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Machine Learning Based Student Performance Prediction Get an A Grade

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Abstract: *As an essential a part of the smart college model, predicting student performance can assist monitor pupil learning and make well timed selections to enhance the general have a look at. In order to acquire a success prediction, it's miles vital to reap critical facts consisting of beyond scholar performance from the student statistics gadget and employment statistics snippets to train gadget mastering models suitable. In this article, specific learning models are used to expect whether or no longer a scholar will get an A grade (i.e. 90 or above). The book uses actual information taken from three one of a kind topics that require computer and technical abilities. This data consists of 3 characteristics of students' past overall performance, namely excessive faculty grade, grade point common, and absenteeism percentage. The information is then used to educate special gaining knowledge of models including Partitioning, Logistic Regression, Naive Bayes, Support Vector Machines, Decision Trees, K-Nearest Populations, and Wood Packing. To spotlight the effectiveness of this product, extraordinary methods are used to assess the category feature, consisting of precision, accuracy, remember and F1 rating.*

Keywords: Machine learning, student performance pre- diction, classifier, smart campus.

I. INTRODUCTION

The concept of a smart campus has evolved to advanced technology that enhances the college education by utilizing a variety of technology, including data mining and AI. These are made possible by the usage of a sophisticated campus infrastructure, which is split into different layers consisting of a layer for networks as well as a sensing layer as well as an IT layer. The most advanced techniques used on campus structures is Internet of Things (IOT) which acts

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as the layer that senses and includes numerous special functions that are exclusive to intelligent lighting devices and smart houses in addition to wear of sensors.

The sensing layer is entrusted to it with the responsibility to make decisions primarily dependent on the specific needs of pupils that can be determined through the processing of information about student performance, attendance, participation and overall performance.

This is to be emphasized that the purpose behind the application of technology in the framework of a smart school isn't necessarily to enhance technological capabilities. It is more important to incorporate these tools to the learning process, for the purpose of creating an environment that is centered on the student. . . . .

The early detection of interest in students assists teachers to identify the weaknesses in the first tiers. They can also adopt proactive measures to the college students to be more engaged and aid in learning. Additionally, the combination of IOT and machine learning along with a smart campus record tool can assist in predicting students' attendance. This lets you measure lecture room occupancy and, consequently, optimize the study space usage, air conditioning effectiveness and the strength of.

II LITERATURE REVIEW

Y. Liang and Monitoring in Smart Campus," IEEE Access, vol. 6, pp. 74836-74846, Nov. 2018.

In the ever-expanding development of technology, we continue to transition into the era of intelligent. Being one of the best-representative technological advancements of the present Artificial Intelligence has been quietly transforming our lives in a dramatic way. In the present we are in we are in the Internet of Things has been officially included in the top five strategically important industries in the United Americans of America. The direction of development is safe city, digital town and perceptions of China. Being an essential component of a safe metropolis the field of health and medicine shifts advanced technological advancements. This is why it's crucial to create a Smart Campus medical institution environment monitoring system that is

based entirely upon Internet of Things generation. The most important component of an intelligent tracking of the environment in your home is the creation of information collection and presentation strategies. This paper specifically creates and implements the patron device statistics layout conversion and the transmission of gadget statistics. The key technical issues include HL7 protocol along with AMQP protocol as well as Rabbit framework. The only difference is that the HL7 protocol and cache era is transferred to the server. Data is saved to offer information to customers who have a unique experience. In addition, real-time monitoring and monitoring of the surroundings can be carried out on the consumer PC and Android customer. The paper-based video display is part of in the Smart Campus health center's environment and then combine's live-time transmission, garage presentation, and then in the end, analyzes data to make intelligent choices about the Smart Campus surrounding health centers.

X. Xu et al., "Research on Key Technologies of Smart Campus Teaching Platform Based on 5G Network," IEEE Access, volume. 7, pp. 20664-20675, Jan. 2019.

