The Brain and an Impact: Real-Time Detection of Concussions Among Athletes in Contact Sports Using Sensor Fusion and Convolutional Neural Networks

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Concussions are very common among a wide variety of contact sports at all levels - particularly among high school and college athletes, with about 3.8 million athletes having a concussion every year. An undetected or ignored concussion could have life-threatening effects on a player through Second Impact Syndrome (SIS) and Chronic Traumatic Encephalopathy (CTE). SIS occurs when the brain swells rapidly due to a second concussion before the first one has completely subsided and has a fatality rate of ~50%. CTE is a progressive neurodegenerative disease which only shows itself a few years or decades after repeated head trauma and can cause anxiety, suicidal thoughts, Parkinsonism, and, eventually, progressive dementia. To support athletes in safely playing the sports they love, I propose a concussion detector headband that can recognize whether a player has suffered a concussion, using a Machine Learning algorithm and data from on-board sensors. This device can determine a range of information on brain impacts and the possibility of those impacts causing concussion. The real-time detection of such concussions can help coaches get players off the field for concussion protocol testing and get them help as soon as possible; reducing the occurrences of SIS and helping players be more aware of possible CTE.

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