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Empowering learners in the digital age: Integrating technology and personalized learning in higher education

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Abstract
Our research "Empowering Learners in the Digital Age: Integrating Technology and Personalized Learning in Higher Education" is a Even in the lack of an explicit declaration, the use of generic descriptive names, registered names, trademarks, service marks, etc. in this book does not indicate that they are exempt from the applicable protective laws and regulations and therefore free for general use. It is reasonable to presume that the advice and information in this book were considered to be truthful and correct at the time it was published by the publisher, the writers, and the editors. With regard to the information presented here or for any potential mistakes or omissions, neither the publisher nor the writers nor the editors provide any kind of warranty, either express or implicit. Regarding jurisdictional assertions in published maps and institutional connections, the publisher maintains its objectivity. The areas of EDM and LA both focus on how to use facts to increase academic learning and improve students' overall performance. Both fields deal with a wide range of topics, including curriculum design, coaching, student mental health, learning motivation, and academic success. The COVID-19 epidemic significantly altered the higher education industry and changed the traditional classroom-based teaching-learning paradigm to one that emphasises online learning. This has the effect of changing the design and character of teaching, learning, assessment, and feedback techniques. Teachers now have more authority because to technology, and they can provide students timely and useful feedback to improve learning.

Keywords: Empowering, learners, digital, age, integrating, technology, personalized, learning, higher education

Introductions
In recent years, higher education has expanded significantly. Both the public and commercial sectors are building numerous new institutions, colleges and universities to support education and the welfare of students [1, 2]. EDM is a recent field that uses various data mining techniques and approaches to analyse information in an academic setting. It provides a thorough grasp of the teaching and learning processes, enabling more up-to-date educational management, performance analysis of the students, and a better comprehension of learning processes to build more effective teaching methods.

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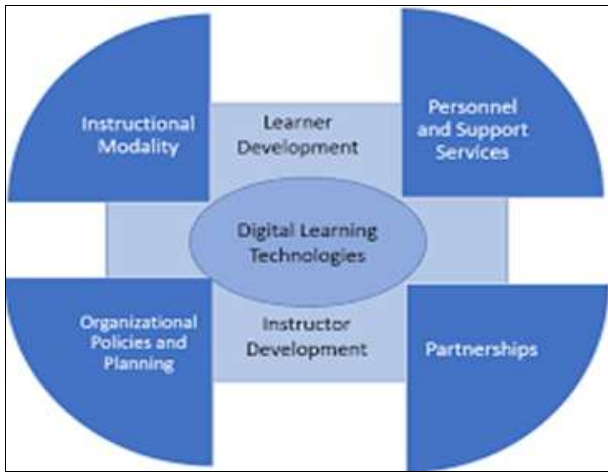
Fig 1: Empowering learners in the digital age: Integrating technology and personalized learning in higher education cycle

Fig 2: Empowering learners in the digital age: integrating technology and personalized learning in higher education process

In recent years, higher education has expanded significantly. Both the public and commercial sectors are building numerous new institutions, colleges and universities to support education and the welfare of students [1, 2]. EDM is a recent field that uses various data mining techniques and approaches to analyse information in an academic setting. It provides a thorough grasp of the teaching and learning processes, enabling more up-to-date educational management, performance analysis of the students, and a better comprehension of learning processes to build more effective teaching methods. The proposed methodology has attained an accuracy of 84%, more significant than the conventional ANN model accuracy rate. The proposed methodology's Recall, F1-score, and precision rates are 0.88, 0.91, and 0.93, respectively.

Challenges and Problems
Over the past two decades, the landscape of knowledge in education has changed. Online learning is now widely used. The crucial circumstance that is required for the success of today's online courses is the ongoing analysis of material through learner-centered assessment. Offline courses must be evaluated in a way that can aid the student in identifying

possible weak points and strategies to strengthen them. LA's attempts to change the nature of teaching, learning, and evaluation in order to revolutionize education.

Fig 3: Empowering learners in the digital age: integrating technology and personalized learning in higher education method

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Proposed Methodology
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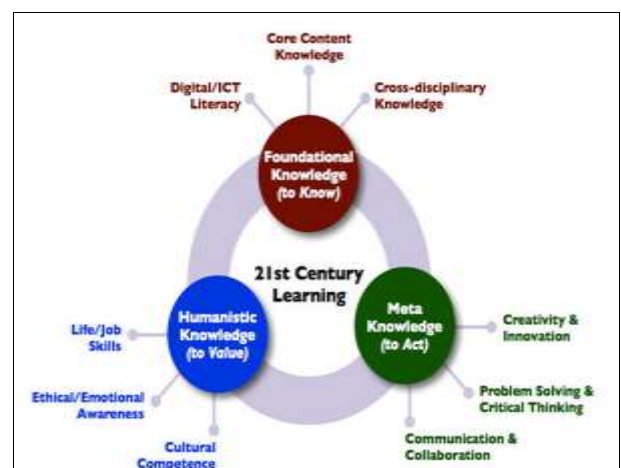

Fig 4: Empowering learners in the digital age: integrating technology and personalized learning in higher education

Over the past two decades, the landscape of knowledge in education has changed. Online learning is now widely used. The crucial circumstance that is required for the success of today's online courses is the ongoing analysis of material through learner-centred assessment. Offline courses must be evaluated in a way that can aid the student in identifying possible weak points and strategies to strengthen them. LA's attempts to change the nature of teaching, learning, and evaluation in order to revolutionize education.

