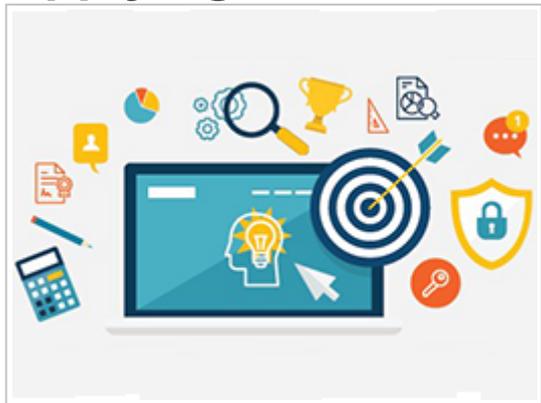


Applying machine learning to education



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The Sequel project-team, which specializes in sequential machine learning, has been working for the last two years with scientists from Carnegie Mellon University in Pittsburgh, in a combined team known as Eduband. This team is investigating how machine learning can improve the new educational tools. But can an algorithm measure a student's interest and progress?

How does Amazon predict its customers' future purchases? Thanks to machine learning! This very on-trend area of artificial intelligence now allows the design of automatic systems able to recommend products according to our preferences. *"Advertising and marketing are currently the main applications of machine learning. This has a very strong economic impact,"* admits Alessandro Lazaric, a researcher in the Sequel project-team at the Inria Lille – Nord Europe research center. *"Personally, I wanted to do research that would have more social impact."* That is why he decided to look into educational systems. This is actually a fast-developing field with the emergence of new tools: MOOCs, serious games, and e-learning web platforms. *"Le machine learning is based on an analysis of big databases,"* explains the scientist. *"Today, these new technologies allow us to collect this data."*

To examine this specific aspect of education, the Sequel Project Team approached scientists at Carnegie Mellon University in Pittsburgh USA, who have been working on such topics for several years. Two years ago, this collaboration resulted in the creation of a combined team called Eduband. On the Inria side, researchers Alessandro Lazaric, project leader, and Michal Valko contribute their machine learning expertise, while the American team has more specific knowledge of the problems related to learning systems.

The scientists will record the reactions of a user taking a training course. They then develop an algorithm that analyzes all the data and formulates recommendations to facilitate the learning process. *"The platform will automatically suggest exercises to focus on things the student has not yet grasped and deal more quickly with points the student has understood,"* says Alessandro Lazaric.

Very subjective parameters

But before they could develop this type of system, the Eduband team researchers had to solve a whole series of problems. *"We realized that education has some specific features, so we couldn't just adapt existing algorithms. We had to create new solutions from scratch."* But it's hard to design algorithms that can incorporate the human and psychological aspects of learning processes. For example, how do you measure student performance? *"A wrong answer to a question is not necessarily negative from the standpoint of the learning process, because it also provides an improvement opportunity,"* notes Alessandro Lazaric. *"And machine learning systems need a clear trace to know whether or not there is any progress. But this can be very hard to define."* Another feature that is tricky to analyze is the student's level of interest. Boredom or fatigue can affect answers and distort the system. *"We measure a certain number of parameters that are very subjective. We will need to rely on expert analysis by education professionals."*

Adapting to user characteristics

The Sequel Project Team has also forged links with a company that sells online revision software for secondary school students. The aim is to improve this type of web platform by making it adapt automatically to the user profile. *"Some students like to have a lot of content before they get to the exercises. Others learn better with a lot of exercises. We want to create a system that naturally adapts to user characteristics and demands."*

And why not then introduce these technologies into the classroom? *"A teacher can't adapt a lesson to each of 30 different students. But why not offer some more personal moments when the student can use a tablet to work on exercises specifically recommended for him/her?"* imagines the researcher, who adds: *"Obviously this doesn't mean replacing teachers: just finding synergies."*

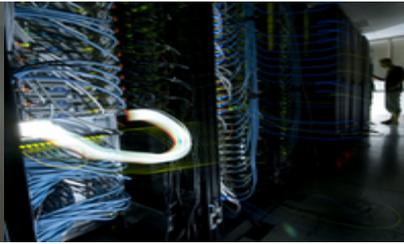
*(joint between the CNRS, University of Lille 1 and University of Lille 3), in the UMR 9189 CNRS-Centrale Lille-Université Lille1, CRIStAL.

Keywords: Sequel project-team Associated team Machine Learning Education

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- Website of Sequel projet-team
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