ARTIFICIAL INTELLIGENCE, DATA ANALYTICS AND SPORTS BIOMECHANICS: A NEW ERA OR A FALSE DAWN?

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The adoption of wearable technologies combined with emerging and evolving data science techniques has the potential to do for sports biomechanists what the industrial revolution did for manufacturing. Yet the full capability of these technologies and methods will likely only be realised if sport scientists are embedded in their application and driving the questions being asked.

KEYWORDS: artifical intelligence, machine learning, data analytics

INTRODUCTION: In contrast to other sport science disciplines the highly quantitative nature of sport biomechanics has historically required practitioners to apportion significant time to the data collection and analysis phases of applied research and athlete servicing. Historically, this has served to limit the time that can be allocated to results interpretation and translation, and to the critical component of athlete/coach feedback. However, recent advances in wearable technologies and in the data science areas of computer vision, data mining, machine learning and sports analytics, is a literal game-changer for the sports industry and the sports biomechanist in-particular.

From compiling the first big data repository of nearly half a million (458,372) sports research motion capture (*.c3d) files for the estimation of ground reaction forces and moments in the field (Johnson et al., 2018), to machine learning methods for auto pose estimation, there is little doubt that there is currently an explosion in the adoption of machine learning techniques in the sports biomechanics domain. With the most important by-product being an upending of the data collection/analysis burden that has hampered the sport biomechanist for so long.

From the sports analyst perspective, a myriad of player tracking tools are now available with new players entering the market daily (e.g. Champion Data, MLBAM Statcast, Catapult, PITCHf/x, NFL Next Gen Stats, HITf/x). Yet, arguably, at the present time this type of global tracking offers little by way of obtaining meaningful, actionable and detailed insights aimed at improving performance at the individual level. Similarly, while touted as a panacea to the sports analysis industry there remains a myriad of additional challenges in adopting machine learning techniques at scale for sport biomechanics. These include; 1) training data scientists with sport science expertise to drive questions that leverage the power of these tools, 2) simplifying the data collection time frame required for traditional data science approaches, and 3) developing consensus on the design and framework schema required for the enterprise architecture necessary to undertake this work at scale. This presentation discusses the potential of artificial intelligence and data analytics for sports biomechanics.

REFERENCES:

Johnson, William R., Alderson, Jacqueline, Lloyd, David, & Mian, Ajmal. (2018). Predicting athlete ground reaction forces and moments from spatio-temporal driven CNN models. IEEE *Transactions on Biomedical Engineering*, (online), 1-7. doi: 10.1109/TBME.2018.2854632.

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