



# STRUCTURAL IMAGE ASYMMETRY AND MACHINE LEARNING FOR EARLY DIAGNOSIS OF DEMENTIA

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## PROBLEM

Current research is motivated by the growing problem of dementia in the elderly population.

Degenerative processes in the human brain change the degree of asymmetry between left and right hemispheres. These changes can be detected by computer analysis and used for the early diagnosis of dementia.

## RESEARCH AIMS

The aim of the research is to create an algorithm to detect structural asymmetries in the brain and then, use the results for the classification of early and progressive dementia.

## MATERIALS

Medical images are obtained from ADNI (Alzheimer's Disease Neuroimaging Initiative) database. 750 structural MRIs are used for image processing and analysis. Images are divided into 3 classes according to diagnosis: Normal Cognitives, Early Mild Cognitive Impairment, and Alzheimer's Disease.

## RESEARCH APPROACH

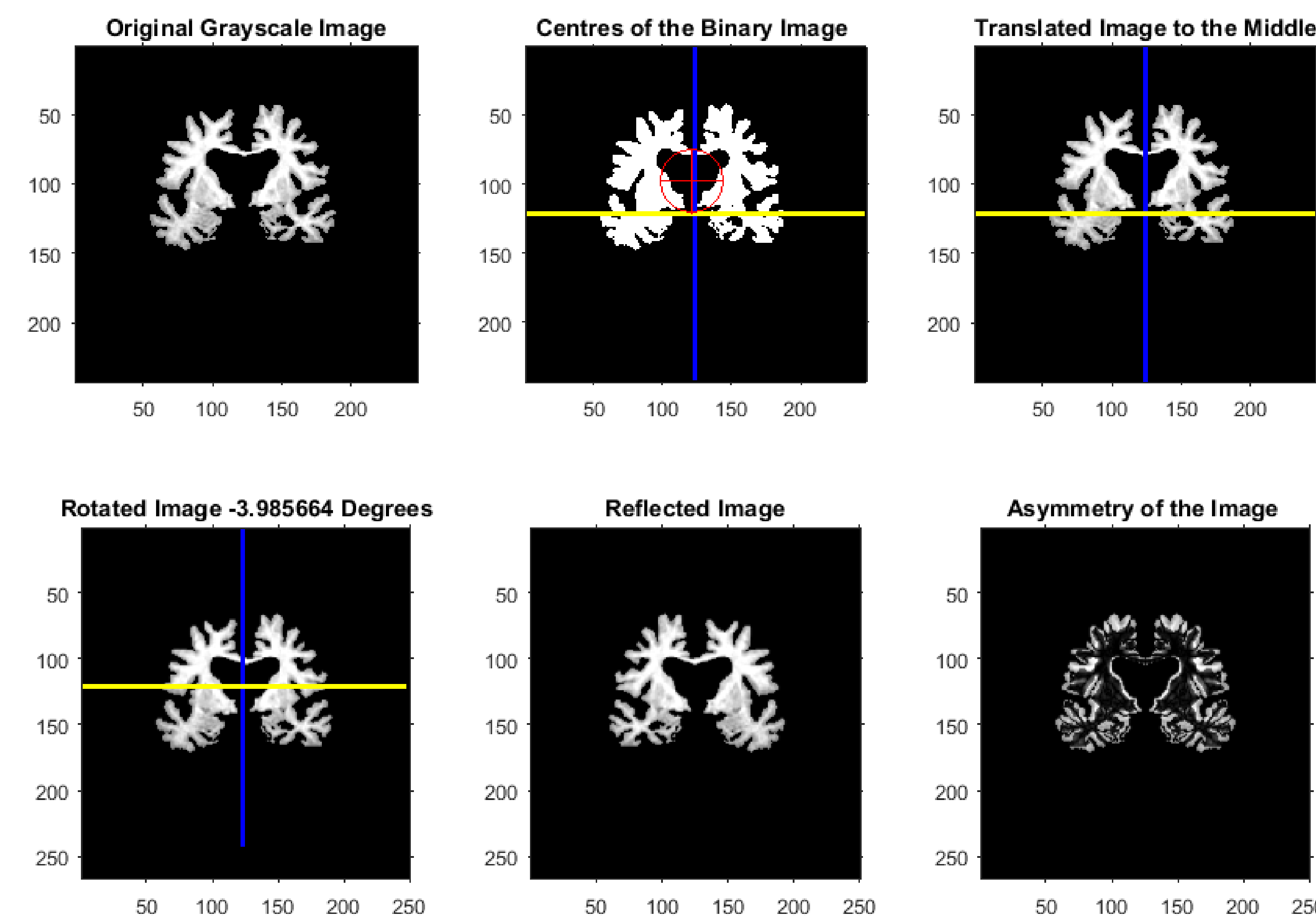


Image asymmetry is detected automatically in segmented 3D structural brain images. The image is simplified using 0-1 binarisation and then reduced to a standard form using translations, rotations and reflection. The differences between the left and right hemispheres are shown visually.

