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Automatic Human Behavior Analysis in ADHD

Context

• **Attention-deficit/hyperactivity disorder (ADHD)** is among the most common childhood psychiatric disorders affecting around 8-12% of the worldwide population.

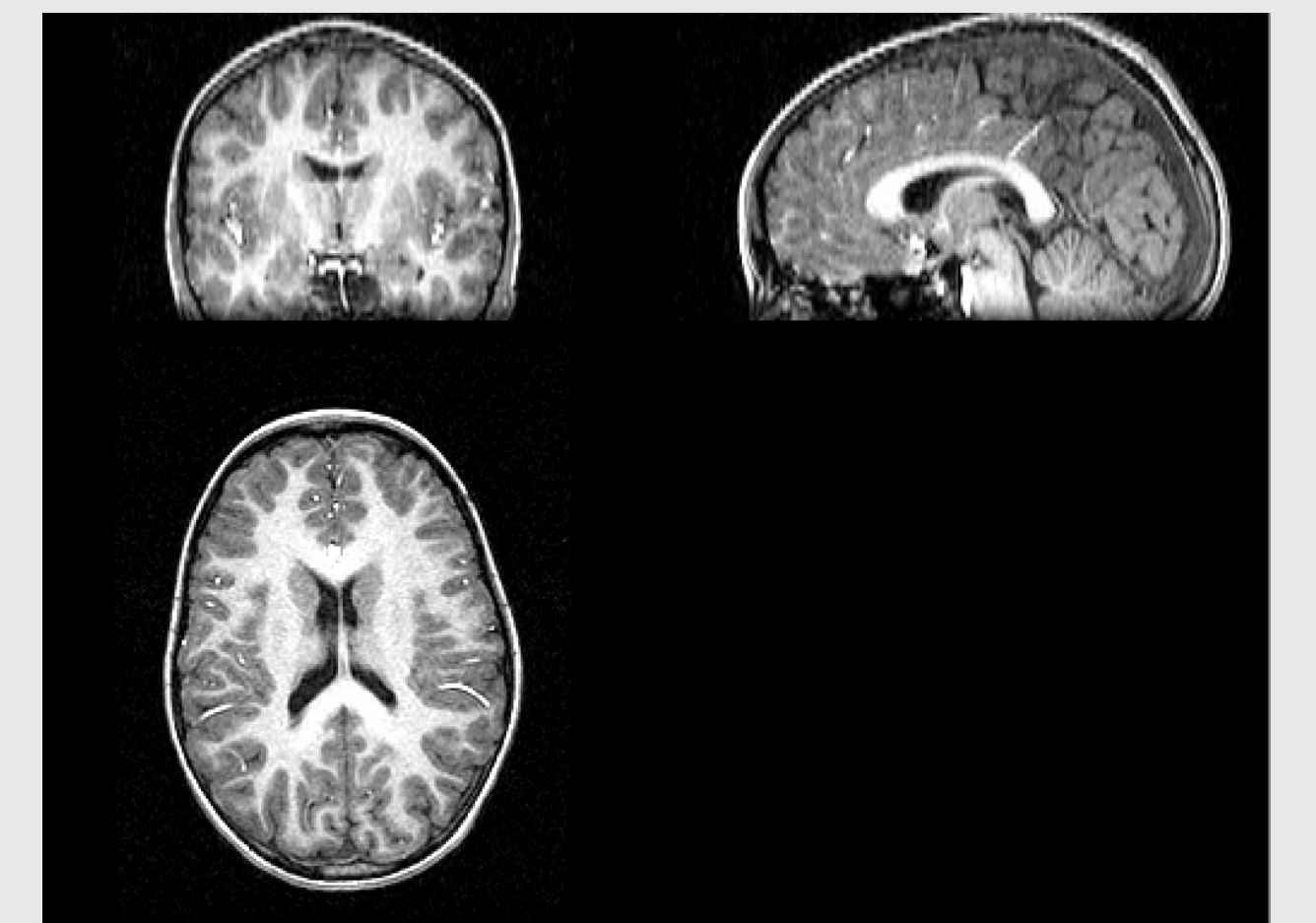
• According to standard criteria (DSM-IV-TR and ICD-10 diagnostic criteria) ADHD is a neurodevelopmental disease characterized by:

✓ **Inattention**

✓ **Hyperactivity**

✓ **Impulsivity**

• Currently, many research works are devoted to analyze children behavior and brain alterations related with ADHD.



