SmartCal: A Machine Learning Approach to Enhancing Student Performance by Optimizing School Processes

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Every year, over 1.7 billion dollars per state is used for external assessments on top of the time and effort spent my teachers and students for internal assignments. However, none of the data gathered from these tests are used to their full potential as can be seen with current systems. To solve this problem, I developed SmartCal which streamlines and optimizes school processes for the betterment of the next generation. SmartCal utilizes Swift for the UI, Python for the ML models, and Firebase API's for data storage, as well as data from 700 students across the nation for three main components which collectively seek to improve students' performance within schools. First, a neural network utilizes past grades to predict an upcoming score and then efficiently allocates time for certain tasks and recommends activities to partake in for optimal performance. Second, a polynomial regression rates a student's level of improvement through integrals and residuals which better indicates performance. Third, a K-Means Clustering algorithm groups students based on achievement and improvement levels from the first two algorithms to group students together allowing teachers to better individualize curriculums. The advantages of this algorithm are evident through a t-interval on data which consisted of the absolute value of the differences between the actual value and the predicted value. After attempting to predict the scores of 200 individuals by only knowing their last ten scores, I concluded with 95 percent confidence that the upper bound of error between the predicted and real value is 4.12%. This aspect alone is revolutionary since no LMS system even attempts to analyze data, but the first algorithm of its kind has an upper bound of error less than five percent.

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