



## FUNCTIONAL MAGNETIC RESONANCE IMAGING (fMRI)

**SUPERVISOR :**

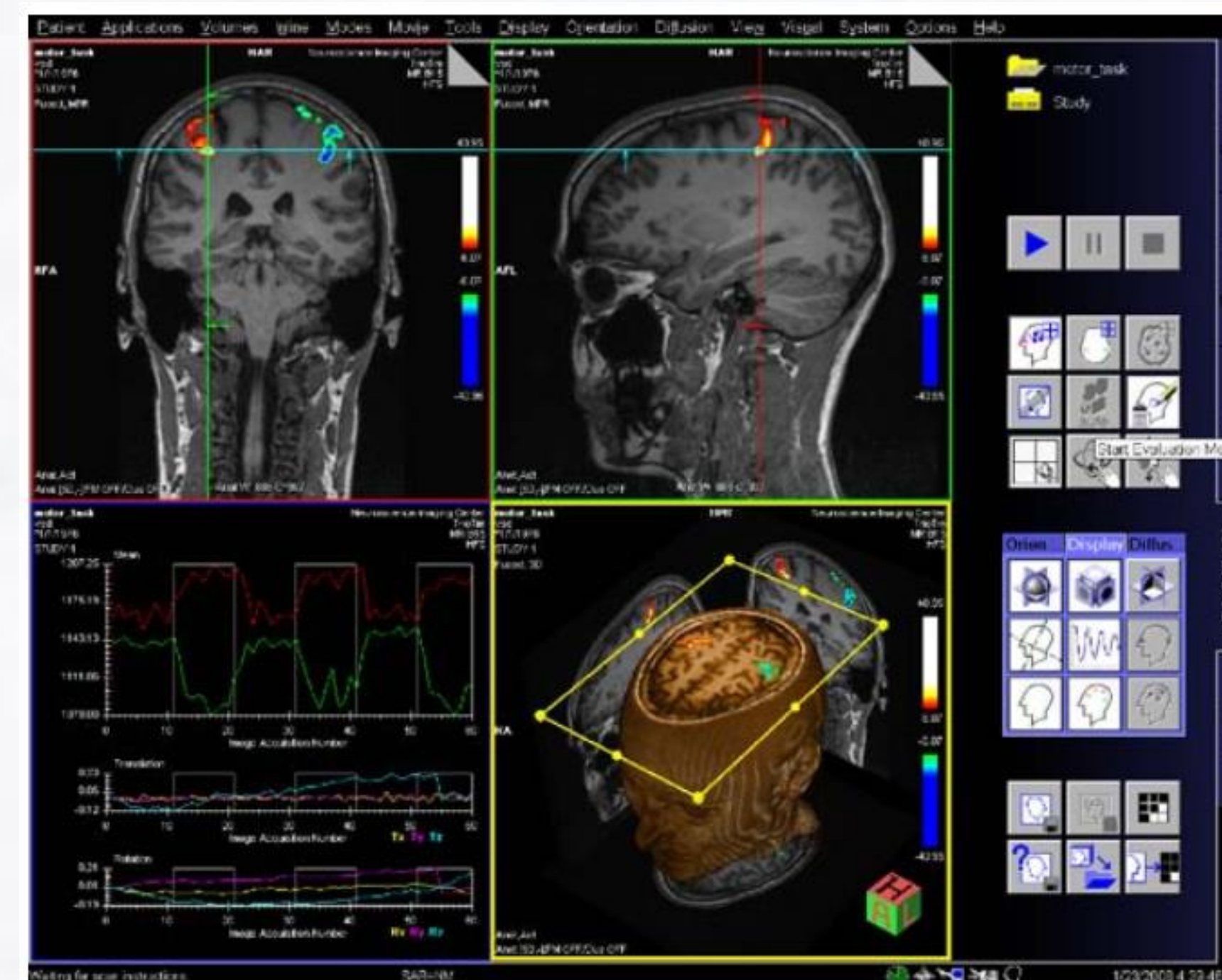
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**GROUP :**

