A new technique revolutionizes video annotation in clinical settings

Lausanne, Switzerland – A new algorithm pipeline developed by the Lausanne University Hospital (CHUV) and the University of Lausanne (UNIL), in partnership with The University of Applied Sciences and Arts Western Switzerland (HES-SO Valais-Wallis), transforms the way clinicians analyse behavioural data.

A new study published in *Behavior Research Methods*, conducted by the The Sense Innovation and Research Center, which is a joint venture of CHUV-UNIL and HES-SO Valais-Wallis, shows it is possible to automate annotation of video recordings, even those involving freely playing children. For the first time, clinicians can more accessibly use machine learning methods for video annotation in naturalistic settings. It offers a significant reduction in the time and effort traditionally required for manual video annotation, benefiting both patients and healthcare providers.

ADVANCE: A Leap in Behavioural Research

Video recordings have long been an essential tool for observing human behaviour, especially in clinical and research settings. However, traditional video annotation methods remain time-consuming, bias-prone, and labour-intensive, especially when tracking multiple individuals or behaviours in complex, unscripted environments. Current attempts to address these limitations often require highly standardized environments and scripted scenarios, which are not representative of real-world behaviours.

A technology for real-world environments

ADVANCE allows for the analysis of video recordings in dynamic, natural settings. The versatility of the ADVANCE system is demonstrated in a study conducted with schoolchildren and adults in an art classroom environment, where the setup involved 2-5 individuals, dynamic occlusions, and large variations in actions.

ADVANCE allows us to observe *real* behaviours that are not influenced by an unfamiliar setting, an unknown experimenter, or a clinician who might unintentionally introduce stress or alter typical responses. This is especially crucial in clinical assessments for diagnostics.

Lead author of the study, Naomi Middelmann says “This opens a new field of research where we can apply machine learning to process behavioural data at a scale and accuracy previously impossible, without having to adapt settings or behaviour. Applications span from clinical diagnostics in developmental psychology to improving patient care in mental health settings.”

Moving beyond what humans can detect

The algorithm can simultaneously track multiple individuals across the entire duration of the recording—even when they leave and re-enter the field of view—and estimate their skeletal positions, providing means of annotating both individual and inter-individual behaviours as well as metrics that cannot be detected and quantified by human annotators.

ADVANCE can monitor subtle changes in movement—such as micro-shifts in posture or variations in movement velocity—gives clinicians access to quantifiable variables that are extremely difficult to capture manually. For perspective, manual annotation typically requires 4–5 hours for every 45-minute video, and even then, requiring multiple validators. ADVANCE simplifies the process, improves the ethological validity, and makes it possible to conduct more accurate and scalable behavioural analyses in real-world contexts.

Easy of use and accessibility

Dr. Matthew J. Vowels, researcher at The Sense Innovation and Research Center, CHUV-UNIL, emphasized, “We built ADVANCE so clinicians and empirical researchers can use it without complex setups and data science specialists, and to put modern engineering tools within easy reach. By keeping the pipeline simple to deploy, we expand what can be measured, improve comparability across sites, and move behavioural science beyond the limits of manual coding.”

The fruit of an interdisciplinary collaboration

Professor Micah Murray, Scientific and Academic Director of The Sense Innovation and Research Center and Full Professor within the Faculty of Biology and Medicine at CHUV-UNIL, emphasized the collaborative effort that made this breakthrough possible. “Five years ago, this innovation would not have been feasible. Only through the synergies across applied, basic, and clinical domains have we seen such rapid progress. It’s precisely this intersection of neuroscience, engineering, and clinical expertise that The Sense Innovation & Research Center aspires to foster to solve complex challenges.”

Supported by the Swiss National Science Foundation and a private foundation that wishes to remain anonymous, the interdisciplinary team is composed of neuroscientists, engineers, mathematicians, and psychiatrists from CHUV-UNIL and HES-SO Valais-Wallis.

Reference

Middelmann NK, Calbimonte JP, Wake EB, Jaquerod ME, Junod N, Glaus J, Sidiropoulou O, Plessen KJ, Murray MM*, Vowels MJ* (2025) The ADVANCE toolkit: automated descriptive video annotation in naturalistic child environments. *Behavior Research Methods*, DOI: https://doi.org/10.3758/s13428-025-02883-0 .

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