

The Future of Sensor Technology in Sports – Empathokineshetics

Different fields are contributing new methods and systems to sports research. Among the three most prominent are ubiquitous computing, machine learning, and modeling and simulation (Fig). Taken together, they will change the way we measure in sports science.

Ubiquitous computing systems play an increasingly important role in sports [1]. Wearable computing and external, for example camera- or wave-based (radar, microwave), measurement systems can provide real-time data, potentially supporting feedback, performance improvement and injury reduction. They also allow to instrument sports science studies outside the lab, facilitating the assessment of the real, “in-the-wild”, situation.

Machine learning and data mining concepts provide data-driven tools for analyzing the considerable amount of data that is generated in sports science studies, especially using the above-mentioned ubiquitous computing systems [2, 3]. Traditional statistical analysis methods commonly cannot handle this amount of data easily. Thus, the analysis is often restricted to limited data and a considerable amount of information is neglected. Moreover, the results are frequently biased by the expectation of the researcher. Using machine learning and data mining concepts, researchers can address these challenges. These concepts have the ability to deal with large data sets, to work data-driven rather than hypothesis-driven, and to provide valuable insights into training effects and injury risks.

Modeling and simulation are essential to analyze human motion and interaction [4, 5]. A lot of research questions are not directly addressable by experimentation, which is due to either ethical reasons or measurement challenges. Using mathematical, biomechanical models, reality can be simulated using controllable boundary conditions. In this setting, objectivity and reproducibility are inherent, which provides acceptable model validity. A challenge is to find an optimal compromise regarding model complexity and modeling accuracy.

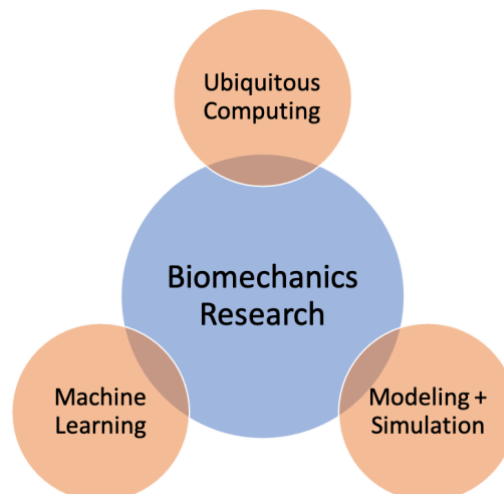


Fig.: UbiComp, Machine Learning, and Modeling & Simulation for Biomechanics Research.

The talk targets interested scientists in the areas of sports science. The main objective of the talk is to bridge the gap between scientists with expertise on technological state-of-the-art and scientists that might apply such technologies but often do not realize their potentials or are not aware how to apply them.

The talk will also touch base on the newly implemented German Research Foundation funded collaborative research center “empatho-kinaesthetic sensory science” (www.empkins.de), highlighting the interdisciplinary research projects of engineering, ethics, medical, and psychological experts that do research in EmpkinS. The systems that are currently being investigated in EmpkinS in laboratory environments will have everyday applicability in the future. This will open up new possibilities in sports science, which will hopefully contribute to more objective, precise, and real-life studies.

References

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