Sports stadiums and facilities historically have had a detrimental impact on the environment, causing issues such as waste management, energy consumption, and air pollution, with sports fans creating carbon footprints much higher than day-to-day activities (Wilkes, 2021). Specifically, waste management operations in sports stadiums have become a pressing environmental concern due to the significant amount of waste generated during events (Costello et al., 2017). Current disposal methods lack sustainability, posing threats to ecosystems. To address this, a robotic waste disposal system was designed for sorting fan-generated waste into recyclables, compost, and trash bins. The system streamlines the collection, enhances sorting efficiency, and reduces landfill waste, consequently lowering CO_2 emissions. To classify scanned images of different types of waste and correctly identify the waste category, the CLIP zero shot model was finetuned. Using the zero-shot model, a robotic waste disposal system was built to dispose of waste in its respective waste bin: recyclable, compost, or trash. The CLIP model was 83.0% accurate in sorting the waste items and the robotic waste disposal system sorted approximatley 5 items every minute. Analyzing recycled and composted data allows for calculating the landfill diversion percentage by assessing waste volume/weight and categorizing prevented contributions. Additionally, evaluating diverted waste enables calculating reduced CO_2 emissions, including avoided emissions from waste decomposition and transportation. In the future, the waste disposal system could handle multiple items simultaneously and become autonomous, reducing the need for numerous robots around the stadium.

Keywords: sports venues, waste, robotic system, sustainable waste management, CLIP zero-shot model, waste classification, Raspberry Pi, CO_2 emissions reduction, zero waste