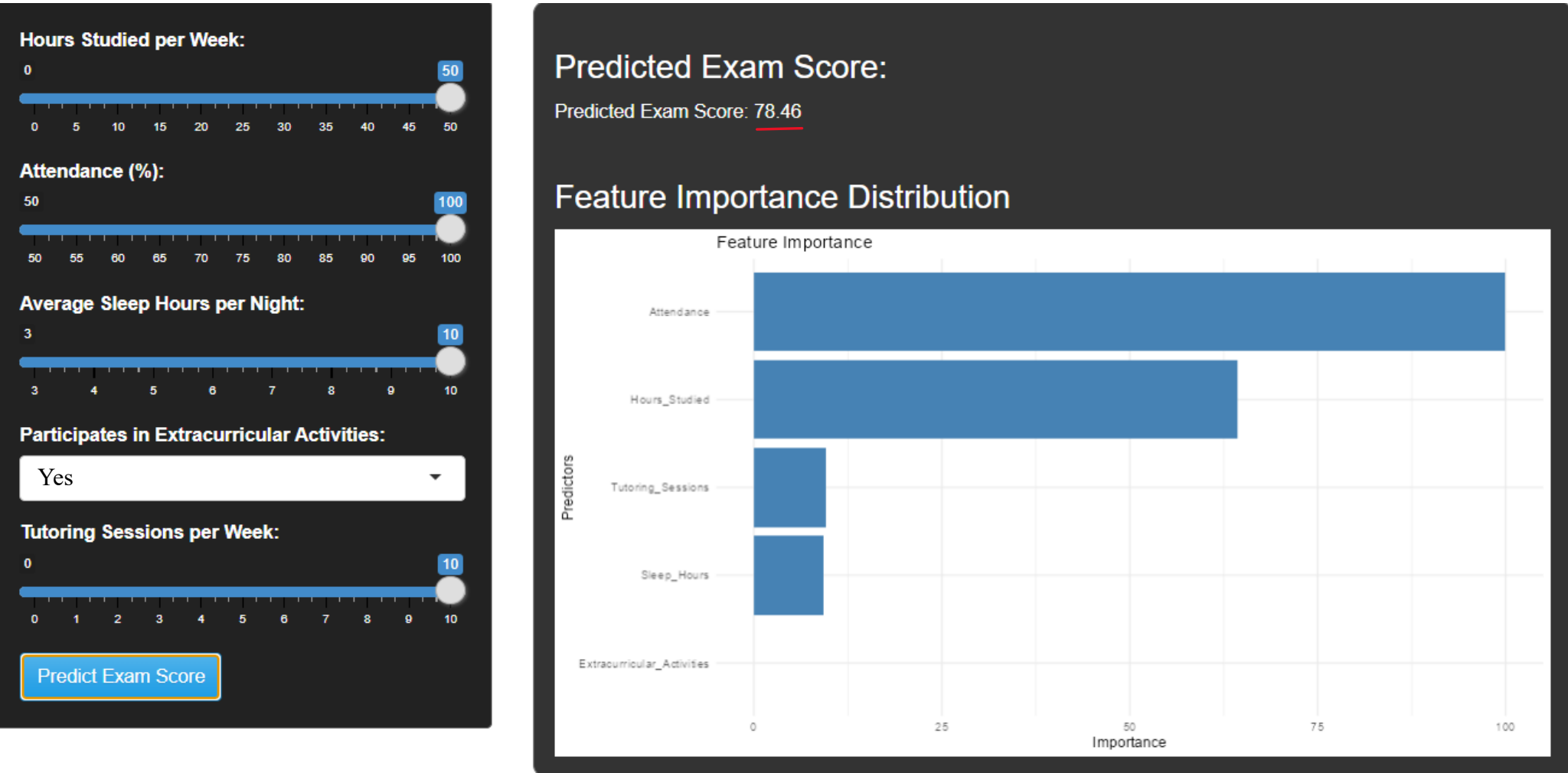


Fig. 4 Shiny App with Maximized Factors

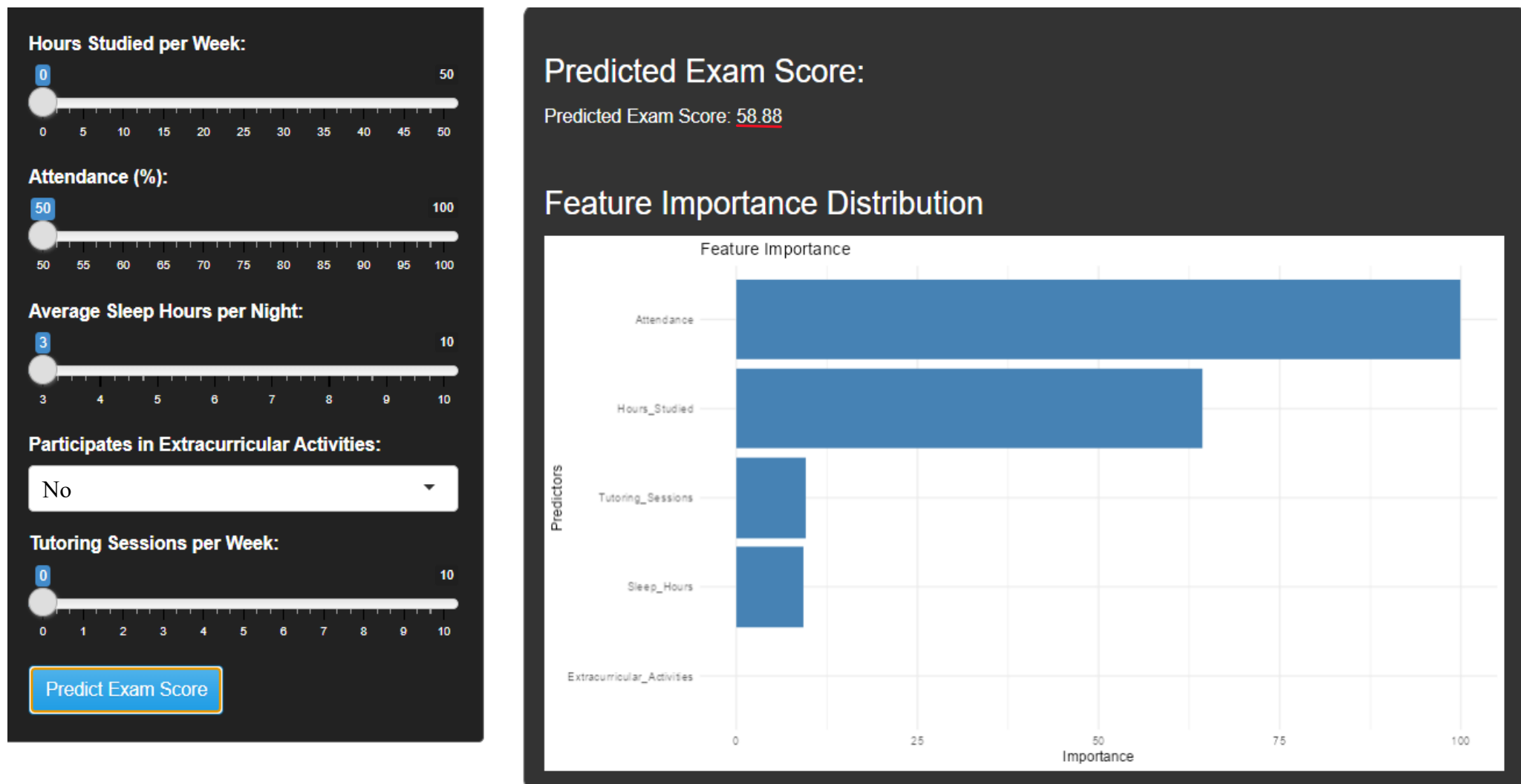


Fig. 5 Shiny App with Minimized Factors

The figures above illustrate two contrasting scenarios: one where a student maximizes key study factors like class attendance, tutoring sessions, and study hours, and another where these factors are minimized. In the first scenario, the student fully engages with available resources, while in the second, they invest little effort in preparation. These visualizations highlight the significant impact of study behaviors on academic performance, demonstrating how strategic planning can improve exam outcomes. By providing a clear comparison, our app helps students make informed decisions about their study habits to optimize success.

