Deep Learning Strategies for Autism Severity Classification in Children

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Abstract

Autism Spectrum Disorder (ASD) is a syndrome characterized by difficulties in social interaction, qualitative deviations in communication and repetitive behaviors. This syndrome is also defined as loss of contact to reality, caused by impossibility or great difficulty in interpersonal communication. ASD is classified into three degrees of severity: mild, moderate and severe. The early diagnosis of the child with autism is essential for an effective treatment. In children under three years, it is possible to achieve an improvement of 80%. In children up to five years, an improvement of 70% can be obtained, and above that age, any treatment is compromised. Literature studies generally consider several techniques for diagnosis. However, they do not take into account the identification of the severity degrees, as well as the differences between boys and girls with ASD. Therefore, this work aims to develop a computational method to diagnose and classify the autism severity degrees. Moreover, it is intended to propose strategies in order to identify possible differences in facial micro-expression between boys and girls, since the diagnosis in girls is more difficult. The methodology to be developed consists of: (I) obtaining images with frontal pose of children between 3 and 5 years; (ii) extracting micro expressions through the Histogram of Oriented Optical Flow (HOOF) algorithm; (iii) extracting facial expressions using Convolutional Neural Networks (CNNs); (iv) identifying autism severity degrees and differentiating boys and girls with autism using different classifiers, such as Support Vector Machines (SVM).

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