Beautiful paintings and an enviable financial boom are crucial to the long-term sustainability of society. Sustainable Development Goal eight (SDG8) as one of the main goals of the United Nations' 2030 Agenda. The 5G network holds the capacity to contribute significantly towards the achievement of SDG8, providing faster and better connectivity opening up new avenues to improve operational performance, innovation as well as activity-based creation. The present study sought to study the impact of 5G technologies in the context of good painting and growth in financials (SDG8). For the purpose of the study 265 research articles from the most important databases like Scopus, IEE Explore, and Science Direct were analyzed with the PRISMA method, which yielded the 74 most relevant papers when using the standards for inclusion and exclusion. The result was an increase in the application of 5G networks was recognized in different sectors like

manufacturing as well as fitness and transportation and resulting in an increase in the economic development as well as activity creation. The study also revealed that the most technologically advanced applications bringing most impact are "Internet of Things" and "Artificial intelligence". In the end, it was evident that the outcomes from this study are positive to future research in technologies that aid 5G networks in bringing about economic growth as well as an equitable and sustainable first rate working in a wide range of rural and industrial sectors.

T. Sutjarittham, H. Habibi Gharakheili, S. S. Kanhere, and V. Sivara guy, "Experiences With IoT and AI in a Smart Campus for Optimizing Classroom Usage," IEEE Internet of Things Journal Vol. 6, no. Five, pp. 7595-7607, 2019.

Demand higher schooling is creating pressure on campuses to make more usage of property assets. The evidence suggests how many college students are taking part in the program is increasing, however costs for attendance have decreased due to the numerous demands regarding student time and ease of gaining access online statistics. This piece outlines our efforts to address the problem of inadequate use of classrooms on a University campus that stems due to the disparity between the students' attendance and that of their instructors. The solution is of integrating schools with IoT sensors to monitor the utilization in real-time and using AI to make decisions about attendance and facilitating that lectures to textbooks and a desire to cut down on the amount of space wasted. Our first contribution undertakes an evaluation of several IoT sensing strategies for measuring class occupancy, and evaluating them in terms of price, accuracy, privateers, and ease of deployment/operation. The second project consists of nine lecture halls that have different capacities across the campus. It is able to collect and clean actual-time occupancy figures from approximately 250 guides over time and also show changes in attendance as well as the names of lecture halls that were cancelled, as well as advanced test results. We're also making available our information for all to use. The third innovation we've made is the application of AI techniques to assess the quality of

attendance the use of real-time attendance data as well as in the way that it should be. It is aiming to predict to predict the attendance of the future using the method of RMSE errors that could be as small as 0.Sixteen. Another thing we could make is to increase the utilization of rooms for advanced schools completely based on predictions of attendance. This is rather than the enrollment. These results in greater than 10% cost savings over the cost of rooms and without the risk of room filled to capacity.

S. Qu, K. Li, S. Zhang S. Qu, K. Li, S. Zhang Y. Wang, "Predicting Achievement of Students in Smart Campus," IEEE Access Volume. 6, pp. 60264-60273, Oct. 2018.

Massive open-online courses (MOOCs) are a type of online course that has been called a new learning method, are utilized in higher-quality training. There are however, some gaps in the information about the relation between the online behavior of students at colleges and their academic performance and also in the assessment of the degree to which students are the material they are learning. We propose the possibility of predicting students' overall performance and the mastery of the knowledge in MOOCs based upon the online conduct related to undertakings which allows people who provide academic support to assist and improve mastery outcomes of students facing difficulties. The method was developed using the data of 1528 people using the C Programming route, from which we derived capabilities that are related to undertakings. Our first experiment was an assignment-based multi-layer, long-term method of predicting performance for students based on reminiscence that uses cross-entropy due to the characteristic of college students to anticipate average performance and the mastery of every factor in their expertise. Our method incorporates the eye mechanism which could be more able to mirror college students' habits of mastery and their performance. The method we use achieves a precision of ninety two.52 percent for forecasting the overall performance of college students and an account for cost that is ninety 4.68 percent. Students' behavior including submission situations and plagiarizing, are associated with their performance in the MOOC the results suggest that our

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model predicts the overall performance of students and the knowledge points students aren't able to master.

Z. Dong, Y. Zhang, C. Yip, S. Swift Z. Dong, C. Yip, S. Swift K. Berwick, "Smart campus: Definition, Framework, Technologies, and Services," IET Smart Cities 2020.