It is proposed to analyze the image asymmetry with the help of statistical features extracted from the final image.

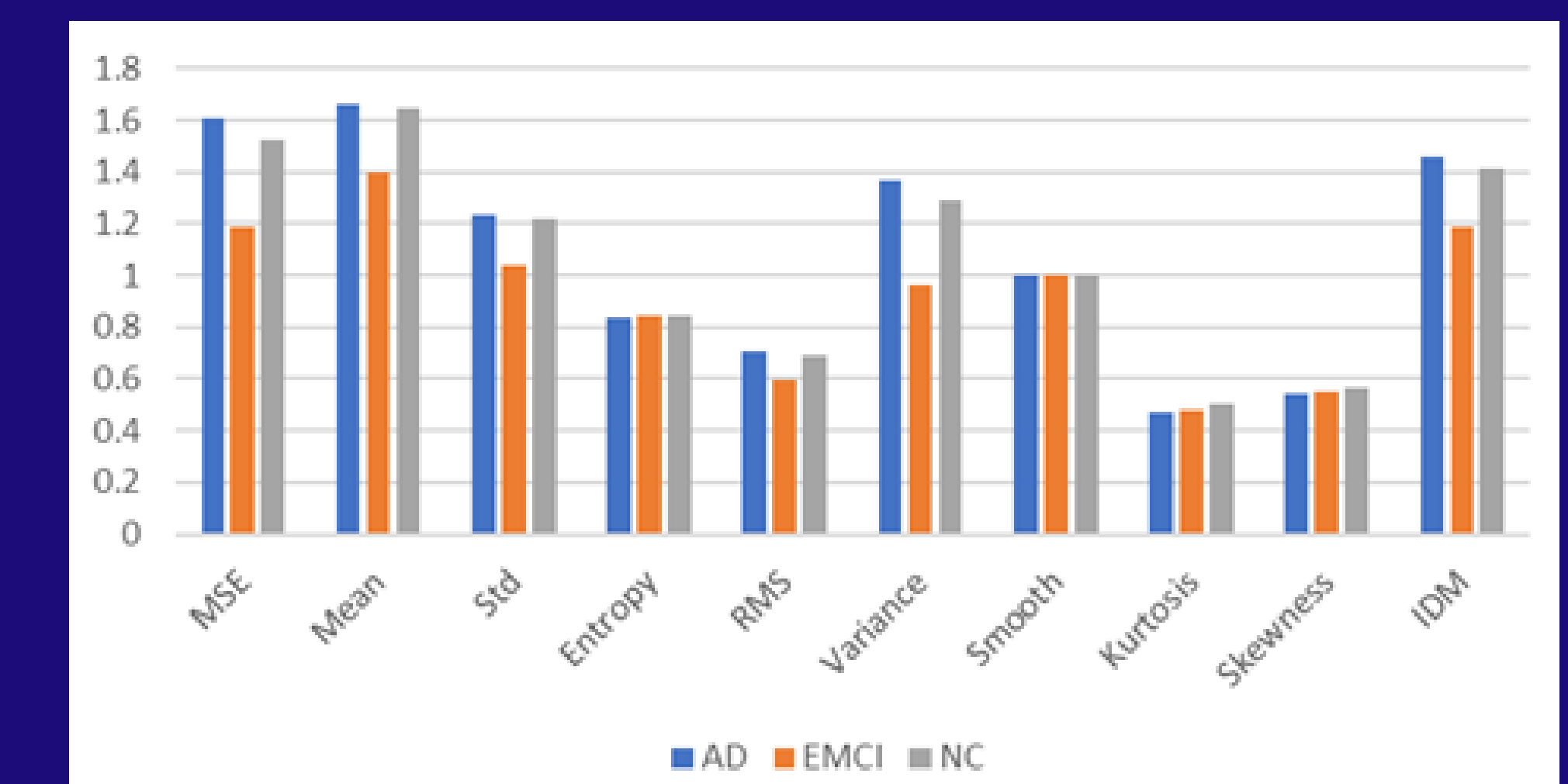
The final stage of the project includes the classification algorithm for the diagnosis of early dementia.



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## FINDINGS

The earliest findings, based on statistical data, are that image asymmetry decreases at the early stages (EMCI) of dementia and increases when the patient develops severe (AD) disease.



## FURTHER RESEARCH

The next stage of the research will focus on machine learning. Algorithms will be developed using the ADNI database and then tested on new databases.

Knowledge Lab

