6BUIS020C – Final Project Report

CYCLEPRO-CYCLING POSTURE ANALYSIS WITH DEEP NEURAL NETWORKS AND POSE ESTIMATIONS WITH AERODYNAMICS

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Abstract

Artificial Intelligence (AI) has emerged as a dominant force in data analytics in recent times. The use of Computer Vision (CV) and Machine Learning (ML) in data analytics has gained popularity ever since their introduction. However, the application of (DNNs) Deep Neural Networks to sports data analysis and their performance evaluation remains unexplored. Data analysis is often a challenging and time-consuming task. The growth of technology in sports has led to an increasing trend in AI-based cycling posture analysis. This study aims to investigate aerodynamics cycling posture analysis and proposes the use of (CNNs) Convolutional Neural Networks and pose estimations as an alternative approach. As aerodynamics-based cycling has received limited research attention in the past, acquiring an appropriate dataset was challenging. Therefore, this study attempts to create a industry expert verified dataset and propose an architecture to predict pose estimation using a Neural Networks.

This technique analysis system would enable cyclists of all levels to identify and rectify their technique faults without the need for a physical coach, thereby improving their technique and making them better cyclists. Additionally, this tool would assist coaches in identifying technique faults and improving their athletes' postures to enhance their performance. As the proposed system has not been investigated before, it could be a significant breakthrough for cycling.

While the primary version of the system seems to be a game changer, there is room for improvement. It is likely that the lower layer of the sport has a shortage of high-quality camera equipment to provide HD video footage for the analysis. Therefore, increasing functionality to handle low-quality material would be beneficial. Another issue is that existing software cannot isolate individual players from films with multiple players. If the system can identify such material, it would once again be a game changer. This program can also be improved to detect more cycling postures. Furthermore, this analysis can be extended to new sports.