ADHD

Attention Deficit Hyperactivity Disorder is one of the most prevalent mental disorders in children and teenagers population. Currently, the diagnostic is based on the DSM IV-TR (American Psychiatric Association, 2000) and/or CIE-10 criteria. These criteria involve three different blocks: attention deficit, hyperactivity, and impulsivity. However, the motivation variable does not appear in the classifications. On the other hand, the clinical experience shows that the motivation variable plays a key role.



1. Objectives

- 1) **Perform a proof-of-concept corresponding to a clinical-technical-methodological analysis to demonstrate that the motivation variable significantly modifies the symptoms of ADHD.** In relation to this objective, it will be necessary to establish the ADHD diagnostic if the child shows the same intensity of the symptoms in both contexts (low and high motivation).
- 2) **Develop an automatic transversal purpose technology for the behavioral analysis and the diagnostic assistance of mental disorders in childhood.**

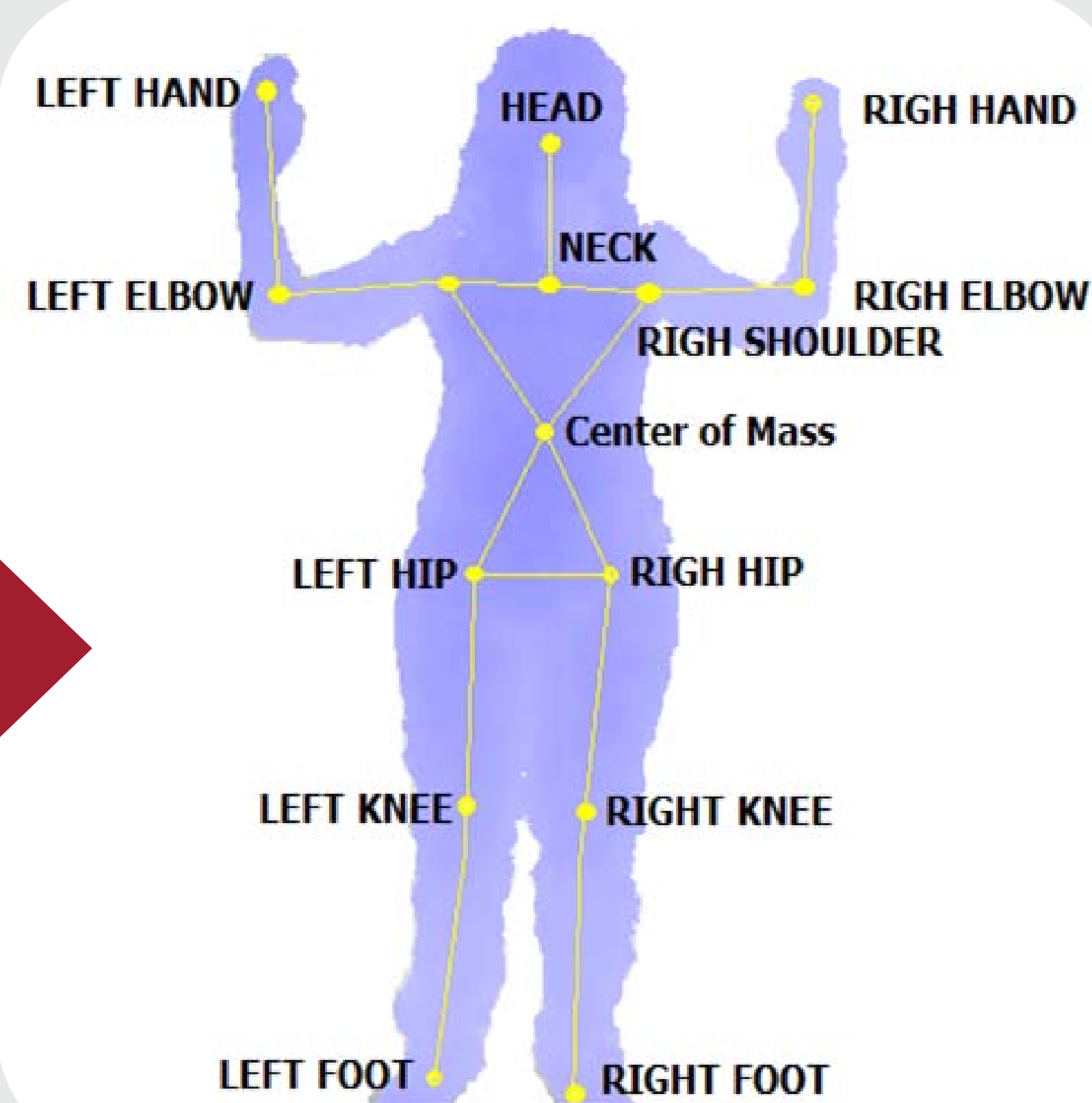
2. Methodology

It has been developed a multi-disciplinary study carried out by means of a diachronic/nomothetic/multidimensional design (Anguera, 2003) in two different contexts (low and high motivation). It has been applied an observational and selective methodology, combined with the information obtained from webcams and infrared sensors, being processed by automatic Computer Vision methods (Escalera, 2009). In this way, we have obtained an automatic, robust, objective, and reliable labeling system of behavioral categories of children with ADHD diagnostic. Finally, the obtained data have been statistically analyzed (Demsar, 2006).

