The Analysis of Medical Images Is Improved to Facilitate the Study of Psychotic Disorders

UPNA/NUP-Public University of Navarre

A team of researchers from the UPNA/NUP-Public University of Navarre has developed new super resolution and segmentation methods for magnetic resonance images so that they can be applied to the structural study of psychosis. The aim is to be able to identify the differences that are produced in specific parts of the brain in psychotic patients with respect to their healthy relatives or other people.

The project, run in coordination with doctors in the Psychiatry and Radiology Service of the Complejo Hospitalarioof Navarre, is based on the study of medical images obtained by means of magnetic resonance and has already begun to yield results. “We have seen that in individuals who have suffered a first psychotic episode, the area of the brain of the subcortical ganglia display certain differences in size with respect to that in healthy individuals,” explained the researcher Beatriz del Cerro. To a certain extent this contradicts what the psychiatric scientific literature used to say. So we argued that antipsychotic pharmacological treatment might be a determining factor in these discrepancies, since our patients were evaluated during the first weeks of treatment using medication while the studies in the literature provided data on patients who had been on treatment for a long time.”

Today, the delimitation of certain structures of the brain or areas of interest in magnetic resonance imaging is often done manually. From the medical point of view, the promoters of the project consider that it would be desirable to have automatic methods that would increase the quality of the images and calculate the desired sizes in the image analysis.

Comparing Psychotic Patients with Their Siblings

In parallel with this project, the researchers attached to the Psychiatry and Radiology service of the Complejo Hospitalarioof Navarre are doing a study entitled “Motor alterations in patients with recent psychosis onset and their healthy siblings and controls in Navarre.” This research focuses on the clinical aspects of the patients who will have the above-mentioned new methods of super resolution and segmentation in magnetic resonance imaging applied to them.

The sample in the study comprises people who have had a first psychotic episode, people related to them and a third group without any kinship with the former but who do coincide in parameters like sex, age and educational attainment. They all underwent cerebral magnetic resonance imaging.

Once the magnetic resonance images reach the UPNA, the researchers have two main tasks ahead of them. Firstly, they use mathematical super resolution techniques to reconstruct and enhance the quality of the images acquired by the medical equipment. Secondly, they segment each image by applying artificial intelligence techniques; in other words, they divide it into various parts (groups of

pixels with common features) in order to simplify it or to swap its representation for another one that is easier to analyze.“To do this, we used commercial software that already exists but we have improved the algorithms and adapted them to our purposes,” explained Aranzazu Jurio. The idea is that although there are various methods of segmentation, the one that best adapts to each type of image has to be determined and then modifications have to be made to adjust it properly to each specific case.”In this phase they also have the expertise provided by the doctors.

To validate and determine the quality of this segmentation they have compared the results with other more used segmentation methods and with the manual segmentation done by the doctors. “We have been able to see that our new method, based on grouping functions, obtains the best results in all the images in the experiment,” they pointed out.

The clinical trial is the third main activity in the project and is handled by the medical team. With the results obtained from the images they will be studying the cerebral size differences in the areas of interest (frontal lobes, the hippocampus and the amygdala as well as the subcortical nuclei) and will be determining the existence or otherwise of significant structural differences among the three groups of people being examined.

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