



Using artificial intelligence, IPN defines biomarkers for detecting Alzheimer's disease

- **Over 50 hours of video footage of healthy individuals were analyzed using image processing to identify human functional patterns**
- **Early detection could improve the quality of life for patients, according to researchers involved in this project**

To detect the early symptoms of Alzheimer's disease in a non-invasive manner, Jesus Alejandro Acosta Franco, a researcher at the IPN, has developed a technological tool that uses artificial intelligence to automate the analysis of cognitive and functional human body movements.

In an unprecedented study in scientific literature, Acosta Franco, who holds a Master's degree in Digital Systems from the Centro de Investigación y Desarrollo de Tecnología Digital (Citedi), analyzed over 50 videos of healthy individuals using signal processing algorithms, image analysis, and artificial intelligence to recognize functional patterns and define key biomechanical markers in humans.

The videos were obtained from a public data archive at the Georgia Institute of Technology in the United States. They depict individuals engaging in instrumental activities of daily living (IADLs), such as counting money, preparing food, using a washing machine, writing, and doing crafts—activities that require certain cognitive abilities.

"Our main tool is multimedia videos, even captured with cell phones, to observe people's behavior while performing daily activities and, based on a metric used by geriatricians, detect any deficiencies in their movements or cognitive abilities," said Acosta Franco, who is also a biomechanical engineer.

With guidance from professors at Citedi, Alejandro Álvaro Ramírez Acosta and Ciro Andrés Martínez García Moreno, as well as geriatrics specialist Clemente Humberto Zúñiga Gil, the IPN graduate reported very encouraging results, achieving an average precision of 73.74% in recognizing human functional patterns related to instrument kinematics and 59.84% in analyzing hand grip patterns.





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Acosta believes that this research topic is highly relevant to society, as Alzheimer's disease significantly alters the patient's and their family's lifestyle. Early diagnosis could lead to an improved quality of life for patients.

The project was carried out in the Deep Learning and Multimedia Indexing Laboratory at Citedi, under the supervision of Mireya Saraí García Vázquez. It was also part of the thesis "Characterization of Egocentric and Allocentric Deficiencies with Deep Learning in Alzheimer's Disease," which earned Jesus Alejandro Acosta Franco the degree of Master of Science in Digital Systems with honors.

This work was also recognized at the Third Interdisciplinary Seminar on Aging Research, organized by the National Institute of Geriatrics in Mexico.

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