Algometrics: A Data Driven Application for Academic Insights

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Abstract:

Identifying students who are at risk early is of utmost importance for improving academic success, reducing dropouts and ensuring timely help for students who require attention with their courses. Students face challenges because of socio-economic conditions, lack of academic help, or inadequate preparation, this can lead to poor performance, repeated failures, or even withdrawal from their studies. Educational institutions very often struggle with effectively allocating resources to support these students, which makes data-driven approaches critical for performance analysis of students. This paper presents Algometrics, a web-based application that leverages machine learning and data analytics to predict student performance considering multiple permutations and combinations of academic and socio-economic factors. The tool processes datasets containing parameters such as race/ethnicity, parental level of education, families' monthly/annual income, gender, and individual subject scores in mathematics, reading and writing. The system has predictive modeling and integrated interactive visualizations, providing educators with insights into the performance trends of students enabling data-driven interventions. The integrated dashboard provides multiple analytical charts such as correlation heatmaps, score distribution trends, and demographic and socio-economic conditions in shaping student success. Algometrics assists institutions in identifying students at risk of failing or dropping out and underperforming through a scientific and data-driven approach. Thus, enabling targeted interventions, personalized learning strategies, and improved resource allocation.

Keywords:

RNN (Recurrent Neural Network), LSTM (Long Short-Term Memory), Predictive Analytics, Regression Analysis, Data Visualization, Big Data in Education.