Research Highlights from Dr. Tanveer's OPTIMAL Research Group

The OPTIMAL research group focusses on early detection of Alzheimer's disease using machine learning techniques. Alzheimer's disease (AD) is the most common cause of cognitive disability and dementia. It is a major public health problem, with 35 million people affected today. This number is expected to reach 115 million cases in 2050. The cost of care is evaluated to approximately USD 600 billion worldwide. Early and accurate diagnosis of AD is crucial in order to enhance care for patients and for the development of new treatments. However, AD is currently under-diagnosed and most patients have not received a precise diagnosis. The current criteria for the inclusion of patients in clinical trials may thus not be sufficient for the discovery of disease-modifying treatments. Recently, neuroimaging has emerged a powerful tool to identify patients with AD. Multiple modalities allow measuring various types of alterations: magnetic resonance imaging (MRI) tracks atrophy caused by neurodegeneration, positron emission tomography (PET) allows measuring the presence of amyloid plaques and hypometabolism. However, powerful analysis tools are needed to fully exploit this multimodal data. In this context, machine learning approaches are particularly promising in order to design systems that can accurately classify patients with AD and predict their evolution. Machine learning approaches have been successfully applied to the individual classification of different neurological and psychiatric conditions such as Alzheimer disease, fronto-temporal dementia, autism and Parkinsonian syndromes.

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