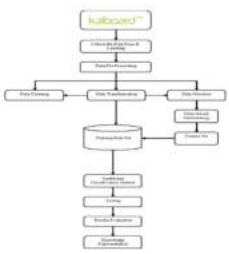
Student Academic Performance Analysis And Prediction Using Machine Learning

Are you curious about how machine learning can revolutionize the way we analyze and predict student academic performance? Look no further! In this article, we will delve into the world of machine learning and its potential to provide meaningful insights into student achievement.

Education plays a crucial role in shaping our society and future generations. It is vital for educators to have a thorough understanding of student academic performance to ensure effective teaching and learning outcomes. Traditionally, analyzing and predicting student performance has relied on human judgement, which can be subjective and time-consuming. However, with the advent of machine learning, we now have access to powerful algorithms that can uncover hidden patterns and make accurate predictions based on vast amounts of data.

The Power of Machine Learning in Education

Machine learning, a subset of artificial intelligence, offers immense potential in enhancing various aspects of education. When applied to student academic performance, it can provide valuable insights for educators, administrators, and policymakers. By analyzing historical data such as test scores, attendance records, and socio-economic backgrounds, machine learning algorithms can identify correlations and patterns that human observers might miss.



STUDENT ACADEMIC PERFORMANCE ANALYSIS AND PREDICTION USING MACHINE LEARNING WITH PYTHON GUI by Vivian Siahaan (Kindle Edition)

★★★★☆ 4.7 out of 5

Language : English

File size	: 5013 KB
Text-to-Speech	: Enabled
Enhanced typesetting	: Enabled
Print length	: 312 pages
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Screen Reader	: Supported

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Identifying At-Risk Students

One of the most significant benefits of machine learning in education is its ability to identify at-risk students. By examining a range of factors such as attendance, grades, behavioral patterns, and socio-economic background, machine learning algorithms can pinpoint students who are more likely to struggle academically in the future. This information allows educators to intervene early and provide targeted support, ultimately increasing the chances of academic success.

Personalized Learning Paths

Every student has unique learning needs and preferences. Machine learning algorithms can aid in creating personalized learning paths tailored to individual students' strengths and weaknesses. By analyzing previous academic performances, interests, and learning styles, these algorithms can recommend appropriate learning materials and strategies for each student, resulting in a more engaging and effective learning experience.

Data Collection and Analysis

Data collection is a crucial step in any machine learning project. In the context of student academic performance, data sources may include student records, test scores, attendance records, extracurricular activities, and even social media data. Once the data is collected, it needs to be prepared and cleaned to remove any

inconsistencies or missing values. Machine learning algorithms require reliable and high-quality data to generate accurate predictions.

Predictive Models

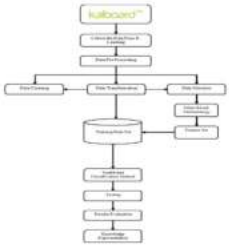
Various machine learning algorithms can be applied to predict student academic performance. Some commonly used algorithms include linear regression, decision trees, random forests, and neural networks. These algorithms analyze the collected data and identify patterns, enabling educators to forecast student performance accurately. By continuously updating and refining the models, their predictive capabilities can further improve over time.

The Future of Student Academic Performance Analysis

As technology continues to advance, the future of student academic performance analysis seems bright. Machine learning has the potential to revolutionize education by providing educators with actionable insights and precise predictions. With the ability to identify at-risk students, personalize learning paths, and offer targeted interventions, machine learning can make a significant impact on student success rates and overall education outcomes.

In , machine learning offers immense potential in analyzing and predicting student academic performance. By leveraging vast amounts of data, machine learning algorithms can provide valuable insights, identify at-risk students, and recommend personalized learning paths. As this technology continues to evolve, educators and policymakers have an opportunity to harness its power for the benefit of students worldwide. Embracing machine learning in education can lead to improved student outcomes and a brighter future for our society.

STUDENT ACADEMIC PERFORMANCE ANALYSIS AND PREDICTION USING MACHINE LEARNING



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The dataset used in this project consists of student achievement in secondary education of two Portuguese schools. The data attributes include student grades, demographic, social and school-related features) and it was collected by using school reports and questionnaires.

