**////Title: A Deep Learning Model to Predict Student Dropout**

**////Stand-first**:

Identifying students who are at risk of withdrawing from higher education is of key importance, as it allows educators to devise and implement intervention strategies that could support students in completing their studies. With this in mind, Dr Naif Radi Aljohani (nigh-eef rar-dee al-jo-han-ee) and his colleagues at King Abdulaziz (abdul-ah-zeez) University in Saudi Arabia have recently devised a technique that could help to predict early dropout from university courses, by analysing data related to student engagement on online learning platforms.

**////Body text:**

A growing number of schools and universities worldwide have started using online and virtual learning platforms as primary or complementary resources for their students. With increasing numbers of students accessing these platforms and interacting with them, researchers now have access to a vast pool of data that could offer precious insight into patterns in student behaviour.

One challenge that has been accentuated by the recent growth in online learning is that many students drop out of courses before completing them. In fact, distance learning through online platforms and virtual learning environments has proven to be somewhat inefficient in retaining students over time. This can ultimately result in both students and educators wasting their time, resources and talent.

By analysing the data gathered by such platforms, researchers could better understand the factors related to student engagement in online courses, and even identify those at risk of failing or dropping out of a given course. This could inform the development of effective strategies to improve online learning platforms and encourage students to complete the courses they started.

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Learning analytics is a relatively new field of study, aimed at closely examining student behaviour based on data from online and offline platforms, in order to continuously improve teaching methods and increase course completion rates.

In addition to learning analytics techniques, the data could also be examined using recently developed artificial intelligence methods, such as deep learning. Deep learning is a computational strategy whereby algorithms detect specific patterns or predict certain outcomes by analysing vast amounts of data.

So far, very few studies have combined learning analytics and deep learning to gain a better understanding of student behaviour, engagement and dropout in higher education. To bridge this gap, Dr Naif Aljohani and his colleagues at King Abdulaziz University in Saudi Arabia recently developed a deep learning model to predict student withdrawals from university courses.

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The researchers developed a long short-term memory model. This type of deep learning tool is particularly useful for tasks in which data is classified into categories, or predictions are made based on patterns observed in the past.

In contrast with other deep learning techniques, such as neural networks, long short-term memory models consider both data that was fed to them in the past and new information. This makes them particularly effective for predicting future events based on past data or identifying long-term dependencies in sequential data spread over a period of time.

Dr Aljohani and his colleagues trained their model using a large publicly available dataset. This dataset contains data related to demographics, log-in patterns, interactions and assessments of 32,593 students who participated in seven courses delivered on a virtual learning platform, collected over a period of nine months.

Out of the students who participated in these online courses, 9% attained a distinction, 38% simply passed, 22% failed, and 31% decided to drop out. Firstly, the researchers processed the data contained in the dataset in order to extract meaningful features that could be useful for predicting the likelihood of withdrawal from online courses.

They specifically focused on the amount of clicks that students performed while navigating the platform every week, as this factor is likely to reflect their level of active engagement with the course on a day-to-day basis. In fact, Dr Aljohani and his colleagues observed that students who dropped out typically interacted less with the online platform and clicked on fewer things in the weeks before their withdrawal.

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Subsequently, the researchers fed the processed data into their long short-term memory model and trained it to predict early withdrawals based on students' clicking behaviour on online learning platforms.

When they tested their model's performance, they found that it outperformed other approaches. Overall, their model was able to predict which students would withdraw from courses with an accuracy of 97.25%.

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Online education platforms, such as virtual learning, continuously collect data about student interactions, such as how often they click on things and what they click on. If analysed using the deep learning model devised by Dr Aljohani and his colleagues, this data could help universities to identify students who are at risk of dropout early-on. By predicting which students are more likely to drop out, educators could devise strategies to support them in completing their studies.

Although the model currently focuses on students' clicking behaviour, it could be adapted to also consider other factors that are useful for predicting dropout risk, such as their test scores or submission of assignments.

Detecting students who are more likely to withdraw from a given course could also allow universities to carry out further analyses of these students' interactions on virtual learning platforms, in order to identify specific aspects of the platform that could be improved to meet the needs of these students.

More recently, Dr Aljohani and his colleagues are using similar deep learning techniques to identify the typical patterns of students' behaviour who are at risk of failing a course, those likely to pass, and those likely to get a distinction. Meanwhile, the team has also introduced a new AI-based

framework that is in used as an ecosystem for educational policies for a number of universities, by highlighting important aspects for the development of learning analytics tools to predict student performance.

**Meet the Researcher**

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