## EXPECTED IMPACT

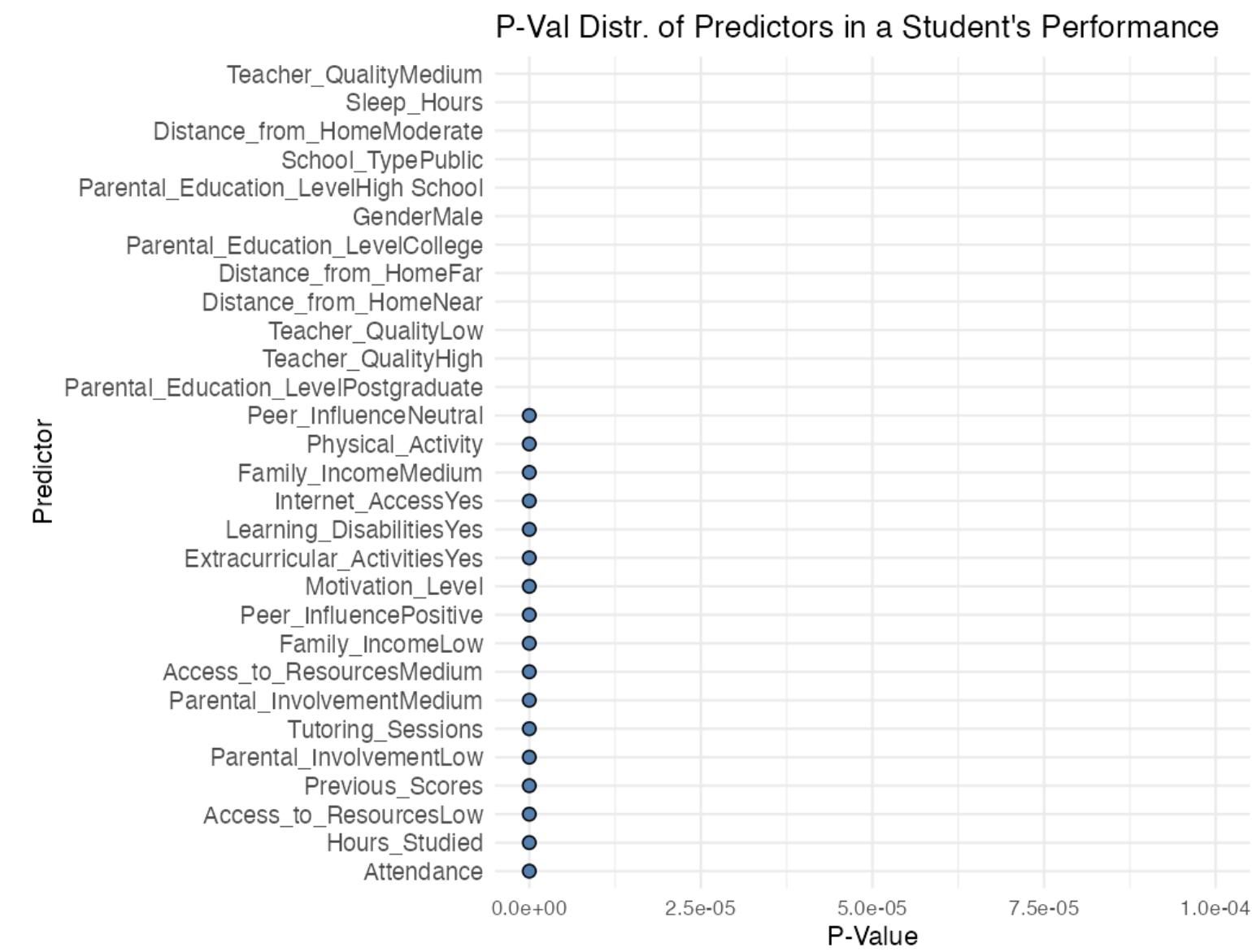


Fig. 6 P-Value of All Predictors in Student Performance

The primary beneficiaries of our insights are students and educators:

- Students can now make informed decisions how to increase their exam score
- By knowing the most influential variables, teachers can promote certain resources or habits to students, for their achievement

## CONCLUSIONS

For students to achieve a high exam score, the most impactful habit would be to attend class. In addition to this, spending more hours studying can boost a student’s exam score. Tutoring sessions and an appropriate amount of sleep are not extremely influential but are good ways for students to still put their best foot forward prior to examinations. On the other hand, factors, such as tutoring sessions and parental involvement, are a significant variables that a student cannot always control. Although there are variables that a student cannot change themselves, it is important for them to adjust their habits based on what they can control for a higher examination score.

## ACKNOWLEDGEMENTS

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