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PROGRAMME ABSTRACT

"Bridging Gaps with Creativity for Future Sustainability"

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CLASSIFICATION OF AUTISM SPECTRUM DISORDER GAIT USING MACHINE LEARNING CLASSIFIERS BASED ON TEMPORAL-SPATIAL GAITPARAMETERS

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Abstract

Autism spectrum disorder (ASD) is a complex and permanent developmental disorder that can be identified in the early years of childhood. ASD is recently considered as the most prevalent forms of developmental disabilities worldwide. Contemporary studies have revealed the existence of movement disturbances particularly gait abnormalities as the additional characteristics that support the diagnosis of ASD. The aim of this study is to classify ASD children from normal healthy children, on the basis of temporal-spatial gait parameters acquired from three-dimensional (3D) gait analysis. Different types of machine learning classifiers were evaluated towards devising an accurate pattern classification system. The gait data of 30 ASD children and 30 age-matched controls were obtained using a state-of-the-art 3D motion analysis during self-selected speed barefoot walking. Eight temporal-spatial gait parameters, namely stride time, step time, stance time, swing time, walking speed, cadence, stride length and step length, were extracted from each subject and used as input features to the classification models. Artificial neural networks (ANN), support vector machines (SVM), k-nearest neighbor (KNN), and linear discriminant analysis (LDA) were utilized to build the classification model. The classification results showed that ANN outperformed other classifiers with 93.3% accuracy, 86.7% sensitivity, and 100% specificity. The current results underline the ability of the temporal-spatial parameters, in combination with ANN classifier as a potential tool for the diagnosis of ASD gait. This work also presents a novel contribution emphasizing the effectiveness of machine learning classifiers for accurate classification of ASD gait from the normal walking pattern. Automated identification of ASD gait may be beneficial for early detection of gait difficulties and enable clinicians to perform rapid and objective clinical decision-making as well as facilitate for appropriate rehabilitation treatments to ASD children needing therapies.