In the form of an excessively-quick version of an intelligent education system, the smart campus is gaining more interest in the field. Owing to the multidisciplinary nature of the smart campus, the present research is on the whole one-ended on both the kingdom-or-the-artwork technology and the modern education principles however lacks a deep fusion views on them and omits the smart campus implication on different smart town domains. The article illustrates the multidisciplinary view of smart campuses. The basis is a thorough study of technology's aid as well as the existing smart campus initiatives Human-centered, getting knowledge-driven smart campus is envisioned in detail, framed and described with the intention of bringing together the needs of stakeholders and enhancing the efficiency of instruction in line with technology advancements and also examining the interconnected elements that facilitate or inhibit the advancement of smart campuses. The expected contribution during the course of this take at is providing the benchmark of a smart campus to worldwide academic organizations officials, government agencies, as well as technological organizations that provide these services.

III System Analysis

Existing Systems:

The current device makes use of gadgets that is able to recognize algorithms and determine whether or not a student can achieve an A-grade with a well-planned campus. Most commonly used algorithms are Logistic Regression, Decision Trees or Random Forest. The algorithm is based on the historical academic data and the student conduct patterns to make predictions.

Advantages:

Predictive Insights: Makes estimates of a student's likelihood to earn an A-grade which allows for proactive interventions.

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Data-driven decision-making: Allows instructors or directors to take educated decision-making based upon the predictive analysis.

Efficiency: It streamlines the identities of students at risk for college by optimizing the distribution of aid assistance offerings.

Disadvantages:

Accuracy of the Model: The precision of the predictions is contingent upon the highest and most relevant the data used to train.

Bias and Fairness It is possible that there are biased predictions that affect positive agencies with a favorable demographic profile unfairly.

Privacy concerns: The usage of sensitive student data can raise privacy issues, and requires strict privacy protections.

Algorithms Used:

Logistic Regression

Decision Trees

Random Forest

Proposed Systems:

The improvements to the proposed device are intended to improve and extend the current system by incorporating techniques like Gradient Boosting (e.g., XG Boost, Light GBM), Neural Networks, K-Nearest Neighbors (KNN) and Support Vector Machines (SVM). These enhancements also take into account precision-trained predictions and early intervention methods accurate predictions that are not prone to error, and also the integration of Learning Management Systems (LMS).

Advantages:

Fine-Grained Prediction: Improves the model to provide exact grades and provides specific insights into the scholar's performances.

The Early Intervention Strategy: Offers individualized interventions, along with other observer sources to help students at-risk.

Subject-Specific Predictions: Expands the tool to anticipate grades on individual subject areas, offering targeted assistance that is needed.

Integration of LMS Integration with LMS: Connects to Learning Management Systems to leverage

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other statistics to improve the accuracy of predictions.

Disadvantages:

Complexity: The emergence of new capabilities as well as ability to predict can add device complexity.

Data Integration Problems: Integration with systems that are already in place could present challenges with regard to records compatibility as well as interoperability.

Ethical considerations: The usage of predictive analytics for schooling raises moral issues, requiring the disclosure of bias and issues.

Algorithms Used:

Gradient Boosting (e.g., XG Boost, Light GBM)

Neural Networks

K-Nearest Neighbors (KNN)

Support Vector Machines (SVM)

IV DATA SET DESCRIPTION

With a machine learning-based student Performance Prediction tool that operates within a Smart Campus framework, a variety of data points are collected and analyzed to determine if students will receive the "A" grade. The predictive model uses data such as gender, age and orientation level, as well as instructional 12 months, the midterm grade and the high school grade and absence data. In processing the data this tool tries to determine patterns and correlates that contribute to education performance. It is, for instance, in a position to determine that students who have higher middle-term marks and lower absences are more likely achieve at least an "A" grade. Utilizing system-wide using algorithms to study, it constantly refines its prediction mostly based on the latest data and provides valuable insights that teachers can utilize to assist students in learning and satisfaction.

Age: Defines the character's age.

Gender: Defines the gender of a person gender, whether female or male.

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Course Level: Defines the degree of study the individual is studying, which could include graduate or undergraduate.

Academic Year: refers to the year of study that in which the person or woman is in.

Midterm Grade: Describes the rating or grade obtained by the male or female during their midterm examination.

High School Grade: Indicates how much or what grade a student received in high school.

Absence: Displays the amount of absences a person had throughout the course of.

