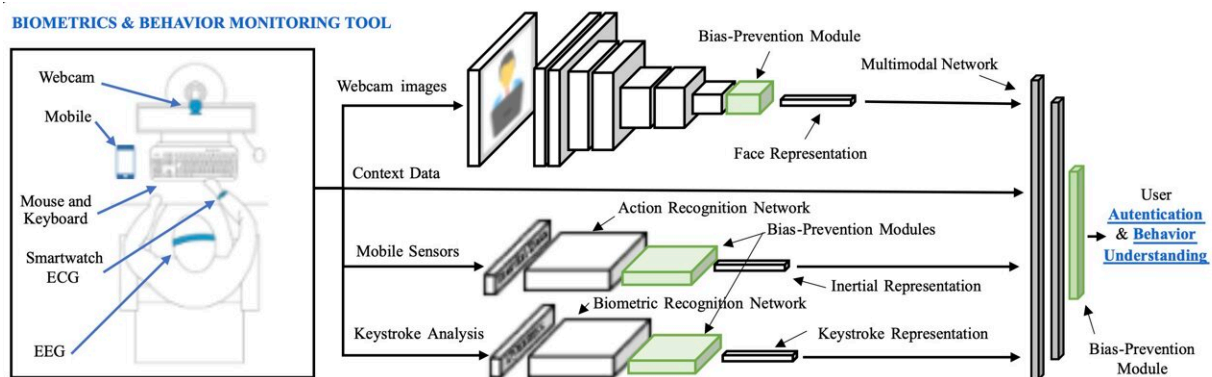


An AI-based platform to enhance and personalize e-learning

December 16 2022, by Ingrid Fadelli



Block Diagram of the learning framework of edBB. Credit: Daza et al.

Researchers at Universidad Autónoma de Madrid have recently created an innovative, AI-powered platform that could enhance remote learning, allowing educators to securely monitor students and verify that they are attending compulsory online classes or exams.

An initial prototype of this platform, called Demo-edBB, is set to be presented at the AAAI-23 Conference on Artificial Intelligence in February 2022, in Washington, and a version of the paper is available on the *arXiv* preprint server.

"Our investigation group, the [BiDA-Lab](#) at Universidad Autónoma de

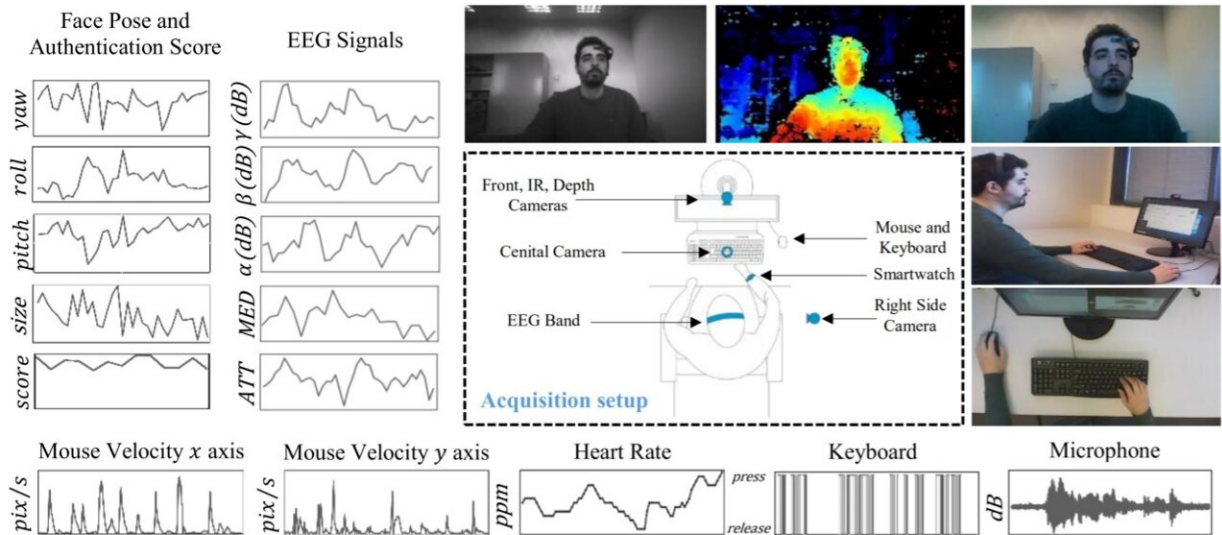
Madrid, has substantial experience with biometric signals and systems, behavior analysis and AI applications, with over 300 hundred published papers in last two decades," Roberto Daza Garcia, one of the researchers who carried out the study, told TechXplore.

