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Preface

The first international interdisciplinary workshop on MILeS (Multimodal Immersive Learning Systems) was organised in the context of the MILKI-PSY (Multimodal Immersive Learning with Artificial Intelligence for Psychomotor Skills) project in 2021 to develop AI-enhanced, data-intensive, MILeS for psychomotor skills development. A year later, the MILeS workshop continues its tradition of excellence, bringing together researchers at the cutting edge in domains such as AI & data science, educational science, sports science etc., by organising the second edition of the MILeS workshop on 13th September 2022 in Toulouse, France.

Multimodal immersive technologies such as augmented and virtual reality, along with rapidly evolving technologies such as AI and sensors, are redefining human-computer interaction and, consequently, the domain of technology-enhanced learning. Decades ago, the seminal work. “Bloom's 2 sigma problem”, led to the inception of the potentialities of “educational technology” for personalised learning. This was immediately followed by an influx of researchers from all domains interested in education exploring various technologies in search of this promised land and the holy grail. In recent years, Ericsson with his seminal work on “deliberate practice”, recapitulated much of Bloom's conclusions, giving us an epiphany that not much has changed or been achieved in education.

This is ever more so true for psychomotor skills domains that focus on performance outcomes in the real world. Obviously, no skill lies exclusively in one of the three domains of learning but rather in a conceptual three-dimensional space where each domain represents a dimension, as Limbu et al. (2022) highlighted during the workshop. Limbu et al. (2022) shed light on the need for a new framework to view education, which moves away from the traditional view of learning that emphasises the brain as the core learning entity, towards a more embodied and contextual view of learning. MILeS are noteworthy precisely as they promise to situate learning in authentic contexts. As Aristotle argued, how learning should always be an active process. However, facilitating situated learning in authentic contexts requires a shift away from traditional cognitive instructional designs. Cárdenas et al. (2022) state that learning psychomotor skills constitutes not only the physical aspects but also the technical and mental aspects and that additional considerations must be given to the feedback design and timing in MILeS. Similarly, Di Mitri et al. (2022) hammer this point by defining “augmented” feedback, stating that feedback must be timely & actionable within the context.

MILeS offer a plethora of “theoretical” affordances for contextualising psychomotor learning. Currently, in its infancy, much of these affordances are yet to be realised, lying behind walls of theoretical and technological complications which need to be ascended. In this light, the workshop also focused on the design and development of infrastructures that will help MILeS researchers conquer them. Slupczynski et al. (2022) envisioned a cloud infrastructure for collecting streams of multimodal data and to train machine learning models in the cloud. This infrastructure could potentially break the bubbles of individual researchers who can rely on data large amounts of data from other researchers. make use of existing trained models, and contribute towards improving the models. An example of such a model is proposed by Paaßen et al. (2022), who propose a model to match the teacher's demonstration of each motion to the student’s attempts and to identify differences between demonstration and attempt, which is a key step in addressing the core issue of transitioning from multimodal sensor data to feedback in MILeS (Romano et al., 2022).

During the workshop, several authors presented their preliminary use case studies, taking research on MILeS a step further towards the holy grail, i.e. personalised independent learning of (psychomotor) skills. Geisen et al. (2022) presented their study with a MILeS application for training golf in which she provided visual feedforward to improve the putting performance of golfers. Similarly, Mat Sanusi et al. (2022) proposed a MILeS with an intelligent and personalised feedback system that adapts based on the type of mistakes displayed by the learner. The application of MILeS is, of course, not just limited to the context of learning sports skills. It can also be used to foster human-robot collaboration in contexts such as assembly lines, as proposed by Keller et al. (2022), where it is important to teach the learner not only about the collaborative task but also about the mental model of the robot.

Evidently, the MILeS workshop continues to be the Mecca for researchers working on MILeS to get together, learn, share and discuss ideas, and continue to make true the possibility of a truly personalised & situated (psychomotor) skills learning. It was the greatest pleasure to put and see the sMILeS on researchers' faces, despite the MILeS that they have yet to walk, and a 500 more.

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On behalf of the editors,
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