3. Automatic feature extraction



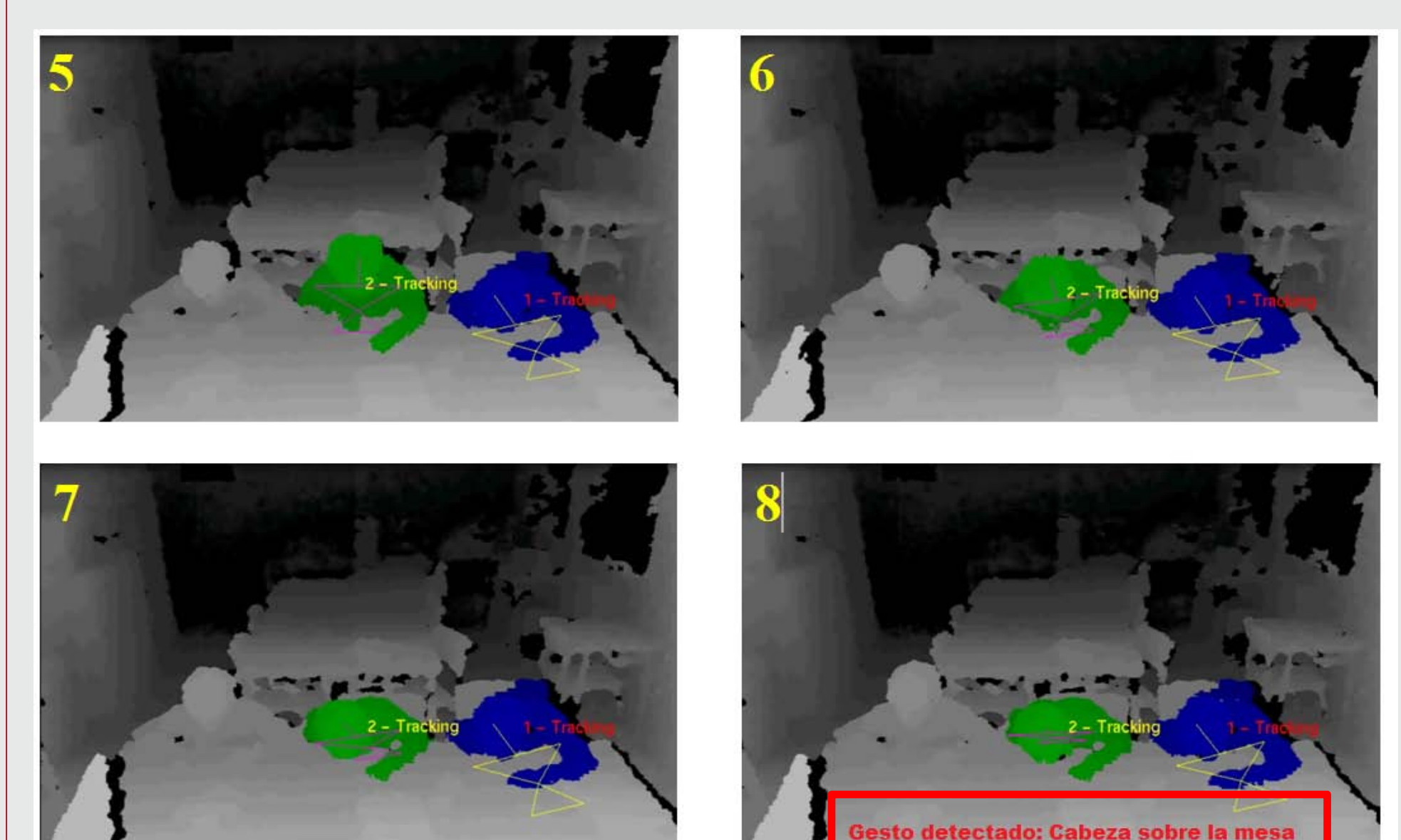
Depth map



Automatic human posture computation

Feature vector

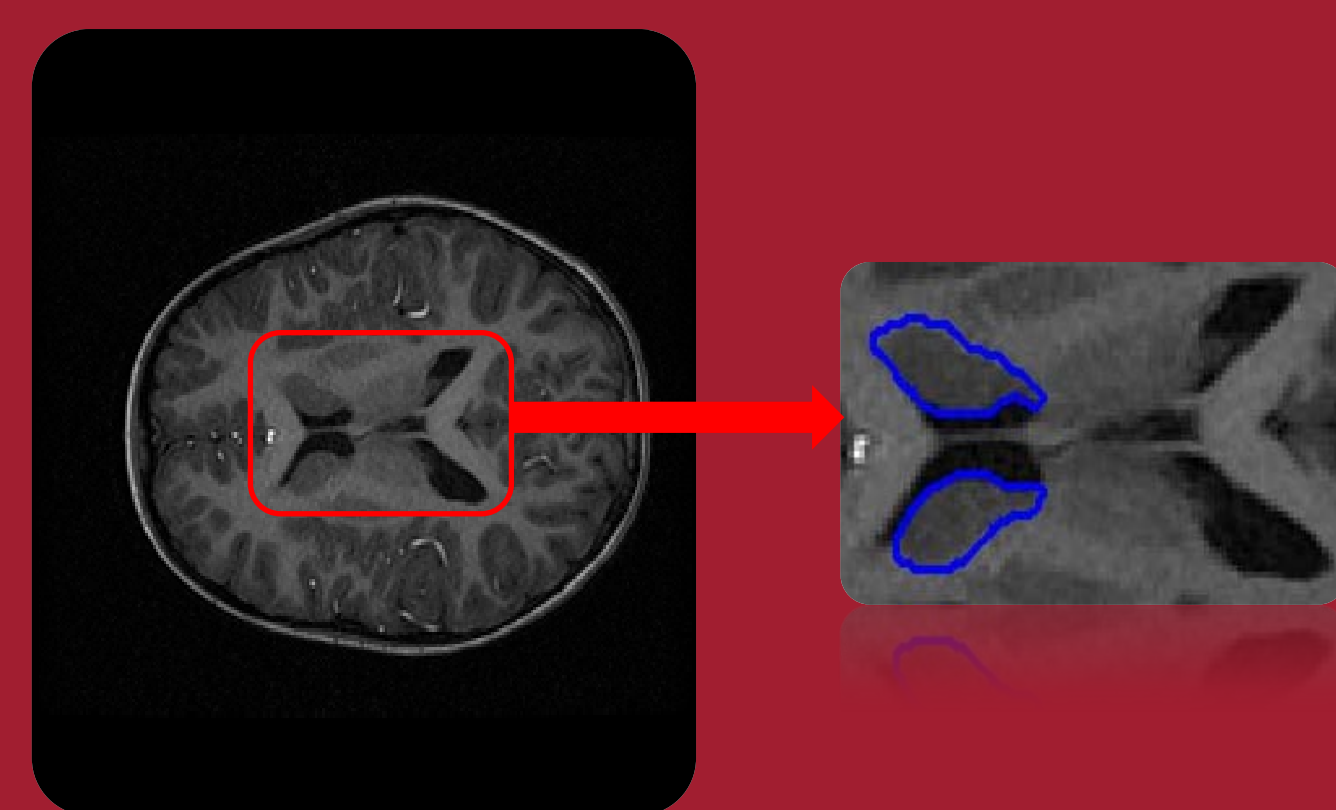
4. Results



- Automatic detection of behavioral patterns.
- Statistically significant differences found between motivational and non-motivational environments.

Future work

- The ADHD children presented significant **volumetric differences** in certain structure as the **caudate nucleus** (Carmona, 2005).
- Automatic analysis of **anatomical and functional MRI structures** in combination with behavioral information.



Referencias

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