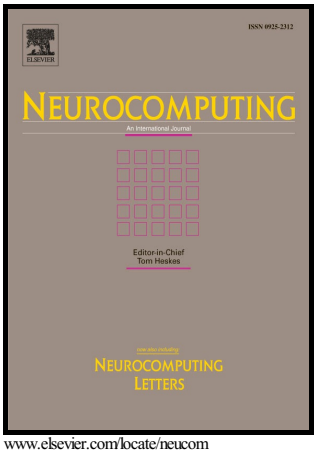

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ABSTRACT - The growing trend of obesity and overweight worldwide has reached epidemic proportions with one third of the global population now considered obese. This is having a significant medical impact on children and adults who are at risk of developing osteoarthritis, coronary heart disease and stroke, type 2 diabetes, cancers, respiratory problems, and non-alcoholic fatty liver disease. In an attempt to redress the issue, physical activity is being promoted as a fundamental component for maintaining a healthy lifestyle. Recommendations for physical activity levels are issued by most governments as part of their public health measures. However, current techniques and protocols, including those used in laboratory settings, have been criticised. The main concern is that it is not feasible to use multiple pieces of measurement hardware, such as VO2 masks and heart rate monitors, to monitor children in free-living environments due to weight and encumbrance constraints. This has prompted research in the use of wearable sensing and machine learning technology to produce classifications for specific physical activity events. This paper builds on this approach and presents a supervised machine learning method that utilises data obtained from accelerometer sensors worn by children in free-living environments. Our results show that when using an artificial neural network algorithm it is possible to obtain an overall accuracy of 96% using four features from