Artificial intelligence can identify students at risk of failing and provide tools for success

May 2 2022

Credit: Pixabay/CC0 Public Domain

Artificial intelligence offers new opportunities to improve university education. This is demonstrated by the Learning Intelligent System (LIS) project, which has been developed by researchers at the Universitat Oberta de Catalunya (UOC) with backing from the eLearning Innovation

Center. The system was created by a transdisciplinary research team at the UOC and has already produced excellent results over the past year. It shows how an automatic system can be used to help students who are at risk of failing or dropping out to improve their academic performance.

In 2021, a team from the UOC's Faculty of Computer Science, Multimedia and Telecommunications published a study in the *International Journal of Educational Technology in Higher Education (ETHE)* on the ability of LIS to successfully identify students at risk of failing a course. The team consisted of Ana Elena Guerrero-Roldán and Elena Rodríguez González, from the Technology Enhanced Knowledge and Interaction Group (TEKING) research group, and David Bañeres Besora, from the SOM Research Lab at the Internet Interdisciplinary Institute (IN3).

The team now aims to use this system to provide academic guidance and reduce dropout rates. This latest study, published in the open-access journal *International Review of Research in Open and Distributed Learning (IRRODL)*, demonstrates the benefits of an automated nudging system. Not only can it identify at-risk students, but the system itself can provide relevant information to improve the learning process and student performance.

Rodríguez González said, "The software provides guidelines on the importance of planning and setting goals in the learning process and evaluates whether they are being met. It also produces information about the student's situation throughout the academic year, making it easier for them to make decisions on how to improve. What's more, it provides notifications about what is happening in the virtual classroom, as well as helping to improve communication between teaching staff and students, which is key to success in online learning environments."

This nudging system is a very useful tool for teaching staff, as it allows

them to be involved more frequently and on the basis of individual teaching needs. "Messages are sent automatically to students, although it is the teaching staff who write these messages and also decide what type of information should be sent, according to the characteristics of their course," said Rodríguez González. Once these guidelines have been established, the messages are sent depending on the fulfillment of certain conditions related to the student's performance on the course, their at-risk situation and their behavior in the virtual classroom. "But it is the artificial intelligence system that decides which students should receive which messages, allowing for personalization," she said.

Research to improve academic performance

To try to measure the effectiveness of this system, a study was conducted with three groups of students, each of which received a different number of messages based on the system's identifications. One group received full support, another received only one message explaining the prediction made by the system after each continuous assessment activity had been marked and the possibility of passing the course based on performance and other data from the student's profile, and the third group received no messages at all.

When measuring performance, the results suggest that this is highest in the first group, followed by the second. The group with the worst performance and highest dropout rate was group three, the unattended group. "The results should be regarded with caution," said Rodríguez González. "We suggest that there is correlation, but we can by no means confirm that there is a causal relationship. We also know that there is a self-selection bias, as students in groups one and two participated voluntarily and tend to be more motivated and better performing. In addition, the study was conducted in the second semester of the 2019–2020 academic year, which was subject to pandemic restrictions, a further factor complicating the interpretation of the results.

Nevertheless, students showed a high level of satisfaction with the messages received, considering them to be motivating and useful for improving their course engagement.

It is necessary to study whether these results persist over time by replicating the study for the same course and for other courses. "Especially for first-year courses," she explained, "where there are many students with no experience with online education."

From prototype to full-scale

According to Rodríguez González, the accuracy of the artificial intelligence system when detecting students at risk of failing the course in which the study was conducted was 74% for the first continuous assessment activity, and 94% for the last one. These figures are very promising, but widespread adoption will still require an extensive process.

"The LIS system is in the development and testing phase. We need to analyze its usefulness and possible software adaptations so that it can be taken to a production phase for integration into virtual classrooms," she said. "The key is also in the policy of collecting historical and current student data in accordance with current legislation on personal data protection." She emphasized that "students must always be informed about what data are collected and for what purpose, giving their express signed consent, with the possibility of revoking this consent."