Grade: Describes the overall quality or general performance of either gender. The symbol "<90" and ">ninety" are used to determine if your grade falls below or higher than 90.

V MACHINE LEARNING ALGORITHMS

Machine learning model testing:

```
Froms klearn.ensemble import Random Forest Classifier

OBJ = Random Forest Classifier()

OBJ.fit(x_train, y_train)
```

```
▾ RandomForestClassifier
RandomForestClassifier()
```

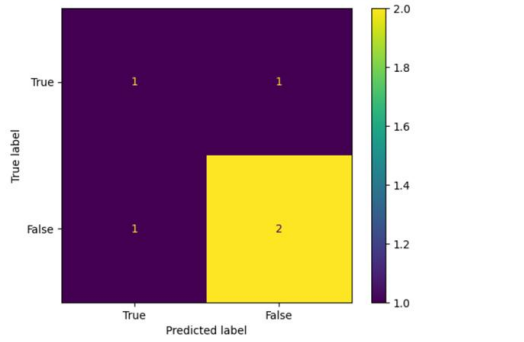
Confusion matrix display:

```
Forms klearn.metrics import Confusion Matrix Display

Confusion matrix= Confusion Matrix Display(confusion_matrix=
cm,display_labels=['True','False'])

confusion_matrix.plot()
```

```
<sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at 0x78dd2dd6f3d0>
```



Calculating the values of accuracy, precision, recall, F1score.

Accuracy:

Number of correct predictions = True Positives (TP) + True Negatives (TN)

= 1 + 2 = 3

Total number of predictions = Sum of all elements in the confusion matrix

= 1 + 1 + 2 + 1 = 5

Using the formula, the accuracy would be:

Accuracy = 3/5

=0.600

So, the accuracy of the classifier would be approximately 0.600or 60%

Precision:

Precision = (True Positives) / (True Positives + False Positives)

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In this case, we have:

True Positives (TP) = 1

False Positives (FP) = 1

Using the formula, the precision would be:

Precision = 1 / 1+1

=1 / 2

=0.500

So, the precision of the classifier would be approximately 0.500 or 50%

Recall:

The recall (also known as sensitivity or true positive rate) of classifier can be calculated.

Recall= True Positives/ True Positives +False Negatives

In this case, we have:

True Positives (TP) = 1

False Negatives (FN) = 1

Recall = 1 / 1+1

=1 / 2

=0.500

So, the recall of the classifier would be approximately 0.500 or 50%.

F1score:

F1 Score = 2 × (Precision × Recall)/ Precision +Recall

The F1score is a metric that combines both precision and recall into single value.

Precision =0.500

Recall =0.500

Substituting these values into the formula, we get:

F1 Score = 2 × (0.500×0.500)/0.500+0.500

Calculating the numerator:

=2 × (0.500×0.500)

=0.5

Now, we calculate the denominator:

=0.500 + 0.500

= 1

Finally, we divide the numerator by the denominator:

F1 Score = 0.5 / 1

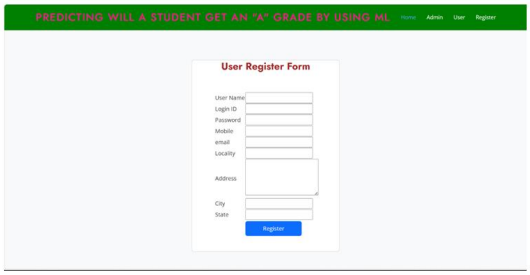
= 0.5

So, the F1 Score of the classifier would be approximately 0.500

OUTPUT SCREENS

HOME PAGE

Registration page



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Prediction form

Out Put values

VI CONCLUSION

In this study, a variety of model systems of mastering have been utilized to assess student overall performance. This is done by stating the likelihood that a student is likely to receive an A-grade or not. The illustrations utilized a genuine information collection of publications that require the use of computers and programming. . . . The database contains three aspects that are related to the past academic performance of college students particularly excessive school marks midcourse grades, percent of absences. The various systems learning about trends were then trained and studied. The systems that study fashions include the following: as well as F1 score were used in conjunction with three methods from the data set to train and test. It was found that the ability to predict the performance of scholars is possible to as high as 99% precision. Furthermore the bag tree designs that have K-nearest buddies showed superior overall performance in comparison to any other devices that gain understanding of the models.

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