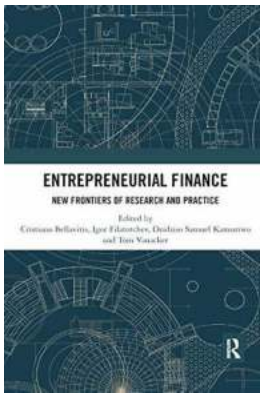
Attributes in the dataset are as follows: school - student's school (binary: 'GP' - Gabriel Pereira or 'MS' - Mousinho da Silveira); sex - student's sex (binary: 'F' - female or 'M' - male); age - student's age (numeric: from 15 to 22); address - student's home address type (binary: 'U' - urban or 'R' - rural); famsize - family size (binary: 'LE3' - less or equal to 3 or 'GT3' - greater than 3); Pstatus - parent's cohabitation status (binary: 'T' - living together or 'A' - apart); Medu - mother's education (numeric: 0 - none, 1 - primary education (4th grade), 2 - 5th to 9th grade, 3 - secondary education or 4 - higher education); Fedu - father's education (numeric: 0 - none, 1 - primary education (4th grade), 2 - 5th to 9th grade, 3 - secondary education or 4 - higher education); Mjob - mother's job (nominal: 'teacher', 'health' care related, civil 'services' (e.g. administrative or police), 'at_home' or 'other'); Fjob - father's job (nominal: 'teacher', 'health' care related, civil 'services' (e.g. administrative or police), 'at_home' or 'other'); reason - reason to choose this school (nominal: close to 'home', school 'reputation', 'course'

preference or 'other'); guardian - student's guardian (nominal: 'mother', 'father' or 'other'); traveltime - home to school travel time (numeric: 1 - <15 min., 2 - 15 to 30 min., 3 - 30 min. to 1 hour, or 4 - >1 hour); studytime - weekly study time (numeric: 1 - <2 hours, 2 - 2 to 5 hours, 3 - 5 to 10 hours, or 4 - >10 hours); failures - number of past class failures (numeric: n if 1<=n<3, else 4); schoolsup - extra educational support (binary: yes or no); famsup - family educational support (binary: yes or no); paid - extra paid classes within the course subject (Math or Portuguese) (binary: yes or no); activities - extra-curricular activities (binary: yes or no); nursery - attended nursery school (binary: yes or no); higher - wants to take higher education (binary: yes or no); internet - Internet access at home (binary: yes or no); romantic - with a romantic relationship (binary: yes or no); famrel - quality of family relationships (numeric: from 1 - very bad to 5 - excellent); freetime - free time after school (numeric: from 1 - very low to 5 - very high); goout - going out with friends (numeric: from 1 - very low to 5 - very high); Dalc - workday alcohol consumption (numeric: from 1 - very low to 5 - very high); Walc - weekend alcohol consumption (numeric: from 1 - very low to 5 - very high); health - current health status (numeric: from 1 - very bad to 5 - very good); absences - number of school absences (numeric: from 0 to 93); G1 - first period grade (numeric: from 0 to 20); G2 - second period grade (numeric: from 0 to 20); and G3 - final grade (numeric: from 0 to 20, output target).

The models used in this project are K-Nearest Neighbor, Random Forest, Naive Bayes, Logistic Regression, Decision Tree, Support Vector Machine, Adaboost, LGBM classifier, Gradient Boosting, and XGB classifier. Three feature scaling used in machine learning are raw, minmax scaler, and standard scaler.

Finally, you will develop a GUI using PyQt5 to plot cross validation score, predicted values versus true values, confusion matrix, learning curve, decision

boundaries, performance of the model, scalability of the model, training loss, and training accuracy.



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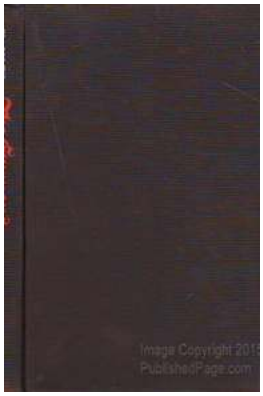

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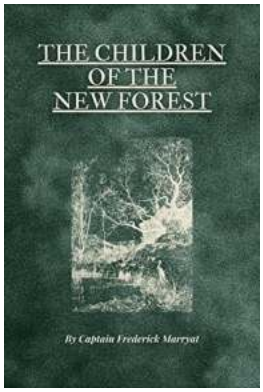

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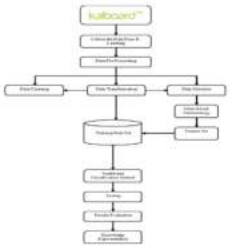

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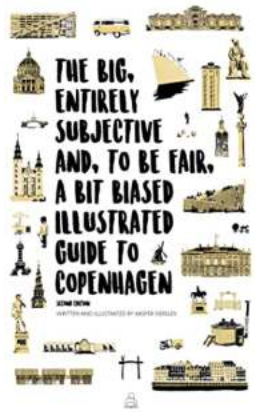

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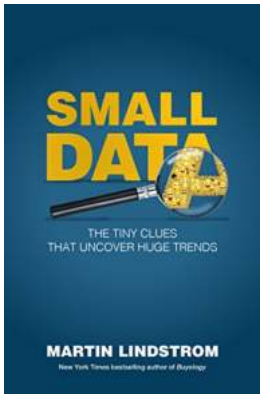

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