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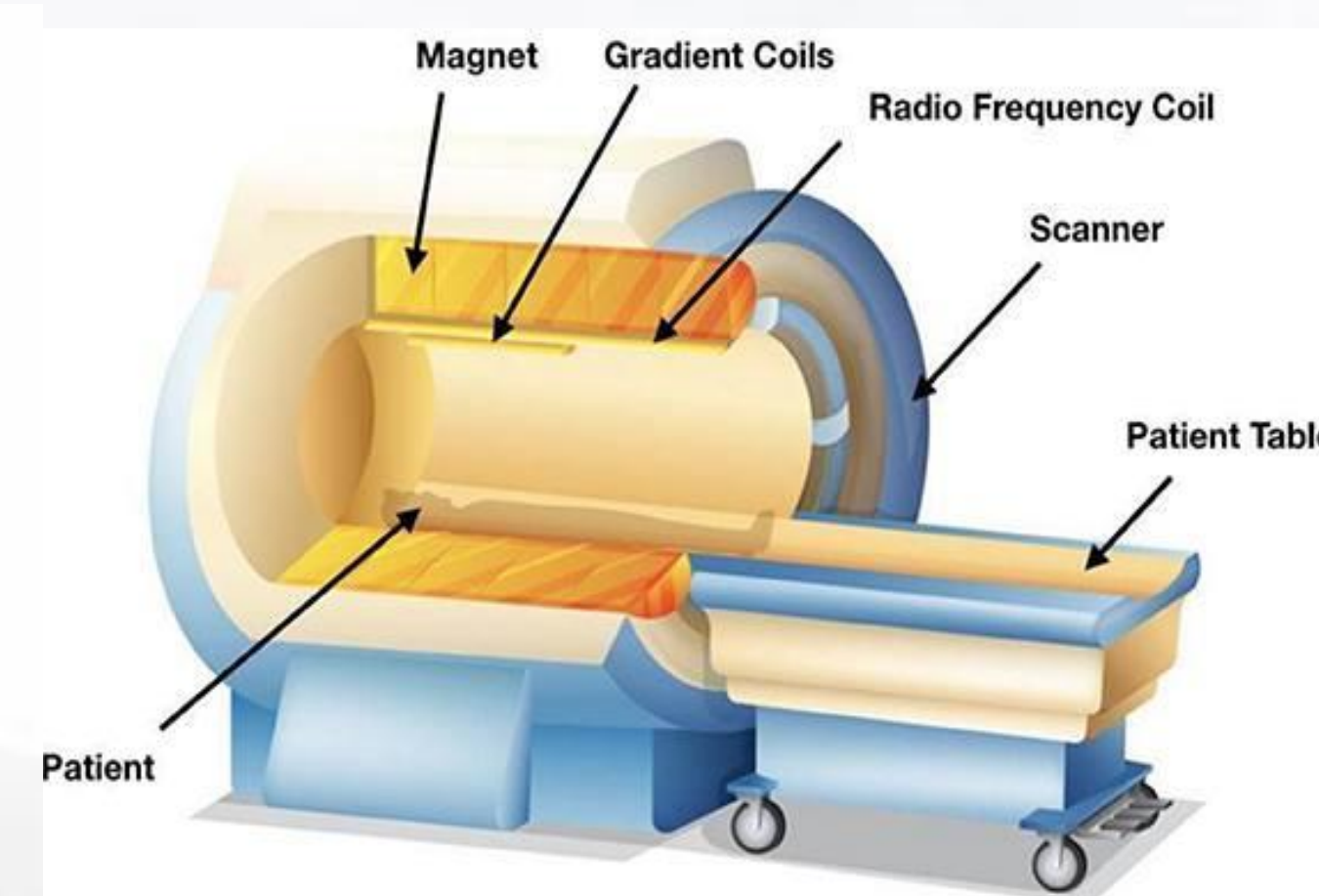
### INTRODUCTION :

Functional magnetic resonance imaging (fMRI) is a medical diagnostic device that operates by detecting the changes in blood oxygenation and flow that occur in response to neural activity. When a brain area is more active than the others; it consumes more oxygen. Thus, blood flow increases to the active area to meet the oxygen demand. It can be used to construct 3D activation maps indicating which parts of the brain are involved in a certain mental process.



### fMRI OPERATION :

The cylindrical tube of an MRI scanner houses a very powerful electromagnet. A standard research scanner has a magnetic field strength of 3 Tesla's (T) which is about 50,000 times greater than the Earth's magnetic field. The magnetic field inside the scanner affects the magnetic nuclei of the atoms. Normally atomic nuclei are randomly oriented, but under the influence of a magnetic field, the nuclei become aligned with the direction of the field. The stronger the field the greater the degree of alignment. When pointing in the same direction, the tiny magnetic signals from individual nuclei add up coherently resulting in a signal that is large enough to measure. In fMRI, it is the magnetic signal from hydrogen nuclei in water (H<sub>2</sub>O) that is detected. The key to MRI is that the signal from hydrogen nuclei varies in strength depending on the surroundings. This provides a means of discriminating between grey matter, white matter, and cerebral spinal fluid in structural images of the brain.



### fMRI COMPONENTS :

- 1- Strong Magnet
- 2- Gradient Coils
- 3- Radio-Frequency Coil
- 4- Scanner
- 5- Patient Table
- 6- Control Unit
- 7- Power Supply
- 8- RF Source, Signal, Detector
- 9- Screen

### fMRI USES :

1. Enlargement of blood vessels in the brain.
2. Multiple sclerosis.
3. Spinal cord injuries.
4. Infections.
5. Brain attack.
6. Enlargement of the head.
7. Tumors
8. Bleeding
9. Acromegaly.
10. Growth problems