Data Cleaning and Preprocessing

The data cleansing step will be used in the suggested work. This stage deals with getting the data ready for use in modelling. It will check for missing numbers; the most important step, data orientation according to requirement, might produce inaccurate results if skipped. The following student registration database will be used by the suggested methodology: This suggested solution would handle such scenario since the database was incorrect; a few unregistered students from the courses were labelled as failed while the real label should have been reserved.

Modeling

Results estimate using various VLE interaction, academic learning indicators, and large surveys have been analysed in order to construct a structure based on ML approaches for students' learning. The DL- and ML-based approaches in predicting student attrition were defined by this literature review. To achieve the study goal, several FCNs (completely connected networks), ANNs, and optimisation (SGD) techniques have often been used.

Connected Network

A collection of interconnected input/output labels with load on each connection make up an upgraded fully connected network. For each class, three output variable features and 21 input variable features have been implemented in this study. During the training phase, the system learns through load distribution in order to predict the precise labels of the input module. It is especially good at drawing conclusions from complicated or ambiguous data. It can also be used for design formation and recognizing patterns that are complicated to be observed by either human beings or any other computer method. It is suitable for rated consistently inputs and outcomes. This system recognizes input samples and is ideal for predicting the outputs.

Artificial Neural Network

Artificial Neural Networks [35] include neurons, some of which are connected in many connection components, just like the human nervous system. Such neurons are referred to as nodes. An artificial neural network (ANN) is designed to replicate the network of linked neurons that makes up the human brain so that robots can sense the world and form human-like judgments. To develop an artificial neural network, machines are designed to behave as connected brain cells.

Computation

The model is computed at this phase to ensure that the proposed objectives are met with credible results. To determine the structure accuracy rate, precision, recall, and other metrics, the parameters were chosen. The highest value of prediction accuracy rate shows that the model is more adept at categorizing the results of student learning. Recall, also known as TPR (true positive rate), refers to the research model's capacity to appropriately categorise certain courses. The entire suggested model is tested for prediction accuracy rate using the F1-score, which seeks the ideal compromise between precision and recall rate. These performance indicators are contrasted with the ANN of the current model.

Simulation Setup

A number of steps have been covered in this part, which covers the setup for the simulation. The research model had previously been ready for computation. As mentioned in Section 4, data collection and preparation have received approval. The OULAD database [36], which was compiled from Open University students, is used to assess the proposed work. The oldest higher education provider in the UK is Open University UK, which has over 170,000 participants (students) registered in various programmers. Study materials for the course are made available through a virtual learning environment.

Result Analysis

In this research project, a prediction model is created, and on the basis of this, students are given timely feedback to improve the quality of results in the courses they have registered in. The whole learning outcome prediction framework of a student has been organized in this study article. The suggested study intends to construct an ESWS (Early-stage warning system) that anticipates a scholar's results after a complete examination. The created model uses student demographic data, academic information, and their engagement with a virtual learning environment as inputs, and outputs the total performance of the students on their final exams. Based on this output, a feedback module is created to assist both the course teacher and the students in making necessary course content and instructional strategy changes to ensure the success of the course. The OULAD database contains data from 32,592 participants and 22 course sessions, as well as demographic information about participants (students), outcomes from evaluation sessions, and clickstream information from interactions with VLEs.

Conclusion and Future Work

With the integration of learning analytics, this effort projected an upgraded EDM system with a better FCN algorithm for the evaluation of student quality in the Higher Education (HE) system. For the purpose of evaluating pupils' performance, EDM and LA are both crucial. Learning analytics is a useful tool for finding hidden patterns in raw, gathered data, and EDM is a technique or approach for extracting patterns utilizing large amounts of student information. To improve student results, an FCN technique based on machine learning is employed to locate the evaluation and feedback. The results show that, among all the established supervised learning methods, the I-FCN (Improved fully connected network) has been the best match for this recently presented study with the largest accuracy rate.

The study model's accuracy rate and F1-score are fairly approximable. The best likely accuracy rate was obtained after many epochs were run on various data sizes. We examine and analyse the different existing educational data

mining and LA approaches, including ANN, SVM, DNN, and KNN. The approaches now in use have a variety of problems, including data imbalance problems, misclassification problems, and inadequate features. The FCN framework has been enhanced to lessen these issues with better outcomes.

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