"Over the past few years, virtual education has grown significantly, becoming the main foundation of one on the most important educational institutions and generating new valuable opportunities for learning. Our group has thus recently been working on new technologies for e-learning, ultimately leading to the development of a platform that combines biometric and behavior analysis tools."

EdBB, the platform created by the BiDA-Lab team, was specifically designed to improve online student evaluation processes, while also making them more security. The platform is based on several technologies, including biometric identification tools that recognize users based on their behavior (e.g., patterns in the use of the keyboard or "keystrokes") or physiological data (e.g., facial recognition tools), as well as algorithms trained to detect specific behaviors (e.g., attention, stress, etc.). So far, the researchers developed a demo version of their platform, dubbed edBB-demo, yet they are now working on the integral version.

"Our platform captures different sensors from the average student's computer (webcam, keyboard, audio, metadata, etc.) and applies different technologies in [real-time](#), to identify users, suspicious events, behavior estimation, etc., subsequently outlining them in reports for teachers," Daza Garcia explained.

"It can capture all students' sensors in a secure and transparent way, while allowing students to use any other online education platform. edBB-Demo combines some of the most important advances in remote biometric and behavioral understanding of the last decade."



Setup and signals captured during an edBB session. Credit: Daza et al.

The platform created by this team of researchers relies on a multi-modal learning framework, a model that can analyze different types of data, including images, videos, audio signals and metadata. The demo version of the platform was trained on a database of learning and exam sessions, each lasting over 20 minutes, featuring 60 different students.

"One of the biggest concerns for educational institutions is how to prove that remote students are in fact attending an online evaluation," Daza Garcia said. "The edBB-Platform's biometric and behavioral detection technologies can assure higher security in this important task, while also detecting a student's behavior, which could improve the learning process and even pave the way for new technologies to estimate students' attention or stress levels. We're convinced that these new technologies will be fundamental in the future to offer more personalized education for each student."

The demo version of edBB has four key capabilities, namely it can authenticate users with high accuracy levels, recognize the actions of humans in videos, estimate a student's heart rate using webcam footage and estimate a students' attention by analyzing their facial expressions. The dataset used to train the framework were recently made available online and could thus be used to train other machine learning models.

The platform created by this team of researchers could soon help to advance [remote learning](#), allowing educators to verify the identity of e-learners reliably and securely. In addition, it could facilitate the personalization of online learning, by identifying possible issues that are hindering a student's learning, such as poor attention or high stress levels.

"We believe this is a wide area that has a promising future with lots of challenges to face, so we now want to continue improving the edBB-[platform](#)," Daza Garcia added. "We want to keep developing the research lines we're currently working on, as well as new cognitive load estimation systems, using multimodal facial analysis and new multimodal architectures to identify the student's keyboard or mouse dynamics. Furthermore, we want to amplify our investigation fields into visual attention estimation, gaze tracking, answer prediction, etc."

More information: Roberto Daza et al, edBB-Demo: Biometrics and Behavior Analysis for Online Educational Platforms, *arXiv* (2022). [DOI: 10.48550/arxiv.2211.09210](https://doi.org/10.48550/arxiv.2211.09210)

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